

MEASURING EFFICIENCY OF VILLAGE TANKS IN PURULIA AND BANKURA DISTRICTS OF WEST BENGAL, INDIA

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WHAT IS A TANK?

- ✘ Tanks are particular types of dammed reservoirs, formed by enclosing depressions across the valley of small rivulets and streams to intercept water during rain (Source: Agricultural Statistics of India, Government of India, 1924).
- ✘ Other water bodies, such as natural water storage structures have also been incorporated in tank category, primarily for the purpose of improvement (Source: Reference of a committee constituted in 1961, cited in User-Friendly Irrigation Design by Sengupta, 1993).
- ✘ Tank means water storage structures that incorporate water bodies popular in various names such as 'Pokhar', 'talab', 'jhil', 'sagar', 'bil' and many others.
- ✘ Hence, tanks vary in terms of their size.

TANK TYPIFICATION

- ✘ In terms of creation tanks are of two categories –
 1. Natural.
 2. Artificial or man-made.
- ✘ In terms of sources of water tanks are again of two categories –
 1. System tanks (Linked with other sources).
 2. Non-system tanks (Isolated)
- ✘ In terms of ownership tanks can be classified in three categories –
 1. Government tank.
 2. Common Property tank.
 3. Private tank.

WHY TANK IS IMPORTANT?

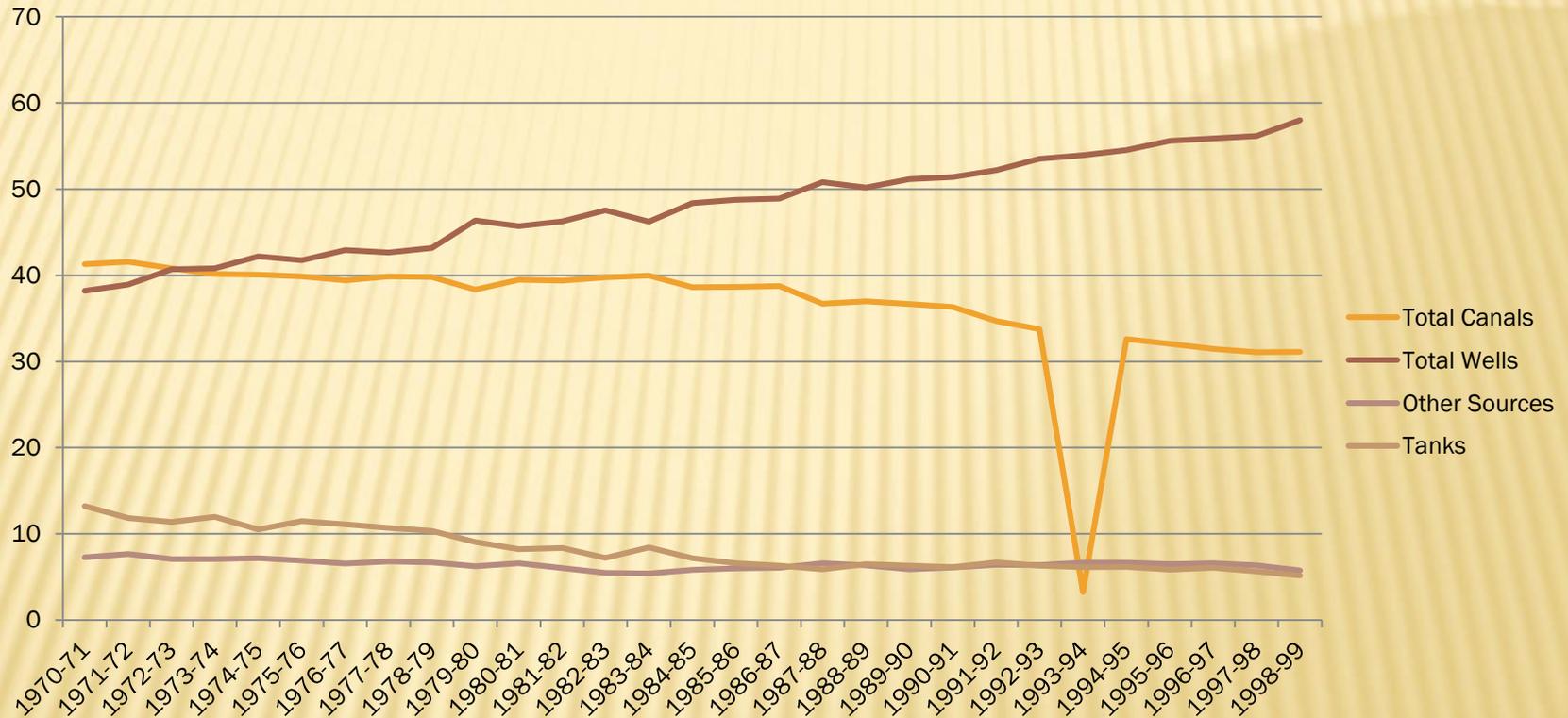
1. Tank can act as flood and drought moderator.
 2. Tank can be a good source of water for rural people in other than rainy season.
 3. Management of tank is possible in decentralized manner.
 4. Application of participatory approach is possible.
- ✘ Management of tank is more important in the backdrop of complex social relations and human behavior with economic sustenance.
 - ✘ Tank have become a part of social, cultural and religious life of rural society in India.

