Revival and Management of Traditional Water Harvesting Systems

C.R. Shanmugham

Introduction

Traditional water harvesting systems comprise mostly small scale water bodies like irrigation tanks, farm ponds, anicuits (diversion weirs with offtake channels), and Ooranis (drinking water ponds). These systems were built by our ancient kings, zamindars and chieftains, through the rural people living in the respective regions over the past 10-15 centuries. They were not only planned and constructed by the local people but were also managed by them locally. Almost every village had at least one or more such structures.

One of the most ingenious technologies appropriate to the peninsular India has been the creation of tank irrigation systems. Ingenious because, the tanks capture the runoff resulting from the unpredictable monsoon rains having a wide diversity of distribution; conserve the water for the multifarious uses like irrigated agriculture, drinking water for cattle and domestic uses, and augment ground water resources through subsurface recharge. Appropriate because the terrain of peninsular India with its undulating topography is ideally suited to impound the rainwater by a simple technique of forming an earthen embankment across the slope and providing a surplusing structure to direct the excess water to flow down to the next tank below. Water required from the tank for irrigation is released according to the needs of the crop through sluice outlets and regulated by simple wooden shutters designed for economic use of the water. Water flows down the tanks by gravity through field channels and doesn’t need any kind of energy for the supply of water to the crops raised in the command area.

Tanks are the only source of water for many villages and for the dry land farmers of this semi arid region. Tanks have been both moderators of floods during heavy and intense rainfalls and providers of the much needed water during the periods of drought. They are simple to operate which the farmers have been doing traditionally for distribution of tank water equitably among themselves to irrigate their crops. The local people who are the users of the tank water are managing the water distribution. But the periodical maintenance of the tanks, cleaning of supply and distribution channels, and the minor repairs to the water regulatory structures which were once meticulously undertaken by the users under Kudimaramath (Community labour) have been gradually neglected over a period of time. This has led to the deterioration of the tank structures, siltation of supply channels and tank waterspreads and weed infestation, resulting in inadequate storage and wastage of water though leakage or diversions. Some tanks are also becoming extinct due to urbanization and encroachments. Considering the fact that there exist about 1,60,000 tanks in the three southern states of Tamil Nadu, Karnataka and Andhra Pradesh - most of them with low efficiency, there is an urgent need to rehabilitate them to their design standard and improve their performance level through farmers’ participation and management. Yet another reason for this imperative is that rehabilitation of existing small scale irrigation resources is much more cost effective than developing new water resources; and more important, suitable sites for forming new reservoirs are not available, with the pressure on land increasing for various uses.

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2 Programme Officer, DHAN Foundation, S.S.Colony, Madurai - 625 010.
Tank Rehabilitation

The main objective of tank rehabilitation is to alleviate poverty and raise the standard of living of the small and marginal farmers in the rural areas who have no access to large irrigation systems. This is proposed to be achieved through provision of more reliable supply of irrigation water for the monsoon dependant crops and ensuring a threshold level of productivity, which would result from the supplemental irrigation through tanks. Rehabilitation of irrigation tanks is a process of restoring the deteriorating tanks to their original design standard and performance efficiency.

**Tank Rehabilitation**
- facilitates greater acquisition of water
- strengthens the tank bund and other water surplusing and regulation structures and safeguards them from flood damage
- increases storage capacity
- prevents wastage or loss of water
- improves reliability of water for irrigation
- permits easy operation of the system
- facilitates regulation and economic use of water
- promotes conjunctive use through increased storage
- stabilizes/ increases crop production
- minimizes silt accretion
- improves groundwater recharge
- facilitates fishery in some areas
- provides additional revenue through usufructs of trees, grass or short duration crops on tank bund and bed
- ensures sustainable high performance

Sustainability of Tank Irrigation

Tank rehabilitation raises the interest and enthusiasm of the users to make the best use of the renovated tank systems. But if the rehabilitated tanks are to provide sustained benefits to the users, periodical maintenance and local management of the tanks are essential. For this to happen, the active participation and committed involvement of the users of the tanks becomes necessary, right from the planning through the implementation of the rehabilitation.

