Restoration of Irrigation Tank (A Case Study on Kunta Chervu in Warangal District)

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Abstract— The tanks occupy vital role in the irrigation as well as local ecosystem in the semi-arid and regions of South India. Meanwhile, tank provides multiple uses like source of drinking water for uncountable rural and urban communities and livestock, fish culture, recharge of ground water, control of floods etc. However, after the independence of india the significant source of tank irrigation has drastically decreased due to several socio-economic and institutional factors, particularly the changes in land ownership pattern, caste, class configuration and importance given to canal systems and over exploitation of ground water. At the same time today there is alarm that these valuable and extensive resources are in a state of collapse, contributing to increased drought vulnerability in some of the poorest districts in the country. The main motivation of this thesis is to examine the RESTORATION OF TANKS in South India particularly in case of Telangana state i.e., MISSION KAKATHIYA. The case study also makes an effort to recommend policy guideline measures to revive tank irrigation in telengana. In this context of restoration of tanks the desilting of the tank bed will help in increasing the tank capacity and recharge the ground water. A new sluice and weir was designed and constructed for the accurate discharge of water to the command area for the entire crop period.

Key words: Restoration of Irrigation Tank, Case Study on Kunta Chervu, Mission Kakathiya

I. INTRODUCTION

A tank is a low, earthen bund constructed across a shallow valley to hold the rainfall runoff from its catchment area. Tanks may be either isolated or in cascades. In a cascade, when the upper tank gets filled, the spill over the surplus weir is led into the tanks lower down, one below the other as a cascade until the last tank spills into a drain or a river. Tanks have been the main source of irrigation in many parts of India from time immemorial. India experiences extremes of climate within its 329 million hectares (ha) of geographical area. Rainfall pattern is neither predictable nor uniform over space and time. The incidence of rainfall is also seasonal, occurring mainly during the southwest monsoon (June to September) in most of the country except the rain shadow areas of the Western Ghats (steep mountainous range), notably Tamil Nadu. Being confined to a few monsoon months, rainfall behavior is highly erratic. This hydrological characteristic of the Indian monsoon necessitated the creation of storage facilities to hold the rainwater of the monsoon and utilize the same at a later date. With extraordinary engineering, managerial, and social skills, an extensive system of rainwater harvesting structures comprising tanks and ponds had been built and maintained by the people for centuries. The hydrological characteristic of the Indian monsoon necessitated creating storage facilities to hold the monsoon rainwater and utilize it later. With extraordinary engineering, managerial, and social skills, an extensive system of rainwater harvesting structures comprising tanks and ponds had been built and maintained by the people for centuries.

A. What is a Tank and basic importance of minor irrigation tanks?

A tank is a low, earthen bund constructed across a shallow valley to hold rainfall runoff from catchment area. A lake/tank is formed when water flow is intercepted by an obstruction i.e., a rock outcrop or dyke. People recognizing the obstruction constructed a stop dam to raise water level in the natural flow path. When the bund assumes certain length, the impounded water looks like a pond/ tank. Tanks may be either isolated or in cascades. In a cascade, when the upper tank gets filled, the surplus weir flows spill into the tanks in the downstream one below the other as a cascade until the last tank spills into a drain or a river. The configuration of the physical system of tank cascade in a particular watershed has to be considered as a link system of Tank restoration index for prioritization of tanks in semi arid regions. The objective of Improvement of Minor Irrigation tank component is to enhance the physical condition and operational performance of selected tank systems through a range of interventions identified and executed in partnership with the respective tank users. In executing these interventions steps are taken to secure safety of the tank structures, improve on-farm water management and water use efficiency. However, as most of the tanks presently operate below their designed capacity, it is necessary to revive these tanks for ensuring optimum use.

