Assessing the Financial Viability of Tank Restoration under Mission Kakatiya and its Impact on Farm Income

ABSTRACT

The study assessed the economic feasibility of restoring two tank systems each in Nalgonda and Warangal districts of Telangana state under Mission Kakatiya. The costs and benefits of tank restoration, as well as the financial feasibility of investing in tank restoration and the benefits accruing to farmers after restoration, were analyzed. The restoration works included de-silting, repairing sluice and weir, and strengthening bunds, with a total investment spent. The study found that cropping intensity was significantly higher (186.05%) in sample farms with a tank than in those without (125.22%). Additionally, silt application in the field had a positive impact on crop yields. The investment analysis revealed a positive net present worth (NPW), benefit-cost (B:C) ratio greater than unity, and internal rate of return (IRR) exceeding the opportunity cost of capital in both restored tanks, indicating the economic feasibility of tank restoration.

Key words: NPW, IRR, B-C ratio, Mission Kakatiya, Restoration of tank.

Introduction:

In the Telangana region, agriculture accounts for only 30% of total income, yet it is crucial for the survival of approximately 78% of the population. Over a period of 53 years, from 1956 to 2009, the region lost 2.92 lakh hectares of tank irrigation. (Pingle, 2011)

In an effort to address this issue, the government of Telangana has prioritized the restoration of minor irrigation tanks to store their original capacity and make effective use of 255 TMC of water allocated for the minor irrigation sector under the Godavari and Krishna River basins. However, currently, only 9 to 10 lakh acres of land are being irrigated under minor irrigation tanks, while the minimum ayacut that can be irrigated with the allocated water is approximately 20 lakh acres, leaving a gap of about 10 lakh acres.

To address this challenge, the government launched "Mission Kakatiya" in 2014, aimed at restoring the lost glory of minor irrigation in the state with community participation for ensuring sustainable water security. The mission aims to restore 46,531 minor irrigation sources, including M.I. small tanks, percolation tanks, private kuntas, and small tanks built by the Forest Department. The plan is to restore all these sources in five phases, with 20% of the tanks being restored each year, i.e., 9,306 per year.(https://www.missionkakatiya.cgg.gov.in).

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The main objective of this mission is to enhance the development of agriculture-based income for small and marginal farmers by accelerating the development of minor irrigation infrastructure, strengthening community-based irrigation management, and adopting a comprehensive program for the restoration of tanks. A study on the financial feasibility of rehabilitating tank systems and its impact on the farm economy revealed that the investment analysis had a positive net present worth, benefit-cost ratio greater than unity, and internal rate of return more than the opportunity cost of capital, with a payback period of 4 to 5 years in all the five rehabilitated tanks, indicating economic viability of tank rehabilitation.(Naveena et al. 2014).

The restoration of tanks has also increased the productivity indicator of yield from 4800 to 5400 in the first season and 4425 to 5400 in the second season. The profitable indicator of benefit-cost ratio also increased from 0.64 to 1.04 in the first season and 1.13 to 1.31 in the second season. In conclusion, the profitable indicator of total cost, net income, and benefit-cost ratio, as well as the productivity indicator of crop yield, were significantly higher after restoration compared to before restoration.(Deivalathaet al. 2014)

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Methodology:

The current study analyzed the financial viability of two restored tanks, one each in Nalgonda and Warangal districts of Telangana, which were selected with a sample size of 720 farmers using random sampling. To determine the financial viability of the investment, the study considered four measures: Net Present Worth (NPW), Benefit-Cost Ratio (BCR), Internal Rate of Return (IRR), and Payback Period.

The NPW was calculated by finding the difference between the present value of cost and benefit streams, discounted at a rate of 14%. The BCR is the ratio of discounted cash inflows to discounted cash outflows, and should be greater than or equal to one for the investment to be considered profitable.The payback period was calculated by adding up all the net profits over the years to recover the initial investment incurred during the pre-bearing period. The payback period indicates the length of time required for the investment to return the cost of capital investment.

The IRR represents the average earning capacity of the investment over its economic life period and is the discount rate that makes the net present worth of cash flow equal to zero.The study assumed a 10-year economic life for the tanks and estimated benefits based on returns per total command area of all crops and fisheries income. The cost of restoring the tanks was considered as an initial investment, and the expenditure on cultivation of crops in the selected tank area per annum was considered a variable cost. Cash flows were discounted at a 14% rate, which represents the prevailing bank rate. Overall, the study aimed to determine whether the investment in the restored tanks was financially viable or not.