TANK AS A SUBJECT OF STUDY

- ✘ Tank performance –
 1. Area irrigated by tanks and crop yields.
 1. Ratio of actual to registered irrigated area.
 1. Adjusted tank performance, which is the tank irrigated area less the well irrigated area in tank command.
 1. Frequency of tank fill in a year.

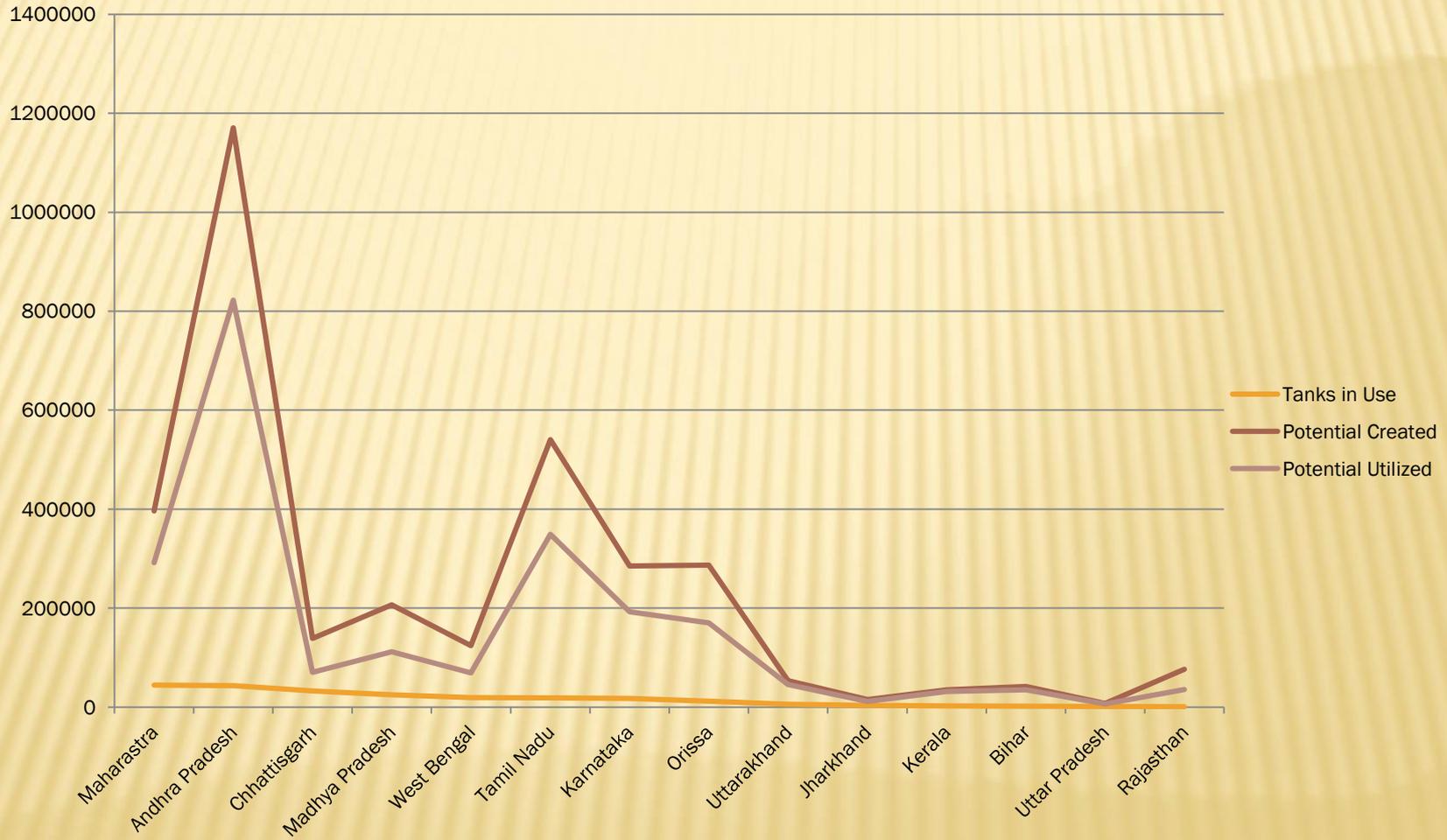
WATER RESOURCE IN INDIA

Figure 1: Net Area Irrigated by Canals, Wells, Tanks and Other Sources



Source: Centre for Monitoring Indian Economy, December 2002 and Economic Survey, Government of India (Various Years)

STATE-WISE PERCENTAGE DISTRIBUTION OF TANKS IN THE COUNTRY



PERCENTAGE OF AREA IRRIGATED BY DIFFERENT SOURCES IN WEST BENGAL

Year	Canal	Tank	Groundwater	Others
1997-98	37.84	13.04	15.98	33.12
1998-99	33.10	11.39	24.17	31.34
1999-00	41.36	10.72	27.77	20.14
2000-01	36.18	11.32	30.92	21.31
2001-02	33.63	9.75	39.90	16.61
2002-03	34.39	9.48	40.32	14.69
2003-04	38.87	10.35	30.55	20.23
2004-05	36.08	9.53	35.95	18.44
2005-06	37.19	7.59	36.49	18.73
2006-07	35.29	7.37	40.05	17.29

CHANGE IN NUMBER OF TANKS AND TOTAL AREA IRRIGATED BY TANKS IN WEST BENGAL

Year	Number of Tanks in West Bengal	Area Irrigated by Tanks
1998-99	257668	370220
1999-00	439340	312630
2000-01	470524	325240
2001-02	473128	296650
2002-03	449659	288630
2003-04	449649	266300
2004-05	440565	266042
2005-06	392808	245093
2006-07	403962	247856