B. What are the functions of irrigation tanks?

India, a tropical country, has historical evidences of human interventions in the management of water for agriculture from village water bodies. One such intervention is an irrigation tank. Minor water reservoirs located behind earthen dams are known as irrigation tanks as they are generally used for ensuring protective irrigation to crops. A tank is a simple rainwater harvesting structure designed by people using indigenous wisdom and strengthened with generous support of native rulers and chieftains. There are 500,000 irrigation tanks in the country, of which 150,000 tanks are located in the semi arid region of Deccan plateau. They are located in hydrologically favourable sites, some of them in sequential chains or cascades, effectively capturing the rainfall and serving multiple uses with irrigation having the major share. Tank irrigation systems are simple but fragile structures. They have to be constantly maintained, monitored and conserved. Even more difficult is sharing the scarce water amongst its consumers, particularly farmers.

C. Decline of Tanks

Tank, as an important source of Irrigation, has lost its significance during the last three or four decades. Most of the tanks in the state perform below their capacity level and the gap between the irrigation potential created and actual irrigated area under tanks has been reported at about 40 to

60 percent depending upon the rainfall during the year. In the process, area under tank irrigation has declined, which has adversely affected people who were traditionally depending for their livelihoods on tanks.

The proportion of area irrigated under tanks showed a significant decline from 39% in 1995 to 14% in2005 in the state. Though the irrigation potential created through the tanks is estimated at 14 lakh hectares, the actual area irrigated is only about 4-6 lakh hectares. The variation in rainfall in the last decade is also one of the principle causes for the large decline.

The fall in efficiency of the tank system could be one or more of the following reasons:

- Decrease in inflows to the tank
- Deterioration of physical system
- Poor canal system

The decline in tank irrigation is now widespread turn and affecting the agricultural economy of the state. Much of the tank-fed areas are situated in the districts where there are no possibilities of providing other systems of irrigation. This loss is not only to irrigation but also to other village common use like domestic and drinking in many places. As per the estimates of the Indian Planning Commission, in the last 25 years, about 1.7 million hectares of net area under tank irrigation has been lost amounting to a capital loss of about Rs.51, 000 millions.

II. MISSION KAKATHIYA

The government has prioritized to take the restoration of minor irrigation tanks to restore them to store their original capacity and to effectively utilize 255 tmc of water allocated for minor irrigation sector under Godavari and Krishna river basins.

The minimum ayacut that can be irrigated with the above allocated water is about 20lakh acres.but as per the statistics the ayacut now being irrigated tanks, thus, there is a gap ayacut of about 9 to 10 lakhs acers.

The reasons for this gap ayacut under minor irrigation tanks are due to,

1) Loss of water storage capacity of tanks due to accumulation of silt in tank beds over a long period.
2) Due to dilapidated sluices, weir and weak bund.
3) Due to dilapidated condition of irrigation canals

The massive programme for restoration of tanks is named as “china neeti vana rula punaruddarana” and it is renamed as “mission kakathiya” .The government is planned to restore 9306 tanks every year(20% of total tanks) with an eventual target of restoring all 46,531 tanks in 5 years in a phased manner. The present programme of “mission kakathiya” is to bring this gap ayacut of 10 lakh acres into command which requires no further allocation of water and also land acquisition.

A. Case Study

The assessment consisted of personnel structured interviews with key representatives and inspection of documents. The restoration of tank involves the works strengthening of bund, clearing of jungle on bund, desiltataion of bed, construction of weir and sluice.

III. BUND

Bund is a very important component of the tank structure. Generally it is built with earth of homogeneous soil. Some tanks are of composite type with earthen bunds with masonry or earthen bund with weir and sluice. The earthen bunds consists of top width varying from 1.5 to 5 meters with more flattened slopes with revetment on the front slopes and steep slopes with turfing on the rear slopes. In the case of kunta chervu the bund was strengthened by filling layer by layer of 25 to 30 cm and it was compacted by roller. Before strengthening of bund the width of bund was 2.5 meters and after strengthening it was 4 meters. Jungle was cleared to decrease the leakage from the bund.

