B. Anuradha, N.K.Ambujam / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com
Vol. 2, Issue4, July-August 2012, pp.1941-1943

Impact Of Tank Rehabilitation On Improved Efficiency Of Storage Structures

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ABSTRACT

Tanks were common property of village community; they were owned, maintained and managed by the beneficiaries. The benefits occurring out of the tank and its water use including usufruct rights were enjoyed by the village community especially women, Landless and poor. Tanks and rehabilitation of tanks are exclusive to the tropical history. To revolutionize the outcome of rehabilitation, in recent times the main emphasis has been shifted towards the livelihood approaches through community-based tank rehabilitation on environmental restoration. With involvement of multiple stakeholders, which includes small, marginal farmers, landless group, women and other vulnerable groups, irrigation tank rehabilitation provides positive results. The present study attempts to explain the impact of tanks rehabilitation exclusively in peri-urban areas with the specific objective of to understand the impact of irrigation tank rehabilitation on improved efficiency of storage structure. As to understand the above a total of 20 per cent respondents (irrespective of their land ownership) were selected from Vengal village in Tamil Nadu State of India and the extent of use of tank was studied. The samples were analyzed and the results abstracted were highly responsive in terms of a rise in internal rate of net return, yield increases/ha, increase in yield due to silt application, incremental net return per hectare, increase in yield of dug and dug cum bore wells, increase in yield of bore wells, net yield/ ha and enhanced livelihood options by and large.

Keywords: Agriculture, Economic return Groundwater recharge Irrigation, Tank rehabilitation,

1. INTRODUCTION

Tank irrigation is an old established practice in most of the semi-arid tropical parts of India, Since the monsoon rainfall pours erratically in this region. Irrigation tanks serves to store and regulate the flow of water for agricultural use. In southern part of India, they are primarily used for the production of rice. Since major and medium irrigation projects needs huge investment, cost, long gestation period, heavy maintenance cost and ecological problem. There is a need to utilize the existing tanks by undertaking necessary repairs to them and evolving proper management system. This will facilitate the optimum utilization of the available rain water for Sustainable agriculture development in semi-arid tracks of the country. Several factors such as increase in urbanization, encroachments, changes in land ownership pattern, absentee landlordism, development of well irrigation in tank command area, changes in cropping pattern in favor of cash crop and occupational diversification from agricultural to non-agricultural activities leads to improper maintenance of tanks causes many of the tanks dysfunctional. Later it was realized to rehabilitate the existing tank system and maintain them properly to obtain continued benefits from them than allowing them to degenerate and create new sources at exorbitantly high cost.

2. MATERIALS AND METHODS

The Vengal village is situated in Thiruvallur district in the northern part of Tamil Nadu, India. It has a population of 5523 constituting of 2786 males and 2737 females. The area under Vengal command is 178 ha and there are 252 members in Water Users Association. It is a rainfed tank which is fully depending on its own catchment's for water. Tank capacity is 1.11Mm^3. A total of 20 per cent respondents from farming households have been selected from Vengal village and the extent of use of tank on environmental restoration were studied. Year of consideration for post and pre rehabilitation period is 2003-04 and 2009-10 respectively. As the first step, a pilot survey was taken up and on the basis of it a detailed questionnaire was prepared. Then, the collected data were analysed using SPSS (Statistical package of Social Science). Irrigation efficiency was calculated by multiplying conveyance efficiency in the tank, conveyance efficiency in the field channel and application efficiency. Conveyance efficiency is the ratio of water delivered at field inlet to water released from a tank. Application efficiency is the ratio of crop water requirement to quantity of water delivered to a field.

3. RESULTS

3.1Efficiency

The earthen field channels were having mild bottom width lots of undulations that caused heavy silting up and stagnation problems in the channels. But after rehabilitation phase the main distributory channels are lined. And hence the conveyance, field channel, field application and irrigation efficiency got

increased to 16.36%, 12.49%, 0.81%, and 19.28% respectively shown in Table 1. Not only that, the percentage of loss of flow in study tank also reduced to 2.39%.

Table 1. Details of Increased Efficiency in Vengal Tank

Sl.no	Particulars	Pre project (%)	Post project (%)	Test length (m)
1	Conveyance efficiency	59.64	74.17	100
2.	Field channel efficiency	83.67	90.96	100
3.	Irrigation efficiency	39.88	52.29	100
4.	Time of Travel	5.85 min	3.28 min	100

Apart from hours spent in fetching water from different private wells women also experiences abuse treatment of well owners. They have to put up with, as there are no other options. This trend can be reversed through rehabilitation. Drinking water problem is solved in Vengal village through drilling bore in tank bed itself. Water extracted is stored in six overhead tanks of 60,000 litres capacity helps to meet their drinking water demand. Moreover the excess water was used for kitchen garden like vegetables and orchids. Thereby women can get a small amount for their home needs and their nutritional value was also improved when they consumed it. The post and pre rehabilitation period was taken into account for 100 m length of field channel. The time taken for the water to pass through the specified 100 m length was 6.15 minutes before tank rehabilitation and 3.28m after rehabilitation. This reduces the travel time of water considerably. The tail end farmers felt that they received sufficient irrigation water to their fields leading to the increase of paddy production. Before the lining of field channel farmers put of mud bund (Kondam) to divert water and often broke open by it or by other farmers sometimes. This causes silting up in the channel. The slope of the channel was very mild. Silting up reduced it further and decreased the velocity. But now the shutters are locked by the farmer association and water is distributed evenly to all areas.

