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IMPACT OF WATER CONSERVATION THROUGH TANKS IN RURAL VILLAGE OF TAMILNADU, INDIA.

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ABSTRACT

Tanks and rehabilitation of tanks are exclusive to the tropical history. The apprehension of the impact of tanks in general is of recent interest for the developing countries like India and in specific to South India. In the initial years of tank rehabilitation, the focus was to maximize the agricultural production per unit of water supplied to the farmers field through improved tank system and by adopting better water management practice. Though, the endeavor was worthwhile, it never paid the expected direct results. To revolutionize the outcome of rehabilitation, in recent times the main emphasis has been shifted towards the livelihood approaches through community-based tank rehabilitation with involvement of multiple stakeholders, which includes small, marginal farmers, landless group, women and other vulnerable groups. The present study attempts to explain the impact of tanks rehabilitation exclusively in rural areas with the specific objective

- To understand both the direct and indirect impact of productivity of water and the economic benefits of livelihood options after rehabilitation of tanks.

As to understand the above a total of 10 per cent respondents (irrespective of their land ownership) were selected from Pelasur village, Thiruvannamalai district of Tamilnadu, India and the extent of use of tank through water management was studied.

The samples are analysed and the results abstracted are highly responsive in terms of a rise in internal rate of net return, yield increases/acre, 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.

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The selected indicators were:

- Irrigation efficiency
- Conveyance efficiency
- Application efficiency
- Water use efficiency
- Equity in water supply
- Ground water use in Ayacut
- Crop yield (productivity)
- Awareness and adoption level of improved agriculture
- Time lag in agricultural operations and
- Farmers Association – A status analysis.

In Tamilnadu, there is on the average, one tank for every 3.3 sq.km. of geographical area. In some areas, they are densely located and in others not. Maintenance of these tanks through governmental agncies 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. Hence better water conservation practice can be adopted for amplified food production.

INTRODUCTION

Man developed the art of cultivation when he could not meet the food demand for his group from natural vegetation. Initially, he used the rise and falls of the water in the flood plains and developed the art of inundation irrigation, which was at large intervals, and unpredictable. During this period, river valley civilization flourished at different parts of the world. As he moved away from the perennial rivers to uplands, he developed the art of impounding surface runoff at depression and valleys to utilize the stored water for crop production and domestic use. These storage structures are known as ponds and tanks. Southern states of India were the forerunners in the techniques of storage. It marked that many of the oldest tanks were built in the 18th and 19th centuries by kings and zamindars and had been kept for multipurpose use.

During British period tanks were classified into Panchayat union and PWD tanks, based upon the management authority. In Tamil Nadu out of the total 39,000 tanks, 78% are Panchayat union tanks and 22% are PWD tanks. They started receiving tax from the tank users, which made the users, think that the tanks are of government property and they are not responsible for maintaining it. Even after independence, the same situation continued, which caused many of the tanks defunct. Among the tanks which function storage capacity also drastically reduced. In recent times, farmers who have access to ground water have shown less interest in maintaining the surface water systems such as tanks and canals as a result the surface water systems are performing poorly. Also, critical functions of traditional irrigation institutions such as collective efforts in maintenance work system of water regulation and water sharing etc. is ignored and water markets come to thrive (Vaidhianathan, 1991).

Although tanks and ponds are found everywhere in the world nowhere they are as important as in monsoon Asia, which has distinct rainfall pattern. The North East Monsoon is more active in the coastal districts of Tamil Nadu and Andrapradesh and they also have the maximum number of tanks. The southern states of Andhrapradesh, Karnataka and Tamil Nadu put together have around 1,43,000 tanks constituting nearly 50% of the tanks in India. India experiences extremes of climate within its 329 million ha of geographical area. Its water resources potential and agriculture economy, hinge around monsoon rains and its spatial and temporal variation. The incident of rainfall is not only seasonal, but also in most of the regions including Tamil Nadu, it is erratic with its onset and withdrawal timing. However, three-fourth of its concentration during monsoon months of June to September coupled with long dry periods during the monsoon makes tanks and ponds as an important supplementary sources of water supply for intensive agriculture and for other multiple uses in most regions. The North East Monsoon is often accompanied by cyclones and pours heavily in short spells. Unless this rainwater is collected and stored, these areas will have acute water shortage and drought during the rest of the year.

