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Tank rehabilitation in India: Review of experiences and strategies

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ABSTRACT

Traditional water harvesting (tank) systems are integral to agricultural development and livelihoods of rural communities in India. Despite the fact that these systems provide number of services (drinking water, protective irrigation, etc.,), their importance and contribution declined during the post-independence India. Population pressure along with poor maintenance have led to their deterioration. For instance, the number tanks not in use has doubled between 2000-01 and 2010-11. The share of tank irrigation in to total irrigation in India declined from 17% to 2.5% between 1950-51 and 2014-15. Realising the multiple benefits from theses traditional systems, tank rehabilitation has been one of the policy priorities at the central as well as in some States.

This paper is a review of experiences on tank systems and their rehabilitation across the regions of India. The idea is to explore the variations in tank systems across the regions and identify specific approaches for strengthening and promoting them. Tank uses, benefits, users or stakeholders differ from region to region. Hence, the priorities may not be same in all the regions.

The evidence across the regions indicates that the benefits from tank rehabilitation outweigh the costs. It is argued that scaling up of tank rehabilitation at the national and state level is critical for providing substantial benefits to the local communities. While the policy initiatives to restore irrigation tanks are rational, the interventions need to be based on the changing conditions in terms of groundwater development and climate variability in the specific regions.

1. Introduction

In India, age-old water harvesting and storage systems such as tanks and ponds are becoming things of the past because of lack of any sort of maintenance by the state or civil society. These traditional systems have degenerated overtime because of unwarranted interventions by the state and changing socio-economic and political conditions at the village level. As a result, area under tank irrigation has declined substantially at the all India level i.e., 3.6 million hectares (17%) in 1950-51 to 1.7 million hectares (2.5%) in 2014-15[1], though the extent of deterioration varies across states (CWC, 2010). This declining capacity of the tanks has not only led to loss of area under irrigation but also groundwater recharge in the tank dominated regions that are relatively dry, drought-prone and dependent on wells as tanks improve recharge by 40 per cent (Meter, et. al., 2016). Well irrigation recorded a phenomenal rise, especially during 1970s and 1980s and moved from second to the first position in terms of area irrigated by a single source. This has, in turn, created considerable imbalance in the ecological and social systems of the country.

Declining tank irrigation and expansion of groundwater irrigation are observed across India, especially in the drought-prone regions. The literature identifies numerous socio-economic, institutional and physical reasons for the decline of tank irrigation (Von Oppen and Rao, 1980a; Reddy, 1990, 1995; Shankari, 1991; Janakarajan, 1993; Reddy et al., 1993; Palanisami, 2006 and 2008; Palanisami et al., 2011; Nehlin, 2016). The decline in tank irrigation has been linked with increasing population density (Von Oppen and Rao, 1980b). It has also been linked to the development of well irrigation (Palanisami, 2006). For, the decline in benefits from community-based technology/sources (tanks) has prompted people to shift towards individual-based technology/sources (wells). This, however, connotes a wrong notion of substitutability between tank and well irrigation, particularly because tanks complement groundwater development in reality. The decline of traditional systems, therefore, is a cumulative effect of policy and

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[1] Compiled from the Directorate of Economics and Statistics for different years, Ministry of Agriculture and Farmers Welfare, Government of India. Figures are provisional for the year 2014-15.

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institutional neglect.

In the pre-independence past (before 1947), institutional arrangements such as *Dasabandam* and *Kudimaramat* of South India, *Aher-Pyne* systems of South Bihar; *Chandeli* tanks of Bhundelkh; and *Johads and Pals* of Rajasthan, were in place to protect these systems from decay. These institutional arrangements nurtured by the benevolent local rulers have been central to development and sustenance of the tank systems over centuries. However, the policy shift towards major and medium irrigation[2]during the British period, coupled with the changes in policy perception of irrigation development, that is, treating irrigation as a productive (revenue-generating source) rather than a protective source, has resulted in the degeneration of these institutions. In addition, overall environmental degradation, especially in drought-prone regions, has led to silting up of tanks and shrinking of their capacities. This, in turn, has led to the shift towards private well irrigation. Declining tank irrigation and expansion of well irrigation were slowed down towards the end of the British period and the slow down continued until the 1980s.

The second phase of the tank systems decline was triggered by the advent of the energization of groundwater lifting mechanisms. The new technologies in pumping systems during the1980s coupled with the benefits from green revolution technology have resulted in an unprecedented expansion of groundwater development. Further, poor farmers were not in a position to adopt these technologies because of their capital-intensive nature, especially during the initial stages. Due to over exploitation (OE) a large number of open wells have started drying up in drought-prone regions. In fact, well failure (including borewells) has become a common phenomenon in the recent past, as the policies have been passive.

