TANKS IN THE TUNGABHADRA SUB-BASIN AND AN IWRM STRATEGY FOR TANKS: The long and the short view

Suhas Paranjape and K. J. Joy[1]

Abstract

Though tanks were the mainstay of irrigation in the pre-British period, they declined in importance during the British period and even more rapidly in the post-independence period which was dominated by large scale canal irrigation. A study of tanks in the upper catchment of the Tungabhadra sub-basin in Karnataka found that tanks still play an important role in the area and that a proper integration of the tank and canal systems can provide important synergies. In the short run, it is important to recognise the nature of tanks, and potentially, of all water sources, as multipurpose community resources instead of purely irrigation sources serving landowners in the command. This involves changes in perceptions of who is a water user and what are the governance structures around these concepts. In the long run, there is a need to integrate small systems into large systems on the model of the Chinese `melons on the vine' where local systems form the melons and the larger systems form the stems that convey water to feed and strengthen the melons.

Acknowledgments

The study of tanks in the Tungabhadra basin referred to above was carried out as part of European Union Supported STRIVER project titled 'Strategy and Methodology for Improved IWRM – An integrated interdisciplinary assessment in four twinning river basins'. Details may be found at www.striver.no. We draw substantially on the policy brief on tanks that we prepared for STRIVER (see below) along with our co-authors S. Manasi and N. Latha from the Institute of Social and Economic Change (ISEC), Bangalore.

Mainstay of livelihood assurance in the pre-British period

Every region in the world has evolved water systems that are adapted to its social, geographical, geo-morphological and climatic particularities. While the perennial streams of North India have often led to systems based on diverted flows like the *kuhl*s; in South India, traditional water systems have been based mainly on tanks (small reservoirs) and often an interconnected cascade of tanks in the lower

[1] Both the authors are Senior Fellows in the Society for Promoting Participative Ecosystem Management (SOPPECOM), 16 Kale Park, Someshwarwadi Road, Pashan, Pune 411008, Tel: 91-20-2588 0786/6542 Email: soppecom@gmail.com

portions of catchments. Over centuries a sophisticated system of irrigation had evolved around them that incorporated regulated access and allocations between and within tanks and also provided for their upkeep and improvement. Though they were not free from the social inequalities that existed in the larger system, they nevertheless provided some minimum water assurance for those traditionally entitled to farming land.

With the advent of British rule and subsequent developments centred on modern and large irrigation systems, things began to change. However, the pace of change was relatively slow and in the immediate post-independence period they still retained their eminence as providers of water for various livelihood purposes. Thus, tanks irrigated 1,151,082 ha in 1960-61 in Andhra Pradesh and 335,468 ha in 1957-58 in Karnataka and accounted for as much as 39.6% of net irrigated area in Andhra Pradesh and 44.2% in Karnataka. For the districts comprising the Tungabhadra basin, tanks irrigated 108,829 ha comprising 39.5% of net irrigated area in those Andhra districts and 157,156 ha comprising 53.4% of net irrigated area in the Karnataka districts (See Table 1 below.)

The decline of tanks

As noted by a number of studies[2], tank systems declined in status continuously in the post-independence period. Recent figures bring out this decline very clearly. As Table 1 shows, by 2004-05 net area irrigated by tanks in Andhra Pradesh had fallen to 477,100 ha in 2004-05 (12.3% of net irrigated area) and in Karnataka it had fallen to 147,068 ha in 2003-04 (6.2% of net irrigated area). For the districts comprising the Tungabhadra basin, in the Andhra districts, area irrigated by tanks had fallen to 12,176 ha (comprising a mere 2.9% of net irrigated area) and in the Karnataka districts it had fallen to 68,882 ha (comprising only 9.8% of net irrigated area). The decline is evident from the fact that the decline in tank irrigated area is not just relative, but there is a massive reduction in absolute terms as well. In the Andhra districts of Tungabhadra basin the area irrigated by tanks in 2004-05 was 11.2% of the area they irrigated in 1960-61, and in the Karnataka districts, the area irrigated by tanks in 2003-04 was 43.8% of the area they irrigated in 1957-58.