IV. DESILTATAION OF BED

De-silting is an important option for improving tank irrigation system. This process am is at removing accumulated silt in the tank bed, clearing foreshore encroachments and brining the tanks to their original capacity. The process of de-silting is done by means of heavy earth moving machinery.

The silt removed from the tank bed can be:

- Transported by the needy farmers into their lands.
- Deposited on the submergible lands on the foreshore of the tank which can thus be reclaimed and brought under cultivation. These newly cultivable areas become more productive.
- Excess silt than that has been usefully transported may be deposited on the downstream side of the toe of the tank bund. To take up the de-siltation of tanks and decide upon the quantum of silt that can be removed, the following procedure has to be adopted.

1) Preliminary investigation including collection of statistics regarding tank bed level and quantum of silt that can be objective taken.
2) Trial pits up to impermeable layer of the tank bed may be taken at suitable intervals so as to help the measurable quantity of de-siltation this will be a check against meddling the impermeable layer leading to the tank becoming percolation tank.
3) The silt removed may be got tested for acidic impurities which may harmful for agricultural growth.

A. Advantages of De-siltation

1) Increased availability of fresh water eliminates fluoride risks trough improvement of ground water levels.
2) Usage of silt in the farms land improves soil fertility thus reducing fertilizer usage.
3) There will be increase in food productivity due to silt usage as effective manure.
4) The soil moisture content in the farm fields also increases.

V. WEIR

The surplus work of a tank is usually either a weir or flush escape. The length of such a weir or an escape must be such that the quantity of water estimated as the maximum flood discharge likely to enter from the catchment into the tank, can be disposed off with a depth of water over the weir equal to the difference between the maximum water level and full tank level. The effective storage capacity is limited

by the full tank level but the area submerged by the tank water spread, height of the tank bund, etc., are all dependent on the maximum water level. For small tanks, the head is limited between 40 and 75 centimeters.

Generally the weir is constructed by size stone masonry with deep pointing of the joints. Excess water over and above the full tank level overflows through these weir upto the maximum water level. The leakages or damages occur due to the following reasons.

1) Leakages occur through the body wall of the waste weir due to weak structure of masonry.
2) If there are pot holes in the solid apron on the downstream of weir, there is possibility of leakage from the bottom of the surplus weir.

In case kunta chervu to reduce all the above factors the weir was design based on the flood discharge and is constructed with concrete and a solid apron was provided to reduce seepage effect , a cut wall of 2feet depth and width was provided for reducing the over turning effect due the heavy floods.

VI. SLUICE

Sluices are one of the important masonry/concrete structures in the tank component. Sluices may be one/two/three/four in numbers depending on the size and the topography of the command area. Sluice may be of barrel type or piped structure facilitated with plug and rod or shutter type arrangements.

Sluice consists of a regulating device at the head of the barrel passing through the bund at a suitable location and level to command the fields in the ayacut and connecting the main channel downstream of the bund to draw water when needed to irrigate crops. The regulating device may consist of plug and rod in old tanks or a sliding steel shutter with screw gear arrangement in the present day tanks. The sluice barrel in olden days was constructed in brick or stone masonry covered with stone slabs. Later constructions have hume pipes as an improvement against leakages and for better and easy maintenance.

In case of kunta chervu the sluice was not in condition to serve along the crop period, so according to estimation and depending on command area the new sluice was constructed to serve along the crop period.

VII. CONCLUSION

The major part of agriculture in telengana region is dependent on the tank irrigation. The government of telengana adopted a comprehensive programme. "MISSION KAKATHIYA" for restoration of tanks and accelerating the development of irrigation tank infrastructure.

There are sequences of steps involved under thesis programme

1) Bund strengthening is done to improve water storage capacity of the tank in rainy seasons
2) Sluice and surplus weir are masonry works, designed based on the discharge and catchment area calculations. Leakages in sluice and damaged surplus weir are designed and reconstructed in this case study.

Removal of silt in tank bed is to increase water storage capacity of the tank. There will be increase in ground water level and water quality there by getting lands beyond the command area under bore well irrigation.

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