Realising the importance of protecting and sustaining these systems, tank rehabilitation programmes have been initiated by the state governments, bi-lateral agencies and Non-Governmental Organisations (NGOs) in number of states (Reddy, 2015). Of late, tank rehabilitation and modernisation has been initiated at the national level with budgetary allocations. While rehabilitation is defined as “bringing back the systems to their original technical form”, modernisation is defined as upgradation of the systems with modern infrastructure and management (Shah and Raju, 2002). Modernization thus also involves institutional arrangements for managing the systems. In fact, management is increasingly becoming critical for rehabilitating the systems. For, in the absence of appropriate and effective institutional arrangements investing in rehabilitation may not be a viable proposition. Therefore, rehabilitation and modernisation could involve number of activities such as strengthening the bund, sluice repair, de-silting, treatment of catchment, repairs to feeder channels and irrigation canals, institutional arrangements, etc., Some of these activities are taken up in the rehabilitation programmes, though institutional aspects are gaining importance in the recent years.

Although there is every reason to protect and strengthen these traditional systems, it needs to be based on the region specific nature and importance of tank systems. For, tank systems differ in their size, extent, functionality, management, etc., from region to region and hence requires specific approaches for their rehabilitation and management in a sustainable manner. The economic viability of tanks, given their scale, is crucial for the communities to realize their importance in improving their livelihoods. Tanks being common pool resources (CPRs), collective action is a prerequisite to manage them in a sustainable manner. This becomes important in the context of the changing socio-economic and political scenario. This paper is an attempt to explore the variations in tank systems across the regions and identify specific approaches for strengthening and promoting them across regions. Specific objectives include:

a) Assess the extent and importance of tank systems across the four regions (North, South, East and West);
b) Examine the various tank management practices across these regions;
c) Examine various tank rehabilitation interventions and their impacts in different regions; and
d) Suggest appropriate tank rehabilitation strategies in the changing socio-economic, environmental and policy context.

This paper is based on the literature available across the states and provides a meta-analysis of various aspects. This paper is organised in six sections: After the introductory section (one) the following section (two) presents the status of tank irrigation across the four regions of the country and sets the priorities for tank rehabilitation in these regions, section three provides the rationale and importance of tank rehabilitation interventions. Section four discusses the impact of tank rehabilitation programmes. The importance and nature of tank rehabilitation in the changing environmental and policy context is discussed in section five. And the last section (six) makes some concluding remarks and suggests region specific policy options.

2. Status and profile of tank irrigation across regions in India

2.1. Extent of tank irrigation

All the major States and Union Territories (UTs) in India are grouped under five regions (as per the Planning Commission) viz., South, North, East and West (Table 1). North-eastern states are not included here as there are no studies available for this region. Research on tank irrigation is mainly focused on south, east and western regions and very few studies are available from northern states. This could be due to the relative importance of tank irrigation in these regions or states. Irrigated area under tanks has been declining since 1950-51, while all other sources have recorded an increase (Fig. 1).

The Minor Irrigation[3](MI) Census, carried out by the Ministry of Water Resources (MoWR), provide the information on tanks at the state level every five years since 1986-87. But only 2010-11 (MI) Census are the latest available[4]. Even the data provided in these Censuses are not consistent over the years. Only in one year (2000-01) number of tanks in use is given separately, while in other years tanks are given under surface water flows, which includes canal irrigation as well. These two figures are not comparable as tanks in use account for less than 50 per cent of the surface water flows and the 50 per cent decline between 1986-87 and 2000-01 in some studies (Pant and Verma, 2009) is not real (Fig. 2). Over the years there is an increase in the number of tanks from 0.5 million in 1986-87 to 0.64 million in 2000-01 and then they declined to 0.6 million in 2006-07. This may be due to watershed development programmes (WSDP) after the 1990s, under which number of surface water bodies are being created. Among the regions north and west have recorded an increase while south and east reported decline in surface water bodies between 1986-87 and 2006-07.

In the absence of accurate data across all the states, the number of tanks and ponds in India are reported to vary between 0.2 to 0.35 million (ADB, 2006). The number of tanks in use assessed by the MI census in 2000-01 was 0.23 million in India (Fig. 3). Besides, an estimated 42,955 tanks were not in use in 2000-01, which has gone up to 85,807 in 2010-11[5]. Together, this provides an estimate of number of tanks in the range of 0.3 million in India. Southern region accounts for

[2] Major irrigation schemes are those with a culturable command (irrigated) area of 10,000 hectares and medium irrigation schemes are those with 2,000 to 10,000 hectares.

[3] Minor irrigation schemes are those with less than 2000 ha. of culturable command (irrigated) area.

[4] The data are released with a lag of 3-5 years. The 2016-17 Census data are likely to be available by 2020 at the latest.

[5] These figures are provided by indiastat.com. The actual year of reference is not clear as the data was sourced from a parliament question in 2011.