[2] For example, Von Oppen 1980, Chiranjeevulu 1992, Shankari 1993, Agarwal 1997, Vaidyanathan 2001, Shah 2002, Raju 2003, Kajisa 2005,

Table 1: Past and present status of tank irrigation in Andhra Pradesh and Karnataka

Region	Area irrigated by tanks		Area irrigated by all sources		% Irrigated area irrigated by tanks	
Andhra Pradesh						
Year	**1960-61**	**2004-05**	**1960-61**	**2004-05**	**1960-61**	**2004-05**
Entire state	1,151,082	477,100	2,909,096	3,880,590	39.6	12.3
Tungabhadra districts	108,829	12,176	275,613	423,098	39.5	2.9
Karnataka						
Year	**1957-58**	**2003-04**	**1957-58**	**2003-04**	**1957-58**	**2003-04**
Entire state	335,469	147,068	759,379	2,384,037	44.2	6.2
Tungabhadra districts	157,156	68,882	294,525	701,531	53.4	9.8

Source: Directorate of Economics and Statistics, Government of Andhra Pradesh and Directorate of Economics and Statistics, Government of Karnataka, Bangalore

Many studies have been carried out in respect of the decline of tanks. Their decline may be traced to a chain of events started by the takeover of community and *zamindari* tanks (private tanks) by the state. This led to an institutional breakdown and erosion of traditional arrangements in most tanks, consequent breakdown of collection of water charges, lack of maintenance and increasing encroachments on tank beds and feeder channels. The decline also led to decrease in recharge of groundwater and increase in flash floods and overspills and reduced capacities. At the same time, there was an increasing population that demanded services from the tanks and their expectations were also changing rapidly and away from traditional thinking that framed traditional agriculture and tank use.

Tanks were also made redundant because of environmental degradation in upstream catchments such as deforestation, overgrazing, soil erosion and siltation. In addition, changes in land use pattern particularly in the catchment zones of reservoirs, aggravated soil erosion and subsequent siltation in tank beds. With the extension of rural agricultural community beyond the traditional sections, neo-farmers are yet to acquire proper agriculture and water management skills.

Also, it should be noted that the advent of canal irrigation results in the neglect of tanks and the net result is a replacement of tank irrigation by canal irrigation rather than an addition of canal irrigated area to tank irrigated area. This is strikingly evident in the Tungabhadra basin if we compare the figures for the Andhra districts of the basin with the Karnataka districts of the basin (see above) because the Andhra portion of the sub basin is largely served by canal irrigation. Whereas previously tank irrigation was higher in the Andhra portion than that in the Karnataka portion, now it is much lower and has been reduced to negligible proportions.

The present situation of tanks in the upper catchment of the Tungabhadra sub-basin

During the STRIVER project[3], Society for Promoting Participative Ecosystem Management (SOPPECOM), a partner organisation in the STRIVER project, with the help of two local organisations, Integrated Community Development Organisation (ICDO) Davangere and Vikasana, Shimoga took up a study of tanks in Shimoga and Davangere districts in the upper parts of the Tungabhadra sub-basin. Five villages served by four tanks were taken up for the study. Two types of tanks were included in the study. Two of the tanks were rainfed tanks and two of them were balancing tanks, that is, they served as buffer storages for the larger Bhadra irrigation system and therefore received periodic supplements which were stored in the tanks. The net result was that these tanks received water from their own catchment as well as from the Bhadra system.

A house listing census was carried out in the 1655 households in the five villages. Of these, a small stratified sample of 202 households was then selected for a more detailed household survey based on perception data. For various questions, people were asked for reasons or comments and were asked to rank them in terms of importance. The household data was then further discussed in focus groups to verify trends.

Tanks have multiple uses

One of the first findings was from the house listing. The house listing form included a simple question where the households were asked to indicate the different kinds of uses of tanks that the households employed. It clearly shows that tanks should not be regarded as irrigation sources alone. A very high number of households use the tanks for several other purposes.

[3] "Strategy and Methodology for Improved IWRM – An Integrated Interdisciplinary Assessment in Four Twinning River Basins" or STRIVER for short was a European Commission project under the Sixth Framework Programme. There were thirteen institutions across the globe participating in this three year research project and it was coordinated by Norsk Institutt for Vannforskning (NIVA), Norway. The study involved four basins, namely, Glomma (Norway), Tejo/Tagus (Spain/Portugal), Sesan (Vietnam/Cambodia) and Tungabhadra (India) – two from Europe and two from Asia. For the Tungabhadra basin, three institutions, namely, Society for Promoting Participative Ecosystem Management (SOPPECOM), Pune, Institute for Social and Economic Change (ISEC), Bangalore and Centre for Development Research, Bonn University, Germany were involved in the study.