Results and Discussion:

Impact of tank restoration on cropping intensity:

Table 1 presents the cropping intensity of the sampled farms with and without tanks. The results indicate that the cropping intensity was significantly higher (186.05%) for the farms with tanks (Fig. 1) compared to those without tanks (125.22%). This is likely due to the increased availability of water for crop cultivation in the tank command area. The primary crop grown in the restored tank command area is paddy.

Impact of silt application:

One of the main goals of Mission Kakatiya is to restore the storage capacity of tanks through de-silting, which also promotes the use of silt in agriculture. As a result of increased awareness of the program, many farmers have expressed interest in taking the excavated silt

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from the tanks and using it in their fields. On average, 96.5 tractor loads of silt were applied per hectare at a cost of approximately Rs. 252 per tractor for transportation, by farmers both within and outside of the tank command area.

Table 2 presents the benefits of silt application in the selected area, showing that the yield increased by 9.72%, 15.56%, and 16.67% for paddy, cotton, and redgram, respectively. Additionally, all of the sample farmers reported that the application of silt had a positive impact on crop yield, reducing the need for fertilizer application.These observations are comparable with the results of Gireesh et al. (1997).

Impact of tank restoration on crop yields:

Table 3 presents the yield of the major crop grown in the study area, which is paddy. It is evident that the productivity or yield of the paddy crop was higher after the restoration of the tank compared to before restoration. The percentage increase in paddy crop yield after the tank restoration (9.17%) and also in comparison with the crop in the area without a tank (15.10%) clearly highlights the positive impact of Mission Kakatiya on crop yieldsat one per cent significant level. These results are in conformity with the findings of Naveena et al. (2014) and Desai (2005).

Fisheries

In addition to the agriculture-based livelihoods in the study area, the impact of Mission Kakatiya was also observed in other allied sectors such as fisheries. Fish farming was conducted in the villages by a particular community, and the economic analysis of fish farming in the selected tanks is presented in Table 4.

The government of Telangana provided significant support for promoting fishing activities, which resulted in favorable outcomes. Rohu, Katla, and Mrigala were used as fish seed in both Peddacheruvu and Ooracheruvu tanks, with 240,000 and 270,000 seeds used, respectively. The total cost of fish farming, including the lease amount paid to the government, transportation, medicines, labor cost, etc., was Rs. 317,000 and Rs. 425,000 for Peddacheruvu and Ooracheruvu, respectively. The fishing activity in Ooracheruvu yielded 162 tonnes of fish and generated Rs. 9,720,000 in revenue, while Peddacheruvu produced 95 tonnes of fish and earned Rs. 6,700,000 in revenue. The net income from fish farming in Ooracheruvu and Peddacheruvu was Rs. 9,295,000 and Rs. 6,383,000, respectively. The profits were shared among members of the local community. In summary, the restoration of the tanks had a positive impact on fish farming in both tanks by increasing the water level.

Financial feasibility of investment on tank restoration:

The objective of this study was to evaluate the economic viability and benefits of restoring two tanks in Nalgonda and Warangal districts of Telangana. Table 5 presents the general information regarding selected tanks. The Peddacheruvu tank in Nalgonda district had an ayacut of 97.31 ha, and the Ooaracheruvu tank in Warangal district had an ayacut of 180 ha. The total cost of restoration for Peddacheruvu tank and Ooaracheruvu tank was 182.10 lakhs and 82.95 lakhs, respectively, as part of the Mission Kakatiya programme.

To assess the productivity of the investment in tank restoration, various discounted and undiscounted cash flow techniques were used, including benefit-cost ratio, net present worth, internal rate of return, and payback period. The discount rate used for both costs and returns was 14 percent.

The payback period for both tanks was low, with 2.2 years for Peddacheruvu and 2.1 years for Ooracheruvu, indicating that the investment could be recovered in less than three years. Table 6 and 7 shows, financial feasibility analysis of the selected restored tanks. The benefit-cost ratio at a 14 percent discount rate was 1.60:1 for Peddacheruvu and 1.21:1 for Ooracheruvu, which means that every rupee invested resulted in more than one rupee of returns.The net present worth of both tanks was positive at 14 percent discount rate, with Peddacheruvu having a net present worth of Rs. 40856533.79 and Ooracheruvu having a net present worth of Rs. 24423618.88. This shows that the discounted net returns were sufficient to cover the initial, operational, and maintenance costs of restoring the tanks, making the project worthwhile.

The internal rate of return for Peddacheruvu and Ooracheruvu tanks was 87.58 percent and 88.62 percent, respectively, indicating a reasonably high earning capacity of the investment in tank restoration, which was greater than the opportunity cost of capital. Similar studies conducted by Desai (2005), Basavaraj (1999), Naveena et al. (2014), and Selvarajan et al. (1984) found that investment in tank restoration was economically feasible, as evidenced by high internal rates of returns.