Table 2. Crop yield and efficiencies related to water use

Sl.no	Description	Pre project	Post project
1	Crop yield average kg/ha	3980	4100
2	Water use efficiency kg/ha cm	22	23.97
3	Relative water supply	1.51	1.42
4	Rainfall during the crop calendar year (mm)	1256.40	1087.80

Table 3. Comparison of expenses and revenue in Vengal tank

Sl. No	Expenses	Pre project (Rs)	%	Post project(Rs)	%
1	Seeds and sowing	1276	12.56	1376	10.61
2	Main land preparation	1788	17.6	2662	20.48
3	Transplantation	988.64	9.73	1208	9.29
4	Manuring	1367	13.46	1546	11.9
5	Fertilization	1699	16.73	2602	20.02
6	Irrigation	151	1.49	350	2.69
7	Weeding	932	9.18	950	7.31
8	Plant protection	274	2.7	361	2.78
9	Harvesting	1625.88	16.55	1939	14.92
Total		10160	100	13000	100
Yield(kg/ha)		4113		4149	
Gross revenue (Rs)		18509		23867	
Net return (Rs)		8348		10867	

Table 2 and Table 3 shows the average yield in kg/ha is increased by 920 kg/ha and the net return is also increased for Rs. 2519 in post rehabilitated period. Due to the dugout pond work, the cattle are getting sufficient drinking water through out the year. Cattle drinking water source is created and was full with water even in summer. Fodder cultivation on the farm pond bunds and near the plot of farm ponds in 13 acres were introduced. Additionally 160 liters of milk/day has been produced from the watershed area due to the project works. The villages of South India, which are mostly located on the banks of the tanks, enjoy the water from the tank for their use in livestock rearing, drinking and for domestic use [1]. Historically, some marginal groups for grazing livestock, growing trees and for undertaking seasonal cultivation use the water-spread area [6]. Even today the Thiruvellore district has one of the highest populations of livestock such as sheep and goats, which require vast area of grazing. Apart from the above, tank rehabilitation helps in growing more fodder. The most remarkable environmental restoration fact is that the women are the utmost beneficiaries of the above. Migration from this village has stopped in the last two seasons and it is reported that the people from the surrounding villages are coming to work as labourers to this village.

The immediately perceptible benefit is that an average gap of 20 ha land in tail end has been bridged. The Vengal Kuppam main channel length is

2500 m. This channel is lined up to 1950 meter. This made the irrigation possible to the tail end lands. Details of cropped area and gap before the execution of work, the storage was at full tank level (4.115 m) and the area irrigated was 155.92.5 ha. The gap was 22.10.0 ha even though there was copious rainfall in that year. After rehabilitation, the tank water level was only 3.875 m, the area irrigated was 169.51.0 ha and the gap was only 8.53.5 ha. This shows that after rehabilitation the gap was reduced considerably resulting in an increase of cropped area.

3.2 Ground Water Recharge

Increased storage and increased inflow has helped in better groundwater recharge [2]. This is an important environmental indicator to find out impact of tank rehabilitation. Around 160 wells in Vengal tank command area got recharged which was not possible earlier. These wells before rehabilitation were able to supply 2-3 hrs a day during Dec-Jan and 2 hrs in summer during normal rainfall years. This was enough to cultivate around 2 ha from each well. But in post rehabilitation period supply hours has doubled. The water table in this area is also increased below ground level consistently in all the wells. There were around many wells in the vicinity (1 km radius is the ground water recharge area) of the tank's recharge. The tanks usually supply water for 3-5 months and farmers supplement it with groundwater. The recharge in the wells is a function of the tank (surface) water storage. This is a reason why the wells are over flowing when the tank is full and well has meager recharge when the tank is empty [3]. Before rehabilitation, the farmers raised only one paddy crop through tank irrigation. But now they can go in for second crop with tank water in early stage and well in the later stage.

4. DISCUSSION

Tanks have been in existence in India over centuries. They have out been constructed at any particular twist period but came in to existence as to population pressure and demand for additional water storage to meet peoples livelihood needs. Because tanks were constructed over the land surface without digging, availability of suitable abutting sit to locate a tank played a major role constructing a tank. The tanks of south India vary over a wide range in their command, catchments and water spread areas (ranging from a few hectares to hundreds of hectares). The tank system, which have been developed ingeniously over a period of several centuries have provided insulation from recurring droughts and floods and vagaries of monsoon, and provided the much needed livelihood avenue to the marginal and poor people living in the fragile semi-arid tropics [5]

The importance of tanks is being realised more and more, as the continued use of ground water and other large-scale water resources system is proving to be costly and inadequate to meet the increasing demands [4]. So, the tank ecosystems have to be conserved to provide a safety net to the livelihood of millions who depend on these systems. The conservation of tanks has to be done considering the multiple uses such as irrigation, drinking water for people and animals and for recharging ground water [1]. The tank systems also provide fuel wood and timber, fodder, silt, water for rearing fish, and animals and bio-diversity complex for flora and fauna. Thus it could be substantiated from the following observed indicators on the impact on the Vengal village tank rehabilitation.

- Irrigation efficiency 12.41%, Conveyance efficiency 14.53%, Field channel efficiency 7.29%, Field application efficiency 0.91% has been increased during post project period.
- Incremental net return per hectare: Rs. 2519/-
- Increase in yield of dug and dug cum bore wells: 72%
- Increase in yield of bore wells: 30-40%
- Net yield/ ha increases: 20-30% and,
- Enhanced livelihood options by and large.

Maintenance of these tanks through governmental agencies becomes a gigantic task, when aggregated. Since it is not possible and also not necessary to create a new tank, at least it is now essential to revive the old system of maintenance of tank through voluntary group effort at beneficiary level in order to restore environment.

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