Table 2: Multiple uses of tanks		
Type of use	**No. of HH**	**Per cent HH**
Drinking water (directly from tank)	23	1.4 %
Washing clothes	1,264	76.4 %
Bathing	146	8.8 %
Drinking water for cattle	673	40.7 %
Washing cattle	673	40.7 %
Fishing	22	1.3 %
Swimming	229	13.9 %
Worship	236	14.3 %
Tank bed cultivation	18	1.1 %
Silt for farm land	56	3.4 %
		Total no. of HH = 1655

As may be seen from Table 2, there are a host of non-irrigation uses that the tank has and a substantial number of households report these uses. It should also be noted that in this table the use of tank as a source of drinking water is not covered, since it only covers those households that individually draw water directly from the tank for drinking. However, in almost all villages the local water supply is based indirectly on the tank since it is usually based on a groundwater source (tapped through a well or a bore well that is recharged by the tank). What it shows clearly is that tanks cannot be considered to be simply irrigation sources. Indeed this applies to almost all reservoirs, ranging from the village tank right up to the large dams. This has major implications for the definition of water user and the organisation of water users. Presently the state has chosen to treat as water users only those persons who hold land in the designated irrigation command of the projects. This is too narrow a definition to adequately take account of actual water use and water users.

Another use inadvertently left out of the house listing form is water used for sanitation. In the later sample household survey, households were asked whether they used water from the tank for sanitation and the findings show that according to season, between 65 and 82 per cent of the households also use the tank as a source of water for sanitation.

Shortage of water

The reference year 2007-08 was not a bad year in terms of rainfall and water availability and not many households reported water shortages. However, almost everyone complained of recurrent shortages. When asked to assess how many of the last ten years were shortage years, the average of the reported values was 3.2 years out of 10.

Households were also asked their opinion of the reasons for water shortage and were asked to rank them. The top five reasons according a simplified rank index[4] were

1. Lack of repair and maintenance of tanks
2. Excess water drawn by farmers at head reach
3. Encroachments on tank bed have reduced storage
4. Too many people grow water intensive crops
5. There is less rainfall

What is interesting is that excess water use as well as encroachments are also quite important factors perceived. This has implications on how to go about the tank rehabilitation programmes.

Wells and conjunctive use

There is a preponderance of bore wells (total of 52 bore wells in the sample) as against dug wells (only 6). Average pump rating was 5 hp and hours of operation per week varied from 6 in the monsoon to 13 in winter and 21 in summer. Most of the wells go dry in February. However, almost all of the wells are recharged when the tank channels are flowing. This is again important to note: these wells will statistically be counted as separate irrigation sources and the area irrigated by them will appear as well-irrigated area. However, many of the waterings from these wells will come from tank water replenishing them and therefore a substantial proportion of the irrigation they provide is indirectly tank irrigation. Unfortunately, there is no simple way the present statistics can segregate the two components. What is important is that almost universally now in tank and canal commands, farmers routinely use wells to capture recharge from irrigation.

Households were also asked about the major problems they faced regarding wells and the top five were as follows:

1. Electricity is available only for short while
2. Electricity is mainly supplied at night-time
3. Well yield is too low
4. Electricity charge is too high
5. Wells go dry

As may be seen, electricity is closely implicated in these problems

[4] Respondents were asked to select the three highest ranked options. Ranks were assigned integer values from 1 to 3 based on rank. Highest preference was indicated by 3 and lowest by 1. Average ranking was based on aggregate ranking score for the entire sample. This method was used for all the rankings involved.

Crop preferences

Crop preferences as revealed by ranking crop choices made by households were as follows:

1. Paddy
2. Maize
3. Areca nut
4. Sugarcane
5. Sunflower

Of these, paddy, areca nut and sugarcane are all water intensive crops and it is these that are at present accounting for a very large proportion of irrigation water use. A major thrust on water saving technologies in these crops could thus yield substantial water savings. However, there is also a need to link such savings with pooling and providing them to those areas and farmers who at present are deprived of water. If this is not done, the water saved will simply contribute to expanding the area of water intensive crops grown by the resource rich.