**Importance of People’s Participation**

Past experiences have proved that the infrastructure created - in this case, the rehabilitated tank - rapidly deteriorates due to lack of proper maintenance and management. The lack of maintenance can be attributed mainly to three reasons.
- Firstly, the facilities created or improvements made may not meet the user’s needs, due to which they may not be interested in their maintenance.
- Secondly, lack of proper knowledge and skills to maintain the system may lead to its disuse.
- Thirdly, no individual would like to take the responsibility to maintain the system, which belongs to the community as a whole.
Hence, in recent times, great emphasis is being laid on creating a sustainable infrastructure that calls for people’s involvement in planning, operation and maintenance of the system, for which proper awareness has to be created and people need to be organized into groups to take up the activity. Effective participation of the people is the way to gain public acceptance. People’s involvement in planning is a good management practice since it often presents opportunities to:

- Take advantage of the indigenous expertise or local knowledge that may be available with the various people involved.
- Identify financial limitations or other constraints and ensure that the plan is compatible with their needs.
- Overcome conflicts and reach a consensus when there are different points of view with respect to project components, such as encroachment eviction in tank bed and supply channels, catchment area development and alignment of distribution channels in the tank command.
- The people who are involved in planning & implementation of works to gain confidence in its operation and maintenance.
- The people to take care to distribute the water equitably and economically among themselves, and in accordance with the crop water requirements.

**Strategy to enlist People’s Participation**

- Motivate water users and form Water User’s Associations for management of tanks
- Enlist the participation and active involvement of farmers who are the major users of irrigation tank with tank rehabilitation as incentive
- Create farmers’ stake through their contribution by labour/money/materials
- Mobilize funds from funding agencies for rehabilitation
- Build farmers’ capacity through training and techno-managerial support
- Provide opportunity to farmers to voice their felt needs and priorities for rehabilitation and give due consideration to them
- Take up the whole tank complex for rehabilitation & development, viz. the catchment area, supply channels, tank bed, tank bund, tank physical structures like surplus weir, surplus course, sluice outlets and distribution of channels and other On Farm Development works in the tank command and not merely the tank structure.

Instead of a top down approach, a grassroot approach from the beginning of a project formulation has been found to be desirable by establishing a dialogue with the community leaders and discussing with them the tentative plans and options. The community gets motivated to participate in any development project only if they perceive significant gains from it. Without this, the community is often reluctant to be involved and views such activities with suspicion. The local leaders, if well informed and motivated, act as the promotion agents of the programme. They play the main role in organizing meetings and extension sessions with the community and mobilizing community contributions to pay for part of the project. For a successful tank rehabilitation project, a grassroot organisation fully involved in planning and implementation is a prerequisite. The government or other agency’s role will then be limited to the necessary technical and / or financial support and facilitation. A proven technique to enlist people’s participation has been by appealing to the individual or collective interests of the local people in such a way that there is effective response to action. This concept has been used in number of projects all over the world with encouraging results. This would be achieved by making tank rehabilitation as the incentive as it would induce the people to rally around the development work with a common interest.
Tank Rehabilitation as facilitated by DHAN Foundation

The three stages of tank rehabilitation project are,

1. Planning
2. Implementation and
3. Operation and Maintenance

In all these stages the users of the tanks are intensively involved, facilitated by DHAN Foundation through building up their capacity to become self-reliant. The ultimate goal is revival of farmer management in tankfed agriculture. The experience gained from the three hundred tanks rehabilitated so far is highly satisfying in two respects.

1. Farmers’ response to the programme is encouraging and in some areas overwhelming.
2. The quality of rehabilitation work is high, as the Water Users’ Association plans the work in accordance with its felt needs and implements it to prescribed specifications without any profit motive.

Components of Tank Rehabilitation

Tank Complex and Physical Features of Tank Structures

The tank complex comprises the catchment area, supply channel, tank bed, surplus weirs, sluice outlets, distribution channels and command area. Improper land use and faulty cultural practices in catchment area results in soil erosion and sedimentation of tank water spread area. Weeds like Ipomoea cornea also grow and occupy the beds of tanks and feeder channels. This reduces the storage capacity of tank and creates shortage of water supply to the registered command area. The eroded soil also gets deposited in supply channel, choking the water way and impeding water inflow into the tank. Clearing the weeds and desilting supply channel and tank water spread increases the storage capacity and results in greater reliability of water supply to the crops.

Tank Bund

The soil removed from tank bed is deposited on the tank bund to strengthen and restore it to the designed cross-section and top level. The excess soil desilted from the tank bed which is rich in plant nutrients can be transported and spread over the fields in the command and catchment areas. In many areas the soil excavated from the tank bed is also used for brick manufacture.