In the initial years of tank rehabilitation, the focus was to maximize the agricultural production per unit of water supplied to the farmers field through improved tank system and by adopting better water management practice, but this approach has not yielded the direct results. Recently, the main emphasis of the rehabilitation has been shifted towards the livelihood approaches through community-based tank rehabilitation with involvement of multiple stakeholders, which includes small, marginal farmers, landless group, women and other vulnerable groups. Increase in groundwater table through recharge is another important impact of tank rehabilitation. Both irrigation as well drinking water wells are benefited through rehabilitation. The focus of this study is to understand how tank rehabilitation helps to increase groundwater recharge, livelihood for poor people in peri-urban land and water productivity.

OBJECTIVES

- To understand both the direct and indirect impact of productivity of water and the livelihood options after rehabilitation of tanks

SELECTION OF STUDY AREA

Thiruvannamalai district is situated, in the north East of Tamil Nadu. In Thiruvannamalai a Non-System PWD tank called Villapakkam has been selected from Villapakkam village, Polur Block, Thiruvannamalai district for this study.

SAMPLES

A total of 10 per cent respondents (irrespective of their land ownership) have been selected from Villapakkam village and the extent of use of tank was studied.

TECHNIQUES OF DATA COLLECTION

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 tables.

SOURCES OF DATA

The extent of the use of tank has been understood from both observation and questionnaire. As to understand the impact of tank rehabilitation the socio-economic variables that has major impact on the locals of the area such as production, income, nourishment (through fisheries development), gainful employment, seasonal migration, quality of life, livestock and milk production were abstracted. Besides, the effect of other factors such as socio-cultural aspects of rural communities, irrigation, drinking water for people and animals and for recharging ground water was are observed. And other resource derivations like fuel wood and timber, fodder, silt, water for rearing fish, and animals and bio-diversity complex for flora and fauna were also focused for the study.

REVIEW OF LITERATURE

A detailed review of literature available on tank rehabilitation and its impact was done where similar situation were noticed. During the last three years of implementation in Vanamaladinne Watershed 156 acres of dry lands were treated with tank silt. It has enriched the fertility of the land and physical characteristics. The result of the activity is to increase in ragi yields by 15% and groundnut by 5%. Two numbers of wettings has been reduced for mulberry cultivation due to the change in soil texture. Salinity problem in paddy fields were ameliorated by applying sandy loam from the tanks because of the tank renovation and farm ponds the groundwater table has increased by 0.5 to 1.5 cm from the previous years. It is estimated that an additional area of 17 acres of ayacut has been brought under cultivation. Nearly 47 acres of ayacut has been cultivated with the second crop (Srinivasan, 2004). In Thanarajapalli village the tank was rehabilitated by strengthening the bund to the standard size specification at a cost of rupees 97, 500. Here after tank rehabilitation the net area under paddy cultivation has increased from 2.2 acres to 11.8 acres. The dry land farms association has executed this. After renovation of the tank the groundwater level in that area has dramatically risen and the village has become water self-sufficient. Due to the tank rehabilitation works, all the bore-wells in the nearby village have got sufficient water for the second crop apart from the complete successful first crop. The open wells were also not dried as before and the water level stood 3 mts. below ground level in the month of February, which was never seen by the farmers in previous decade. Hence, farmers owning land in the tank ayacut has collectively decided not to open the sluice of the tank and keep it closed for recharge. This was possible since every one has got access to open a bore-well. Nobody was deprived for water (Shanmugam and Kanagavalli, 2004).
In the coastal districts, such as Thiruvannamalai and Thiruvallur to prevent seawater intrusion into coastal aquifer artificial recharging through existing tanks should be taken up on a war footing, also preventing removal of sand from riverbeds, which reduces the groundwater levels in the surrounding wells.