The short view: Tanks can play a vital role in equitable and sustainable IWRM

It has also been pointed out that tanks have enormous potential and that it is possible to realise much of this potential in the short term. For example, K. V. Raju estimates the potential of tank irrigation in Karnataka to be 690,000 ha comparable to the 743,383 ha irrigated by large canal systems in Karnataka in 2003-04 (Raju 2003). Similarly, it has also been pointed out that hectare to hectare irrigated area tank irrigation is less costly. For example, according to the data from the Ministry of Water Resources, the cost of creating irrigation potential for one hectare during the Eighth Plan through large and medium irrigation projects was Rs 98,495 as against just Rs 10,051 for small irrigation projects (Raju 2003) – a factor nine difference. We suggest that tanks can play a vital role in livelihood assurance and poverty alleviation if they are rehabilitated and integrated into the larger system with an IWRM perspective and adequate attention is paid to their advantages and limitations.

Multi-purpose community resources

It is important to move away from the conventional Water User Association (WUA) approach that sees water mainly as an irrigation resource. We need to take into account the various uses that tanks have from an IWRM perspective. They include:

> a) <u>direct uses</u> -- irrigation, drinking water, water for domestic use and sanitation, water for bathing, drinking water for cattle, water for washing and bathing cattle, washing clothes, fishing, recreation, worship, silt and seasonal tank bed cultivation, and
>
> b) <u>indirect uses</u> – basically ecosystem services that regenerate the environment, recharge and replenish ecosystem resources and potentials.

We therefore need to broaden the concept of water use and water users and look at tanks as multi-purpose community resource. The above mentioned study of tanks in the upper catchment of the

Tungabhadra basin corroborates this aspect. In fact, this is true of all reservoirs at all scales, even though the weight given to irrigation increases with scale. The first step thus is to have an integrated view of tanks as multi-purpose resource.

More dispersed sources

Unlike large centralised commands organised almost exclusively around irrigation, tanks serve dispersed areas at various scales. Their management systems are more likely to be within the reach of the local poor and they are likely to provide more equitable access to the service they provide. When commands become large, concentrated and purely centred on irrigation, they create favourable conditions for large scale accumulation, capture and concentration of economic and social power. Moreover, IWRM does not only require basin level IWRM institutions but also requires nested institutions at various scales. At the bottom-most level, the tanks serve as appropriate units of organisation and IWRM because they combine local hydrological and associated ecosystem uses and users and bring together the many uses of water in a local ecosystem.

Tanks, therefore, have great potential of taking us towards IWRM and widely dispersed livelihood assurance, provided there is a suitable policy aimed at realising this potential. To this end, the following suggestions emerge from the study.

Need to go beyond PIM

In Karnataka, all tanks with commands of less than 4 ha are owned by the Gram Panchayat (village council), between 4 to 20 ha by the Zilla Panchayat (district council), between 20 and 200 by the Minor Irrigation Department and above 200 ha by the Major Irrigation Department. In Andhra Pradesh, tanks with commands larger than 400 ha were completely with the Irrigation Department; Panchayat raj institutions maintained tanks with command area below 40 ha in Telangana and below 80 ha in the rest of Andhra Pradesh with joint charge for those in between.

Things have changed after the advent of participatory irrigation management (PIM). Andhra has gone much farther than Karnataka in respect of PIM experience and legislation. However, this study indicates that there is a need to go beyond the prevalent PIM concepts in respect of tanks, if not for all larger sources as well. At present Water User Associations (WUAs) formed under PIM practice and law are restricted to irrigation users and within that too, only to those who own land in designated commands.

A major institutional implication of our study is the need to move from participative irrigation management to IWRM approaches in the governance institution for tanks. This implies that users and membership of WUAs must not be restricted to landowners in designated commands but must embrace the entire community that inhabits and utilises the immediate ecosystem that the tank comprises. Also, governance institutions should be based on a representation from the irrigation users as well as the community that effectively uses the tank which may be a habitat, ward, village, or groups of villages according to the size and situation of the tank. It is also important to maintain a link with the relevant PRIs.