Based on the above results, it can be concluded that investment in tank restoration is financially feasible and economically viable, leading to efficient use of water, land, and other productive resources, and increasing profitability for farmers, particularly those in rural communities.

Table 1: Impact of restoration of tank on cropping intensity of sample farms

Particulars	With tank	Without tank
Gross cropped area (ha)	294.7	771.26
Net cropped area (ha)	158.4	615.9
Cropping intensity (%)	186.05	125.22

Table 2: Benefits of silt application in study area

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Crop	Yield before application of silt (q/ha)	Yield after application of silt (q/ha)	Net increase in yield after application of silt (q/ha)	% increase
Paddy	61.71	67.71	6	9.72***
Cotton	22.5	25.5	3	15.56***
Redgram	11.25	13.13	1.88	16.67***

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*** significant at one per cent level

Table 3: Impact of tank restoration on productivities of major crops

Crop	With tank		Without tank (q/ha)	Difference	
	Before (q/ha)	After (q/ha)		Change in crop yield over after restoration of tank	Change in crop yield over without tank
Paddy	63.53	69.35	60.25	5.825 (9.17)***	9.1 (15.10)***

Note: Figures in parentheses indicate per cent increase in paddy yield after restoration of tank and over non-beneficiary area, *** significant at one per cent level

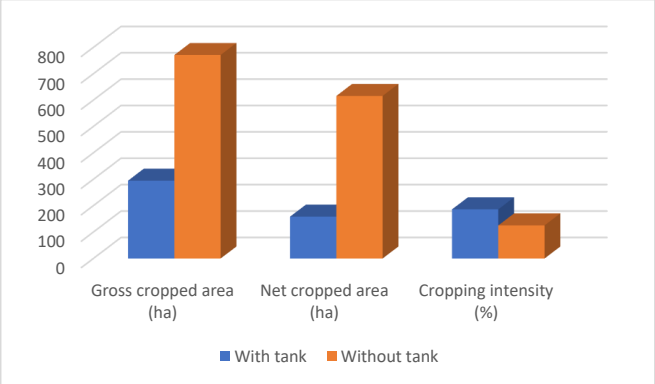

Figure 1: Impact of restoration of tank on cropping intensity of sample farms

Table 4: Economics of fish farming in selected tanks

Tank	Command area of tank (Acres)	Seed (Number)	Total costs of production	Total production of fish (tonnes)	Gross income (Rs.)	Net income
Ooracheruvu	450	270000	425000	162	9720000	9295000
Peddacheruvu	243.28	240000	317000	95	6700000	6383000

Table5: General features of selected tanks

S. No	Particulars	Peddacheruvu	Ooracheruvu
1	Village	Chandupatla	Kundaram
2	Mandal	Nakrekal	Lingala Ghanpur
3	District	Nalgonda	Warangal
4	Ayacut in ac	243.28	450
5	Ayacut in ha	97.31	180
6	Capacity of tank before restoration (Mcft)	34.76	63.56
7	Capacity of tank after restoration (Mcft)	38.75	64.28
8	Bund length (m)	1462	1710
9	Weir length (m)	72	73
10	Sluices	2	2

11	Silt excavation (m^3)	113056.21	20163.67
12	Total investment Rs. in lakhs	182.10	82.95
13	Cost for Repairs Component Rs. in lakhs	64.1	43.32
14	Silt removal & silt application Rs. in lakhs	118	39.63

Table6:Feasibility analysis of Peddacheruvu tank in Nalgonda

					B-C Ratio		NPW	IRR			
Year	**Costs**	**Benefits**	**Net benefits**	**Discount rate factor at 14%**	**Present worth of costs**	**Present worth of benefits**	**Net present value at 14%**	**DF at 86%**	**Discounted benefits (Rs)**	**DF at 89%**	**Discounted benefits (Rs)**
1	26988012.22	14215326.94	-12772685.28	0.877	23673694.93	12469585.03	-11204109.90	0.538	-6867035.10	0.529	-6758034.54
2	8795012.00	18973480.20	10178468.20	0.769	6767476.15	14599476.92	7832000.77	0.289	2942093.94	0.280	2849435.40
3	9234762.60	20833215.01	11598452.41	0.675	6233201.71	14061826.72	7828625.01	0.155	1802441.64	0.148	1717966.27
4	9696500.73	22314547.16	12618046.43	0.592	5741106.84	13212003.27	7470896.43	0.084	1054242.07	0.078	988882.98
5	10181325.77	22757492.63	12576166.86	0.519	5287861.56	11819528.55	6531666.99	0.045	564915.60	0.041	521481.94
6	10690392.05	23622067.55	12931675.50	0.456	4870398.81	10761896.21	5891497.40	0.024	312303.70	0.022	283716.09
7	11224911.66	23688267.23	12463355.57	0.400	4485893.64	9466715.69	4980822.05	0.013	161824.54	0.012	144677.95
8	11786157.24	24656171.11	12870013.87	0.351	4131744.14	8643444.04	4511699.90	0.007	89841.18	0.006	79046.85
9	12375465.10	24689871.61	12314406.51	0.308	3805553.82	7592331.63	3786777.81	0.004	46216.49	0.003	40018.17
10	12994238.36	24956171.19	11961932.83	0.270	3505115.36	6731772.69	3226657.33	0.002	24136.37	0.002	20567.59
Total					68502046.96	109358580.75	40856533.79		130980.45		-112241.29

