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MINOR SURFACE IRRIGATION DEVELOPMENT IN WEST BENGAL- AN OVERVIEW

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Abstract

Based on the data of Minor Irrigation Census (1st M.I Census-1986-87 to 4th M.I Census-2006-07) of West Bengal, this paper shows the development of Minor Surface Irrigation in different districts of West Bengal. For this purpose Compound Annual Growth Rate (CAGR) of number of Schemes, Minor Surface Irrigation Potential Created (IPC) as well as Irrigation Potential Utilization (IPU) has been calculated to show the trend of development of this sector. Analysis shows that the Created Potentiality is not utilised at optimum level. A huge gap is observed between irrigation potential created and its utilisation. Again there is inter- district variation of the gap. The districts like Coochbehar,Maldashow that the gap is too high and for the district of Hooghly it is much less. Besides, there is a inter district variation in utilization of Created Surface Irrigation Potential.

Keyword:IPC, IPU, CAGR

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1. Introduction:

Irrigation is one of the major important factors for thesuccess of agriculture. It is essentially the artificial application of water to overcome deficiencies in rainfall for growing crops. In India, serious efforts have been given for development of Irrigation since 1st five year plan. In spite of thatthe country experiences several drought years (Year 1966, 1969, 1970, 1972, 1979, 1982, 1983, 1987, 1992, 2000, 2013, 2015) in one handas well as depletion of Ground Water in other. In 2011, 1071 number of Blocks were identified where ground water has been over exploited;ground water level in 217 Blocks are under critical condition and in 697 Blocks it isunder semi critical conditions (CGWB 2006, 2011, 2014). In West Bengal, one block is in critical condition, 37 blocks are in semi-critical condition, and 59 numbers of coastal Blocks are saline affected (State Agricultural plan for West Bengal 2005-06). It is said that Minor Surface Irrigation is safe and ecologically viable. In this background of irrigation water crisis, this study **focuses** on the development of Minor Surface Irrigation through analysis of Minor Irrigation Census published by the Ministry of Water Resource (MOWR) in West Bengal**.**

2. Objectives:

To fulfil the above stated aim of this study, the following objectives have been set up-

- To determine the annual growth rate of i) number of Minor Surface Irrigation schemes ii)IrrigationPotential Created (IPC)as well as iii)Irrigation Potential Utilization (IPU)of minor surface water irrigation from 1st Minor Irrigation (M.I)census period (1986-87) to 4thMinor Irrigation Census period (2006-07)and Tank irrigation from 3rd (2000-01) to 4th(2006-07)Minor Irrigation (M.I) census period of different districts of West Bengal.
- To identify the Percentage Gap between the Irrigation Potential Creation (IPC) and Irrigation Potential Utilization (IPU) of M.I schemes in different districts of West Bengal
- To identify the main obstacles of the utilization of minor surface irrigation.

3. Materials and Methods:

District wise secondary data on i)Numberof schemes of Minor Surface Irrigation, Potential Created and Utilization were collected for the period from 1986-87 (1st M.I Census) to 2006-07 (4th M.I census) of West Bengal. While work on 5th M.I Census which has begun on 2011-12, its complete report is yet to be published. In this paper, we have compared those parameters which

are available in 1st to 4th M.I Census period. Compound Annual Growth Rate (CAGR) is calculated to measure the annual growth rate of Number of Surface Water Schemes andIrrigation Potential Creation (IPC) of different districts of West Bengal by the formula –

$$CAGR\ (t0, t1) = \left(\frac{V(tn)}{V(t0)}\right)^{\sim 1/(tn-t0)} - 1$$

Where, t_0 – the first year of observations

t_1 – the last year of observations

$V(t_0)$ – the start value (or initial investment)

$V(t_1)$ – the last value observed.

Percentage Gap is measured to identify the gap between utilization and potential creation. Maps are prepared with the help ofQGIS software.

4. Analysis:

i) Development of Minor Surface Irrigation (MSI)Structuresin West Bengal

During 1st M.I census (1986-87) the number of MSI structure was 161376.It reduced to 78622 during 4th M.I census period 2(2006-07) (Fig 1). During the 1st M.I Census period, surface water structures constituted about 40% of the total M.I structures and it reduced to 15% in 4th M.I Census (2006-07) in West Bengal.Table 1 shows the Number of Surface Water Schemes and their Compound Annual Growth Rate (CAGR). CAGR of number of structures in West Bengal registered a negative growth rate (– 8.35% per annum) from 1st M.I Censusto 2nd M.I Census (from 1986-87to 1993-94) as well as from 3rd M.I Censusto 4th M.I Census (2000-01-2006-07) (-11.29% per annum). Very low positive CAGR is observed from 2nd to 3rd M.I census (1993-94 to 2000-01) that is 1.04%.