Policy guidelines

The following policy guidelines may be suggested in this respect:

a) All tanks with a net irrigated area of up to 200 ha should be governed by the tank related IWRM institutions (because this is the order of size of the traditional tanks),
b) Service area and/or a users list should be worked out for each tank on the basis of its multi-functionality,
c) Adequate representation should be provided to non-irrigation users of tanks, especially those who may not own land in the designated commands (this would normally mean a representation from all groups within the villages served by the tank),
d) Adequate representation should be provided for PRIs (because PRIs largely do and should deal with the other water use related programmes, see below), and
e) Governance and management of tanks is integrated with other water uses (drinking water, sanitation, fairs, water for cattle) and managed in an integrated manner.
f) Rehabilitation should go beyond de-siltation and must ideally precede the transfer to participative institutions. This aspect is crucial in the social sustainability of tank rehabilitation, especially in respect of groups that were excluded from tank benefits in traditional systems.

Prioritising rehabilitation

In this study, farmers reported four main reasons for poor performance of tanks:

a) Lack of repair and maintenance of tanks,

b) Excess water drawn by farmers at head reach,

c) Encroachments on tank area that reduced storage, and

d) Crop pattern in which too many people grow water-intensive crops.

In rehabilitation measures, the first priority should be to clear encroachments, first, on to the feeder channels and supply channels as well as overflow weirs if present, and secondly, on to the tank bed. Attention should also be paid towards cleaning of gates and channels, repair of walls and embankments, provisions for facilities and sites for washing clothes, collecting drinking water, separate sections for animals for drinking and washing, and proper drainage from these sites. Prevention of siltation through filters and catchment treatment comes next and de-siltation comes at the end. It is important to build source protection into tank rehabilitation.

The long view: Integration of rainfed and irrigated farming areas

The measures that have been described above would go a long way towards rehabilitating tanks and increasing their coverage. However, their relationship with the large systems would remain problematic. It would not do to ignore the fact that one of the important reasons for the decline of tanks has been the growth and development of major canal systems. The figures that were quoted at the beginning show that the area irrigated by tanks fell from over 100,000 ha to just about 12,000 ha, that is almost one-tenth of its previous coverage, reflect such a steep fall that it cannot fully be explained by the autonomous decline of tanks.

Though we are not aware of studies that explore the process that takes place when canal irrigation enters an area served by tanks, it is our surmise based on anecdotal information that when canal irrigation enters an area more and more farmers gravitate towards it and drop out of tank institutions. The overall tendency to neglect tanks and tank institutions is intensified manifold and tanks decline much more rapidly in canal served areas than they do in areas outside canal commands. The reason that the Andhra districts in the Tungabhadra sub-basin show such steep fall in tank irrigated area is explained by the additional factor – access to the Tungabhadra canal system, which in turn is symptomatic of the underlying relation and lack of integration between tanks and large systems and between rainfed and irrigated areas generally. In the long view it is this that needs to change. Tanks can become a vital link for a sustainable and equitable IWRM but for that we need to reorient our approach to tanks, dams and irrigation systems.

Tanks should receive stabilising supplements

The first step in this direction is to recognise that tanks would be greatly helped by receiving stabilising supplements from larger systems. Many studies show that rainfed tanks show good performance for years with better rainfall, but may not perform very well in bad years. Also, studies like Vaidyanathan (2001) show that the performance of system tanks in Tamil Nadu (tanks which receive regulated supplements from larger systems) is better than other tanks. Our study of tanks in the Tungabhadra basin also shows that farmers in villages served by rainfed tanks reported between 3 and 5 years out of every 10 years as shortage years, those from villages served by balance reservoirs (tanks that serve as buffer storages for extending canal reach, though not operated as system tanks) reported less than 3 years of shortage. In short, it may be assumed that tanks that receive supplements from larger systems tend to be more reliable and perform better.

This is a larger issue of IWRM in respect to the relations between tanks and between tanks and the larger systems. Studies of system tanks show that supplements from larger systems improve their performance considerably. These supplements play a number of roles. Firstly, since water from larger systems has a greater dependability of supply, such supplements can go a long way towards stabilising tank supplies for various uses. Secondly, as discussed earlier, pure irrigation-centred concentrated large commands create favourable conditions for concentration of economic and social power on a much larger scale that do supplement dispersed tank systems. Thirdly, if availability of such supplements is made dependent on augmentation and protection of local resource and good performance, it can become an incentive and instrument for ecosystem improvement and sustainable productivity enhancement. Such integration of tanks into larger systems will go a long way towards dispersal of water access and poverty alleviation.