CONCENTRATION OF TANKS IN THREE MOST TANK-FED DISTRICTS COMPARED TO THE STATE (IN HECTARES) IN WEST BENGAL

Year	Average Area Irrigated by each Tank in three Districts			Average Area Irrigated by each Tank in the State
	Purulia	Bankura	24 Paraganas	West Bengal
1997-98	2.88	2.37	0.23	1.51
1998-99	3.47	2.00	0.21	1.58
1999-00	3.14	1.98	0.21	0.75
2000-01	3.02	1.85	0.24	0.73
2001-02	2.41	1.69	0.24	0.66
2002-03	2.45	1.89	0.26	0.71
2003-04	2.92	1.82	0.27	0.59
2004-05	2.95	2.20	0.47	0.60
2005-06	2.99	2.25	0.21	0.62
2006-07	3.02	2.28	0.25	0.61

AREA IRRIGATED BY DIFFERENT SOURCES IN PURULIA (PERCENTAGE)

Year	Canal Irrigated Area	Tank Irrigated Area	Groundwater Irrigated Area	Other Source Irrigated Area
2000-01	38.89	39.58	1.45	20.06
2001-02	46.28	43.71	2.12	7.88
2002-03	45.72	43.87	1.96	8.44
2003-04	44.09	41.18	6.05	6.96
2004-05	45.35	42.22	6.15	4.85
2005-06	41.99	39.25	4.74	14.01
2006-07	40.53	40.56	4.84	14.07

AREA IRRIGATED BY DIFFERENT SOURCES IN BANKURA (PERCENTAGE)

Year	Canal Irrigated Area	Tank Irrigated Area	Groundwater Irrigated Area	Other Source Irrigated Area
2000-01	51.74	14.15	27.08	7.02
2001-02	57.89	11.42	25.32	5.36
2002-03	57.73	12.69	23.99	5.58
2003-04	53.78	13.19	26.70	6.31
2004-05	52.67	15.50	24.26	7.56
2005-06	64.44	12.10	18.30	5.15
2006-07	65.12	12.08	17.79	5.00

VILLAGE-WISE TOTAL CULTIVATED AREA WITH VALUE OF CROP PRODUCED (PER ACRE OF TANK)