Paddy used to be the common crop raised in tank fed areas of the basin. The advent of wells and bore wells combined with cheap power has led to change of crops. Typically, tank ayacut had good potential for groundwater and farmers have resorted to digging wells from the fifties. Easy access to ground water combined with the establishment of modern sugar mills induced the farmers to switch over from paddy to sugarcane in many tank fed areas. Sugarcane being an annual crop requiring irrigation for the whole year, it is fed from wells apart from the tank water. 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 (Sakthivadivel and Srinivasan, 2004).

It is also noticed that 10% increase in tank storages will reduce the groundwater supplementation by about 17% and 76% with an energy price of Rs 0.2/kwh and Rs 0.5/kwh respectively, indicating that groundwater use will be easily substituted by system improvement. Since small and marginal farmers dominate the tank systems, this conclusion has more relevant while making investment priorities for tank improvement.

In kumarasamuthiram tank the area cultivated before the rehabilitation was less than 10 acres with great difficulty in a very good year (abnormal year); less than 1.2 acres in a normal year but presently, the entire area is around 12.50 ha of paddy crop is under cultivation. Additional crop like cotton, groundnut, maize, ragi and vegetables are grown with tank and well water. Before rehabilitation cultivation in the tank command is unreliable due to water scarcity in normal years, but now there is assured water supply. Cultivation of dry crop as a second is also possible. During the good rainfall years they had gone third crop also, which was not possible in the previous 30 years. Usually, they raise paddy as their first crop; Ragi, cumbu, cotton, gingelly and sorghum as second and third crop.

Farm field schools through VADCs in the village has helped in reducing the input cost and increased the productivity. Along with the increased water availability combined with the agricultural training, average yield has increased from 33 bags (of 75 kg) 83 bags of paddy per ha of land. This has resulted in an average additional income of Rs 12500/- per ha in a normal season. Through second crop they have earned around Rs 3000- 5000/-. Apart from this, most of the families involved in agriculture have got regular employment within the village (Srinivasan and Kanagavalli, 2004).

The Goundampalayam in Rasingapuram village is presently serving like a storage and recharge structure and other than for direct irrigation. It helps to get water recharge in the wells constructed in the vicinity of this tank and also in the surrounding areas. (Sreenivasan 2004)

DIRECT IMPACT OF TANK REHABILITATION

Efficiency in Productivity of Water Before and After Tank Rehabilitation

Water Acquisition

The outcome of tank rehabilitation could be apprehended with the following documented results. Before rehabilitation the supply channel was full of vegetation and the cross section of the channel was not uniform. So farmers required to remove the vegetation and made proper sectioning of the channel to facilitate smooth inflow into the tank. After rehabilitation supply channel is improved in terms of water acquisition.

Water Storage

Tank bund had to be strengthened and brought to standards by providing the maximum required free board. Sluice number three was in a damaged condition. RF (rear front) weir was also in a damaged condition with the disturbed Apron, broken coping concrete and with cracked abutments through which leakage was possible. In the After rehabilitation phase the damages were rectified.

Water Distribution

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. Not only that, the percentage of loss of flow in study tank also reduced to 2.39%.

Table 1. Details of Increased Efficiency in Villapakkam Tank

Sl.no	Particulars	Pre project (%)	Post project (%)	Test length (m)
1	Conveyance efficiency	61.25	77.61	100

2.	Field channel efficiency	82.98	95.47	100
3.	Irrigation efficiency	40.79	60.07	100
4.	Reduction in loss of flow	3	0.6	100

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

- *Increase in Relative water supply is 0.09. Up to RWS value of 1.12, the WUE increases and reaches the maximum value of 27.20-kg/ha cm.*