Breaking down the 'Chinese wall': Emerging clues for integration

However, this is unlikely to take place unless we break down the conceptual and institutional 'Chinese wall' between irrigated and rainfed farming. At present, radically different policies are adopted for them and are implemented by different departments. Similarly, there is a divide between tanks (seen as 'minor' irrigation systems) and medium and major irrigation systems. In fact, a transition from one to the other may mean that benefits enjoyed earlier may be withdrawn albeit different other schemes and benefits may become applicable. The result is that rainfed farming, seen as farming without any applied water, is rapidly declining, and farmers are abandoning it and crowding into the cities in search of gainful employment. At the same time, centralised canal irrigation systems are not only becoming more and more expensive, but the more centralised they are, the more problems they have in assuring timely and sufficient deliveries to farmer fields.

However, there are clues as to how an integration may take place. First, there is a growing recognition, at the practical level, that when there is a land constraint (when it is not possible to trade off land area against risk-proofing), *some* irrigation is necessary for ensuring sustainable livelihoods. Thus we have the growth of well irrigation in rainfed farming. It is essential to see that this does not mean that *all* the farmers land is irrigated.

Managing such a system is different from managing canal irrigation systems in vogue today. Managing irrigation systems is seen as managing a block, and most often a centralised block of land in which *all* the land is potentially irrigated. Instead, managing a dispersed and changing irrigation area within a larger designated *service area*, rather than a given block of irrigated *command area* have to be dealt with. As an illustrative example, instead of a fixed designated command area of 500 ha that may be supplied with 1 Mm^3 of water, such a system may have to deal with a changing pattern of say providing 1 Mm^3 of water to between 400 to 800 ha within a service area of 2500 ha, where farmers will combine rainfed and irrigated agriculture. The latter in fact is what is closer to what farmers already do.

Learning from traditional systems

Traditional systems had elements of this. It never managed and did not think in terms of fixed designated commands. It was the village and the farmers, who ran it to serve their interest and had within it the inbuilt mechanisms to respond to needs. Systems were laid out, at least in their inception stages to see that everyone got some benefit. The *phad* system in Maharashtra combined *phad*s as irrigated contiguous blocks with ensuring that everyone had some land within the *phad* (Datye and Patil 1987; Sane and Joglekar 2008). This is not to say that those systems were strictly equitable, they were after all, inscribed within highly iniquitous social and economic systems and had to work within them. What is important is that as we look at them, we look at them not as systems to be taken over *in toto* but as systems that certainly have definite lessons for us to learn and apply – in specific situations, in specific ways.

One of the first important lessons that can be learnt from them is that irrigation is not a matter of providing water to designated pieces of land, but is a matter of providing irrigation service to farmers and communities. And secondly, that water sources are not to be reduced to irrigation sources, but should be treated as sources of fulfilling the whole gamut of water uses that a community has. These aspects were inbuilt into traditional systems, and modern systems have broken up these composite systems into individual and virtually independent systems. In that sense, the traditional systems as practising IWRM systems that modernisation has fragmented should be looked at. The issue is now of re-integration into a new IWRM system.

Clues for integration: service areas and water user communities

The above implies a radically different approach to water source management and service delivery. It is important to move away from the command area approach prevalent today to a service area approach. Current approaches are based on delineation of a contiguous *command area* and managing irrigation to that command area. Farmers here appear only as owner-irrigators of pieces of land in the command area and by virtue of their owning land within the command area. This is what is called an area-centred approach.

In contrast, the service area approach treats it as a matter of providing water services to the people within an area. The irrigated area within the service area would normally be only a part of the service area and need not be contiguous or constant, but would be organised in a manner so that every farmer within the service area would receive at least a certain minimum service. Secondly, the irrigated area could also be flexible, especially if crop rotations and rotation of irrigated areas as an important aspect of environmental friendly sustainable practice is taken into account. It is also important to avoid the irrigated island effect that centralised irrigation systems have.