Village Tank Name	Cultivated Area (acres)	Total Value of Yearly Production (Rs.)	Value of Production per acre of Tank (Rs.)
Amjora	12.97	101465	30470
Majhidi	0.49	99625	19925
Layadi	1.98	85570	19762
Lipania	9.24	240388	31630
Mahal	825	9001300	25718
Phusra	5.94	123648	26880
Balidiha	82.5	63030	31515
Pirrabani	132	175875	26645
Tilasuli	26.4	121320	30330
Khejuria	16.5	47434	26763
Dhanjhar	29.7	44832	29646
Rajakata	66	80289	28020

METHOD APPLIED

- ✘ Step I: State – West Bengal
- ✘ Step II: Two most tank irrigated Districts – Purulia and Bankura
- ✘ Step III: Two Blocks from each of the Districts
- ✘ Step IV: Three villages from each of the blocks where each village have one common property tank.
- ✘ Hence, total 12 villages have been taken for study.
- ✘ Each of the village tanks have been considered as Decision Making Unit (DMU).
- ✘ Outputs – Crop Yield per annum and Fish yield per annum
- ✘ Inputs – Volume of water and Investment for fish cultivation and tank maintenance cost.

DATA FOR CRS DEA (WITH TWO OUTPUTS AND TWO INPUTS)

DMU	Crop Yield per annum (Rs.) (Y_1)	Fish Yield per annum (Rs.) (Y_2)	Volume of Water (cubic meters) (X_1)	Investment for Fish Cultivation and Yearly Maintenance (Rs.) (X_2)
Amjora	184150	5000	70237.6	18000
Majhidi	6900	15000	94039.9	15000
Layadi	27000	4000	79666.3	7000
Lipania	152563	100000	127038.8	90000
Mahal	3552500	0	11538521	40000
Phusra	83538	20000	43461.7	17000
Balidiha	1186250	0	74951.1	12000
Pirrabani	1759688	100000	276135.5	40000
Tilasuli	325000	35000	150395.3	10000
Khejuria	229937	10000	69675.9	10000
Dhanjhar	216000	0	70266.6	2000
Rajakata	887250	100000	11983	15000

CRS OUTPUT-ORIENTED DEA RESULTS (WITH TWO OUTPUTS AND TWO INPUTS)

DMU	CRS TE	VRS TE	SCALE
Amjora	0.926	0.963	0.775
Majhidi	0.150	0.150	1.000
Layadi	0.086	0.104	0.824
Lipania	0.167	0.371	0.167
Mahal	1.000	1.000	1.000
Phusra	0.176	0.200	0.882
Balidiha	1.000	1.000	1.000
Pirrabani	0.529	1.000	0.529
Tilasuli	0.530	0.569	0.932
Khejuria	0.258	0.262	0.985
Dhanjhar	1.000	1.000	1.000
Rajakata	1.000	1.000	1.000
Mean	0.502	0.621	0.841

TANK SIZE, TANK CONDITION AND TOTAL OUTPUT OF THE SAMPLE TANKS

Village Tank	Crop and Fish Yield per annum (Rs.)	Tank Size (acre)	Tank Productivity (per acre of tank spread area)	Frequency of Tank Rejuvenation in Last Twenty Years
Amjora	189150	3.33	56801.80	2
Majhidi	21900	5.00	4380	0
Layadi	31000	4.33	7159.35	1
Lipania	252563	7.6	33231.97	0
Mahal	3552500	500	7105	0
Phusra	103538	4.6	22508.26	0
Balidiha	1186250	3.00	395416.66	1
Pirrabani	1859688	6.6	281770.91	1
Tilasuli	360000	4.00	90000	1
Khejuria	239937	1.6	149960.62	1
Dhanjhar	216000	1.6	135000	0
Rajakata	987250	3.00	329083.33	1

CONCLUSION

- ✘ The result shows that –
- ✘ Tanks of Mahal, Balidiha, Dhanjhar, Rajakata and are Amjora are performing well.
- ✘ Tanks of Layadi, Majhidi, Phusra and Khejuria tanks are relatively inefficient.
- ✘ The reason may be that the first set of tanks has been better managed compared to the second set of tanks obtained in the DEA CRS model which has later been confirmed by the per acre tank productivity, except Mahal Tank.
- ✘ The reason may be that the big Mahal tank was excavated particularly for irrigation purpose and fish cultivation is not allowed in it.

POLICY

- ✘ Efficiency and performance of tanks can be increased by –
- ✘ Forming a village-level tank management committee which will take care of tank for water appropriation and provisioning.
- ✘ Yearly tank maintenance activity should involve the tank users.
- ✘ Moreover, the amount of money collected from leasing out the tanks for fish cultivation should be used for yearly tank repair activities.

THANK YOU

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