B: C ratio 1.60: 1, NPW= 40856533.79, IRR= 87.58%

Table7: Feasibility analysis of Ooracheuvu tank in Warangal

					B-C Ratio		NPW	IRR			
Year	**Costs (Rs)**	**Benefits (Rs)**	**Net benefits (Rs)**	**Discount rate factor at 14%**	**Present worth of costs (Rs)**	**Present worth of benefits (Rs)**	**Net present value at 14%**	**DF at 86%**	**Discounted benefits (Rs)**	**DF at 89 %**	**Discounted benefits (Rs)**
1	27746000.00	20180260.00	-7565740.00	0.877	24338596.49	17701982.46	-6636614.04	0.538	-4067602.15	0.991	-4003037.04
2	19152000.00	25402500.00	6250500.00	0.769	14736842.11	19546398.89	4809556.79	0.289	1806711.76	0.982	1749811.04
3	19363350.00	26592187.50	7228837.50	0.675	13069709.71	17948969.12	4879259.41	0.155	1123387.61	0.974	1070737.59
4	19920267.50	26977570.31	7057302.81	0.592	11794397.51	15972887.31	4178489.81	0.084	589640.05	0.965	553084.56
5	21325030.88	27868733.87	6543702.99	0.519	11075552.80	14474147.09	3398594.28	0.045	293940.11	0.957	271340.46
6	22180032.42	29765764.88	7585732.46	0.456	10104924.40	13560882.06	3455957.66	0.024	183197.63	0.948	166428.12
7	22687784.04	30168751.35	7480967.31	0.400	9066885.27	12056559.01	2989673.75	0.013	97133.08	0.940	86841.06
8	24650923.24	32277782.62	7626859.38	0.351	8641604.35	11315268.97	2673664.61	0.007	53240.51	0.932	46843.71
9	24872219.40	33092949.36	8220729.95	0.308	7648405.02	10176344.78	2527939.76	0.004	30852.75	0.923	26714.94
10	25154580.37	33114343.60	7959763.22	0.270	6785292.34	8932389.19	2147096.85	0.002	16060.93	0.915	13686.18
Total					117262209.99	141685828.87	24423618.88		126562.28		-17549.39

B: C ratio 1.21: 1, NPW=24423618.88, IRR= 88.62%

Conclusion

The restoration of irrigation tanks under the Mission Kakatiya program has proven to be financially viable and beneficial for farmers in Telangana. The financial analysis of restored tanks in Nalgonda and Warangal districts reveals positive indicators, including a strong Benefit-Cost Ratio (BCR), positive Net Present Worth (NPW), and Internal Rate of Return (IRR) above the opportunity cost of capital. These results demonstrate that the investments are profitable, with a payback period of 2.1 to 2.2 years.

The restoration has significantly increased agricultural productivity, with higher cropping intensity and improved crop yields, particularly for paddy. Additionally, the use of silt from the tanks has enhanced yields and reduced the need for synthetic fertilizers, promoting sustainability.

The program has also benefited allied sectors, such as fisheries, creating income and employment opportunities for rural communities. Given the positive outcomes, continued investment in tank restoration is essential. Expanding Mission Kakatiya will support more farmers, ensure sustainable water use, and contribute to rural economic growth. The success of this initiative highlights the importance of community participation and efficient resource management in improving agricultural productivity and water security.

Policy implications:

Mission Kakatiya's restoration of tanks has led to increased water availability for irrigation and higher crop yields, resulting in a positive impact on the rural economy. To continue this success, government intervention is necessary to convert non-restored tanks into restored ones under Mission Kakatiya.

The restored tanks under Mission Kakatiya demonstrate financial feasibility and economic viability, with a payback period of 2 to 2.5 years, B:C ratio exceeding 1, positive Net Present Value, and Internal Rate of Return greater than 50%. Therefore, increased investment by the state government in restored tanks is warranted.

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