The service area approach also implies that what is being provided is not irrigation alone but a host of water services, including for example, drinking water, water for sanitation and hygiene, water for cattle and other livestock, water for washing clothes, possibly fishing or fish culture and water for recreation and religious purposes. Many of these services, especially those tied to cultural or spiritual needs are not simply the provision of water, but waterscapes, that is, particular combinations and placements of water and landscapes. It implies a radical move away from water users as owner-irrigators to water user communities. As water users in the widened sense, they form a complex agglomeration that takes them from being a so-called single interest group to a *community* composed of intersecting and overlapping stakeholder groups. Indeed, even though a very large proportion of traditional tank water was used for irrigation, there was never any question that they were managed by the *communities* they served.

This is another point where tanks could have an important role to play. Community bonds do not form very easily and it is useful if their natural-social affinities can serve to bring about this bond among water users. Here it would be important to organise the lower rung of the irrigation system in such a way that the smallest units also coincide as much as possible with traditional units, either in the form of a village or hamlet or groups of hamlets or in the form of earlier tanks. This then would form the most appropriate lowermost unit for an IWRM system.

Integration of irrigated and rainfed farming and minimum water assurance

One of the important aspects of such a system would be the acceptance of the integration of rainfed and irrigated farming. This implies first of all the acceptance that farmers will normally have both irrigated and rainfed land and that they will manage a farming system that is composed of both elements. The task of irrigation providers is to provide irrigation facilities to such an *integrated* system. The service area then constitutes the sum total of the rainfed and irrigated land that the farmers operate and the irrigation provision must take due note of how the integrated system works and demands. If this is taken as a starting premise, farmers can then rotate crops and irrigation in a manner that will avoid the islanding effect of centralised command systems and minimise the environmental ill effects of repeated and continuous mono-cropping.

Hand in hand with this is required the recognition that service areas should be determined so as to devote the bulk of their water to create livelihood security/assurance for as many farmers as possible. This is again distinctly different from the earlier methods of designation of command areas that are based on working out how much contiguous area one can serve by delivering a designated depth of water or serving a hypothetical crop pattern. Planning for a service area then is like a micro planning exercise, in which the attempt is to identify livelihood needs and water requirements and gaps. The important thing here is the change from land to people as a unit and from the introduction of livelihood assurance (which include basic needs) as the principle to be utilised in determining the service. Obviously some guidelines is needed on how much water could be then provided on one hand to the more enterprising farmers for profitable activities and on the other, for the needs of environmental integrity and sustainability of the water source itself.

`Melons on a vine'

So far only the lowest rungs of the IWRM system have been described in an illustrative manner. And, to that extent, many people would agree, but would also maintain that while it is appropriate for smaller systems and traditional tanks, how can the same be then extended to the medium and major systems, which may be at the scale of hundreds and thousands of villages? However, the problem is not all that intractable if it is broken down into modular units. And ironically, a rudimentary form of that type of organisation is also prefigured by the clues towards integration that are emerging from the larger systems themselves that have been pointed out earlier.

The clue to the organisation of such an IWRM system on larger scale is afforded by the long-prevalent system tanks in Tamil Nadu and the increasing use of tanks as `balancing' reservoirs in the other areas. If a system in which water communities, with service area planned around local storages, each of them forming a modular unit is imagined, then the medium or major systems are organised in manner in which they deliver water, *not to the end user* but to these *modular systems.*

The whole system looks like what the Chinese have called `melons on a vine', the melons being the local water systems and the vines, the larger systems supplying the melons with the `nutrients' they need. The system would be extended by the melons growing bigger or by adding new melons. These local systems then act as rainfed tanks in their own right and also as distribution mechanisms for the larger systems. In fact, if tank rehabilitation programmes are planned in such a way as to integrate them into the nearest larger system and the larger systems, in turn are reorganised in such a manner wherever possible, an equitable and sustainable IWRM would almost be attained.

Starting from both ends: walking on two legs

The transition to such a system is not a small task and will have to be taken up from both ends: in restructuring both the existing large and small systems and their further development. This is a big exercise. What follows are a few illustrative suggestions.