Table 3. Use of Tank, Well, Rain Water in Registered Ayacut in Villapakkam Tank

Condition	Area cultivated	Tank water use	Well water use	Quantity of rainwater use	Total volume of water use
Before rehabilitation	98.55 ha	0.858 Mm^3	0.058 Mm^3	0.867 Mm^3	1.783 Mm^3
After rehabilitation	75.525 ha	0.716 Mm^3	Nil	0.575 Mm^3	1.291 Mm^3

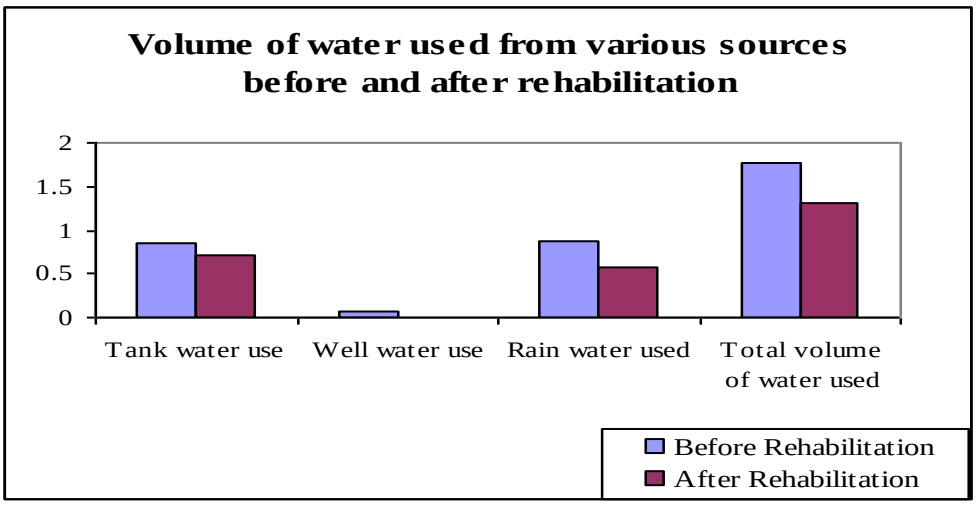

Fig 1 shows the volume of water used from various sources before and after rehabilitation

Water Marketing

Villapakkam, the village is located in peri-urban area of Chennai city has high recharge especially after rehabilitation of tanks which has raised the income of the local people by giving them a ransom in water marketing by way of resolving the problem of the drinking water of the nearby cities. There is a practice of water marketing taking place here as the well owners sell water to the one who do not own well for irrigation, which would be paid back either as cash or as kind.

SOCIO-ECONOMIC CONDITIONS

Tanks in the Indian context are inextricably linked to the socio-cultural aspects of rural communities especially and are considered an indispensable infrastructure of each and every village for sustaining the socio ecological balance. 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. 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. 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. 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.

POTENTIAL SOCIO-ECONOMIC BENEFITS OF REHABILITATION

- Improved production and higher income
- Improved nourishment (through fisheries development)
- Increased opportunity for gainful employment.
- Reduction in seasonal migration by landless and poor households.
- Increased family income.
- Improved quality of life.
- Improved interaction among different communities.
- Improved livestock and milk production.
- Increased availability of water for livestock and humans.

Tank Rehabilitation impact would be increased when Socio-economic problems such as lack of farm inputs, Seasonal migration and damage by stray animals contributes the decrease in production also when women and children travel long distances in search of fodder, fuel, wood and water(Shanmugam and kanagavalli,2004).

Drinking water problem is solved in Villapakkam village. 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 130 liters of milk/day has been produced from the watershed area due to the project works. The association wanted to take up an income generating activity for the maintenance of the tank and so fish rearing in the tank was taken up. Presently, 11,000 fishes were reared within an initial investment of Rs.4500/- from the TFA. Around Rs 12,000 was the gross income during the course of five months from the tank. This is possible only after tank rehabilitation. 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. Due to the dugout pond work, the cattle are getting sufficient drinking water through out the year.