In case of Surface Flow Schemes, it registered low negative to high negative development -0.9% per annum in 1st to 2nd M.I Census year and -2.97% per annum from2nd to 3rd M.I Census year and – 9.33% per annum from3rd to 4th M.I Census Year.

In case of Surface Lift Schemes, it was highly negative -12.04% per annumduring the period of 1st to 2nd M.I Census year and -12.36% per annum from3rd to 4th M.I Census Year but it was low positive by 3.66% per annum from2ndto 3rdM.I census year.

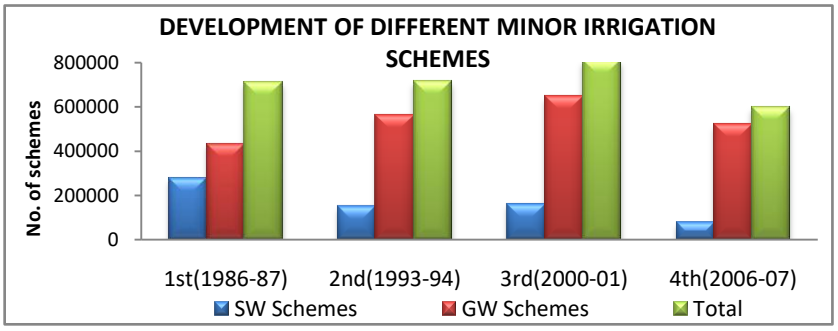


Fig 1: Development of different Minor Irrigation Schemes in different M.I Census period

Table 1: Compound Annual Growth Rate of Surface Water Schemes and Total Minor Irrigation Schemes in West Bengal

year	SW Schemes	CAGR (%)	Surface Flow schemes	CAGR %	Surface Lift schemes	CAGR %	Total M.I Schemes	CAGR (%)
1986-87	276291	-	70820	-	205471		711116	-
1993-94	150099	-8.34	66454	-0.90	83645	-12.04	714759	0.07
2000-01	161376	1.04	53781	-2.97	107595	3.66	809559	1.79
2006-07	78622	-11.29	29869	-9.33	48753	-12.36	598061	-4.23

SW= Surface Water, M.I= Minor Irrigation,

Data Source: 4th Minor Irrigation Census, Gov. of West Bengal

ii) Districtwise Development of Minor Surface Irrigation Structure

Development of Minor Surface Water Schemesshowsnegative growth rate per annum from 1st to 4th M.I census year (1986-87 to 2006-07) in almost in every District. North Bengal mainly the Districts of Darjeeling, Jalpaiguri and Coochbeharexperienced high decline (-25.11%,-27.71%, -22.88% per annum respectively) and Nadia District also showed a high decline (-21.83% per annum) in terms of development of surface water structures. The study shows a decline of23,31,041 surface water structures in all over West Bengal in last 20 years and Districts of Bankura, Birbhum, Burdwan are accounted for highest decline in number i.e. 2,65,687 and

2,42,777 and 2,30,633 respectively. This indicates that surface water structures have lost its importance gradually and many structures become de-functioned.

Table 2: District wise Changes in Number of Minor Surface Irrigation Structuresfrom 1st to 4th M.I Census year (1986-87 to2006- 07) and its CAGR (%)

District	Total Number of Structures de-functioned	CAGR (%) (1986-87 to 2006-07)	District	Total Number of Structures de-functioned	CAGR (%) (1986-87 to 2006-07)
Bankura	265687	-14.67	Malda	171604	-19.07
Birbhum	242777	-14.10	Midnapore	159850	-14.53
Burdwan	230633	-19.89	Murshidabad	70686	-16.75
Coochbehar	207098	-25.11	Nadia	64766	-21.83
Darjeeling	205361	-27.71	North 24 Parganas	63251	-16.76
Hoogly	202583	-19.84	Purulia	48806	-7.16
Howrah	182924	-15.56	South 24 Parganas	33060	-6.47
Jalpaiguri	173638	-22.88	West Dinajpur	8317	-9.00