Surplus Weir

Most of the masonry surplus weirs constructed for flood disposal are broad crested. Where a weir is not able to discharge the excess water rapidly, it can be converted by a simple technique into a high co-efficient weir which would enhance its discharge capacity by 33%. This method is much more cost effective than increasing the length of the weir.

Sluice Outlets

In many tanks the conduit pipes in sluices are found choked with tank silt due to their not being cleaned periodically. In a few instances the pipes are also found broken. Due to the poor quality manufacture, they are not able to withstand the pressure caused by the overburden. Periodical removal of silt from the pipes and the replacement of the collapsed pipes with good quality tested
pipes would restore the functional performance of the sluices. Constructing a masonry cistern at the entrance of the sluice opening helps to trap the tank silt and prevent its entry into the conduit pipe.

**Community wells**

Ground water is a common property which gets recharged by the rains, by the tank water within its zone of influence, by the irrigation water applied to the crops — particularly paddy which gets standing water in the field - and by subsurface movement of water from neighbouring areas. But it is usually appropriated by well-to-do farmers who can afford to sink open dug wells or tube wells in their lands. Some of those rich farmers even sell the well water to those who do not own wells but need water to save their crops, if tank water is not sufficient.

In order to avoid such exploitation, community wells are sunk in the tank command or sometimes in the tank bed, to cater to the needs of farmers who cannot afford to sink individual wells on their own. Such community wells sunk as a part of the revival of tank irrigation systems, provide additional water supply after the rains cease and the tank becomes empty, either to save a standing crop or to facilitate raising a second crop by the farmers. Care should however be taken to locate the well site at an appropriate place where water is available and where the farmers having no wells show a keen interest to sink and manage the wells.

**Tree Planting**

Seedlings of trees of fuel, fodder or timber value can be planted along the boundary line of the common property (Tank) i.e. in the foreshore of the tank bed in the strip of land situated between its FTL and MWL contours. Trees can be planted on the banks of feeder channels also along the boundary of the government land. The tree species desired by the people and which can stand short term submergence are to be planted. They provide additional income to the people from the usufructs besides their maturity value. This additional revenue will be shared with the local panchayat and it will help the people to utilize the income for periodical maintenance and management of a tank. Tree planting serves to prevent encroachment of these lands by unauthorised persons. Besides they shelter birds and preserve the ecology of water bodies.

**Ground Water**

In Theni district of Tamil Nadu, Anantapur district of Andhrapradesh and similar ground water scarcity areas of Karnataka, the farmers avoid direct irrigation of their crops by closing the sluice outlet and using the tanks as percolation ponds to recharge only ground water. The wells sunk in the tank command and even those situated outside the tank command, but within the zone of influence of the tanks upto 1 km radius get benefited by the tank and their water table rises dramatically by about 3-5 m during the next monsoon rains. The area that can be irrigated by these wells also gets extended by 0.50-1.0 acre. The dug wells as well as tube wells get such increase in the ground water recharge, although the increase is more perceptible in the dug wells. In tube wells, the pumpsets that could be run only for about 6 hrs. of pumping earlier, could be used upto 12 hrs. Construction of check dams across the streams conveying water to the tank and desilting of feeder channels have helped to raise the water table even in some of the dug wells situated in the catchment areas of the tanks. These measures have helped to stop the periodical deepening of the wells by the farmers which involves their incurring expenditure of a few thousands of rupees.

- Paddy crop could be raised were only irrigated dry crops were raised earlier.
- The live stock could use the water for longer periods in a year.
- Drinking water wells situated at the head reach of tank command could supply water to the entire village population.
The identification of the highly and moderately favourable terrain for recharge of groundwater by the ground water wing of Water Resources Organisation, the Institute of Remote Sensing and the Agricultural Engineering Department, have been of great help to prioritise the tanks for revival. The groundwater formations in these regions are Bazada, buried pediments & flood plains having weathered thickness ranging from 25 to 40m, with high and moderate infiltration characteristics.

**Conclusion**

All the rehabilitation measures of the traditional water resources are simple and easy to carryout through rural artisans and the farming community. They are highly cost-effective, requiring only about Rs.10,000 per hectare of command area benefited as against a sum of Rs.60,000 per hectare at the current price to create a similar water resource afresh and to provide lasting benefits for the small investments made. Through active participation in the tank rehabilitation, the user group gains experience and confidence to undertake maintenance and management of the rehabilitated tank system without depending upon government or other agency and thus become self-reliant, which is the ultimate objective of the project.