Approach towards local water systems

- Start with a spurt in local water system development with watershed development as a starting point. And extend it to *all* areas including irrigated areas, provided they adopt this type of integration. This will be important in converting present command areas onto melons on a vine.
- Adopt Low External Input Sustainable Agriculture (LEISA) systems with rainfed as well as irrigated components with limited but assured water application. The irrigated areas could comprise of small plots with intensive cultivation and the rainfed component could be biomass production from rainfed horti- and silvi-culture integrated into farming systems.
- Extensive local buffer storages (e.g. farm ponds) for protective and limited irrigation (5 per cent farm pond programme)

Approach towards larger water systems

- All incomplete and new dams and storages should be restructured on the basis of the `melons on a vine' concept, pool command area development funds with watershed funds can rehabilitate and develop local water sources through watershed development as a starting point.
- Restructure as much of the existing command area as possible on the same lines by rehabilitating tanks and local storages within and around the commands and integrating them into the system
- Provide support for water saving and LEISA techniques for the major water consuming crops in canal areas with the condition that saved water be available to non-canal areas
- Tie quantum of water supplied to a local system to the degree of development of local resource. Typically, it could be made proportional to the degree to which the local system realizes the sustainable water resource potential of that area. Since this ties supply of external water to the degree of development of potential of local sources, it helps avoid the sort of neglect and decline of local sources that follows the entry of canal systems into an area.

To summarise, it is believed that tank rehabilitation without the long view in mind is insufficient in respect of moving towards a truly IWRM system that integrates the large and the small. Without the long view, tank revival will certainly take place, but will always remain threatened because it will lack the stabilizing integration into larger systems that it sorely needs. On the other hand, the larger systems will continue to be overextended, over-centralised and will suffer from lack of sufficient buffer capacity. Both large and small systems will suffer. Together, they have the potential to form a stable IWRM system that will go a long way towards providing sustainable livelihoods for the rural areas in India.

References

Vaidyanathan A. (ed.) 2001. *Tanks of South India*, Centre for Science and Environment, New Delhi

Raju K. V., Karanth G. K., Bhende M. J., Rajasekar D., Gayathridevi K. G. 2003. *Rejuvenating Tanks: A Socio- Ecological Approach*, Books for Change, Bangalore

Raju K. V. 2002. *Tank Rejuvenation in Karnataka: Why it should be a Community Based Approach?* IWMITATA Water Policy Research Program, Annual Partner's Meet

Paranjape Suhas and Joy K. J. 2008. *Report on Findings of Tank Survey in Five Villages in Upper Tungabhadra* Sub-basin, (memo) (forthcoming), SOPPECOM, Pune

Paranjape Suhas, Joy K. J., Manasi S. and Latha N. , 2008. *IWRM and Traditional systems: Tanks in the Tungabhadra system* available online: www.striver.no

Tushaar Shah, R Seenivasan, C. R. Shanmugam and M. P. Vasamalai, 2002. Sustaining Tamil Nadu's Tanks: A Review of Issues and Approaches in Dinesh K. Marothis (ed.), Institutionalising Common Pool Resources, Concept Publishing Company, New Delhi

Kei Kajisa, K. Palanisami and Takeshi Sakurai, 2006. Declines in the collective management of tank irrigation and their impact on income distribution and poverty in Tamil Nadu, India FASID Discussion Paper Series on International Development Strategies No. 2006-10-005

U Shankari and E Shah, 1993. Water management traditions in India, PPST Foundation, Chennai

M Von Oppen and KV Subba Rao, 1980. Tank Irrigation in Semi-arid Tropical India,

Economics Program Progress Report, ICRISAT, Hyderabad

P Chiranjeevulu, 1992. Tank irrigation and agricultural development, Kanishka Pub. House

Anil Agarwal and Sunita Narain, 1997. Dying Wisdom: Rise, Fall and Potential of India's Traditional Water Harvesting Systems, Centre for Science and Environment, New Delhi

Sane, S. B. and G. D. Joglekar, 2008. "The Collapse of the Phad System in the Tapi: A River Strains to Meet Farmers' Needs", in Joy et al (edited) *Water Conflicts in India: A Million Revolts in the Making*; New Delhi: Routlege

Datye, K. R. and R. K. Patil, 1987. Farmer Managed Irrigation Systems: Indian Experience, Pune: Centre for Applied Systems Analysis in Development.