Tanks located in urban and periurban areas once used to irrigate private lands, can now be used as drinking water storage tanks to nearby towns or as a percolation ponds (Sakthivadivel and Sreenivasan). For instance, the impact of tank rehabilitation in several places has shown that the income from sale of fish is enormous.

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.

Historically, some marginal groups for grazing livestock, growing trees and for undertaking seasonal cultivation use the water-spread area. Even today the 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 fact is that the women are the utmost beneficiaries of the above.

INDIRECT IMPACT OF TANK REHABILITATION

Ground Water Recharge

Increased storage and increased inflow has helped in better groundwater recharge. 7 wells in Villapakkam ayacut got recharged. This was not possible before rehabilitation. 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 is enough to cultivate around 2 ha from each well. 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. 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.

Tank irrigation offers an excellent opportunity to optimally utilize surface water and at the same time to augment ground water resources. Owing to population growth and sinking of innumerable private tube wells for irrigation as well as industrial and domestic use, the level of fresh ground water has declined. To check this particular situation necessary action was taken by governments to stop the indiscriminate abstraction of water in many parts of Tamil Nadu. In Pondicherry also, the groundwater department stated that the water table declined 18m in 22 years in northwest part, and in the same declined 8m in the southwest part. The government of Pondicherry decided to halt the process of groundwater exploitation by means of rehabilitating tanks and auxiliary infrastructure.

Duck rearing in Villapakkam

In Villapakkam village Duck rearing is practiced by three households. There is an agent in nearby town who purchases ducks from andhra Pradesh and give them to these households on lease in this village. The ducks are reared during the month of September and returned back to the agent person during the month of April. The initial investment towards lease that is to be paid is gradually deducted as and when the households give the eggs to the agent.A minimum of 150 to a maximum of 500 ducks are taken on lease normally by each household. The cost of one duck is Rs.65/- during purchase and 150 ducks costs Rs.9750/-. If the tank has sufficient water, the ducks get nutritious food, which makes a duck to lay 100 eggs in six months period. The cost of one egg is Rs.2 and the total amount each household earns from selling eggs from 150 ducks in six months is Rs.24000/-. Taking the health risks involved only 140 ducks are returned back to the agent at the rate of Rs.40/- per duck and earn another Rs.5600/-. The total amount of income from rearing ducks comes up to Rs.30,100/- in six months.

In addition to grazing in tank and harvested fields the ducks are also supplemented with Paddy *Karukka* (the least graded paddy), which cost around Rs.3600/- in six months period. Within a week time 150 ducks can consume a bag of Paddy *Karukka* (one bag consists of 70 kg). Each bag costs Rs.150/-. They should pay a grazing fee to the village panchayat at the rate of Rs.3/- per duck for grazing in the tank and tank command area. This comes up to Rs.450 for 150 ducks. And health risk expenditure costs around Rs.200/-. Expenditure incurred during the grazing period includes to and fro transportation charges Rs.3000/-. All together the total expenditure incurred during six months of grazing period comes up to Rs.7250/-.

After deducting the expenditure from the income the net income is Rs.22400/- in six months period. If water in the tank is low, the gross income will reduce to Rs.7500/- but the expenditure will be the same as only 75 ducks could lay eggs during a period of 45 days in six months. This causes a great loss for them. One individual could earn a wage of Rs.70 per day by engaging in other activities and make a total of Rs.8400 (120 man days at the rate of Rs.70/- per day) in six months, which is very less when compared to duck rearing.

CONCUSION

Thus it could be substantiated from the following that tank rehabilitation had impact by and large in Villapakkam.

1. Internal rate of net return before rehabilitation 1.53 and after 1.17%
2. Yield increases/acre: 20-30%
3. Increase in yield due to silt application: 2-10%

4. Incremental net return per hectare: Rs. 1500 /-
5. Increase in yield of dug and dug cum bore wells: 62%
6. Increase in yield of bore wells: 30-35%
7. Net yield/ ha increases: 20-30% and,
8. Enhanced livelihood options by and large.

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