Source:

iii) District Scenario of Irrigation Potential Creation (IPC)

Total Potential Created by Minor Surface Water Structures in West Bengal is 1092834.86 ha in 2006-07 of which 532131.35 ha (48.69%) has been utilised. Growth rate for potential created by total minor surface water structures West Bengal as a whole is observed to be negative -0.09% per annum from 1st to 4th M.I Census year (1986-87 to 2006-07) (table 3). It is also negative for both surface flow and surface lift irrigation -0.18% and -0.10 % per annum. Among the Districts positive growth rate is observed in Bankura, Coochbehar, Jalpaiguri, Malda, South 24 Parganas, and Uttar and DakshinDinajpur (West Dinajpur in 1986) Districts and negative growth rate is observed in rest of the Districts in terms of total Minor Surface Irrigation Potential Creation. Among different minor surface irrigation components, with respect to creation of potential,

highest growth rate is observed in case of Surface Flow schemes in North 24 ParganasDistrict. In case of Surface Lift irrigation schemes, highest potential creation is observed in JalpaiguriDistrict.

Table 3: Compound Annual Growth Rate of Minor Irrigational Potential (ha) from year 1986-87 to 2006-07

DISTRICTS	**Total surface Water**	**Surface flow**	**Surface Lift**	**DISTRICTS**	**Total Surface Water**	**Surface Flow**	**Surface Lift**
	IPC	**IPC**	**IPC**		**IPC**	**IPC**	**IPC**
	CAGR %)	**CAGR %**	**CAGR %**		**CAGR %)**	**CAGR %**	**CAGR %**
Bankura	0.69	3.19	-4.36	Malda	1.32	-6.05	1.92
Birbhum	-1.78	1.35	-2.10	Midnapore	-0.30	-3.86	1.15
Burdwan	-1.64	4.31	-4.92	Murshidabad	-2.62	-5.51	-2.27
Coochbehar	4.11	-7.11	4.34	Nadia	0.36	-	-0.11
Darjeeling	-1.56	-3.32	2.78	North 24 Parganas	1.41	15.47	0.51
Hoogly	-2.27	-2.41	-2.24	Purulia	-2.73	-2.83	-2.01
Howrah	-0.88	-5.94	1.37	South 24 Parganas	3.39	3.64	3.30
Jalpaiguri	6.54	2.44	12.97	West Dinajpur	0.37	-14.09	2.52
				Total	-0.09	-0.18	-0.10

Source: 1st and 4th Minor Irrigation Census of West Bengal, CAGR computed by the researcher, *West Dinajpur is total result of Uttar Dinajpur and DakshinDinajpur

iv) Irrigation Potential Utilization (IPU) or Actual Irrigation

According to 4th Minor Irrigation Census (2006-07) only 23.37% area is irrigated by surface water structures to total MI structures in West Bengal, whereas 43.71% area was irrigated in

1986-87(1st M.I Census) (Table 4). Though huge potential was created but the utilization of this schemes were less. From the 1st M.I census it is seen that most of the districts were depended on minor surface water structures (surface lift and surface flow) for irrigation. Only four districts (Coochbehar, Murshidabad, Nadia and North 24 Pgs) were less dependent on itwhere below 28% area irrigated by minor SW schemes (Fig:2). But in 2006-07 (4th MI Census) ten districts where below 26% area irrigated by minor SW schemes were seen (Fig: 3).

Table 4: Area (%) irrigated by Surface Water Schemes in 1986-87 and 2006-07

Districts	**Area irrigated by SW schemes (%)**		**Districts**	**Area irrigated by SW schemes (%)**	
	1986-87	**2006-07**		1986-87	2006-07
Bankura	71.60	74.29	Midnapore	43.70	47.93
Birbhum	69.98	47.77	Murshidabad	20.25	6.717
Burdwan	43.75	12.29	Nadia	5.54	4.78
Coochbehar	19.37	6.031	North 24 Parganas	4.92	4.34
Darjeeling	96.21	68.56	Purulia	94.32	97.20
Hooghly	43.32	21.74	South 24 Parganas	82.38	83.05
Jalpaiguri	64.98	48.20	West Dinajpur	29.28	14.70
Malda	30.14	13.92	**West Bengal**	43.71	23.37

Source: Percentage of area calculated by the Researcher

Fig2: Irrigated area (%) by SW schemes in 1986-87

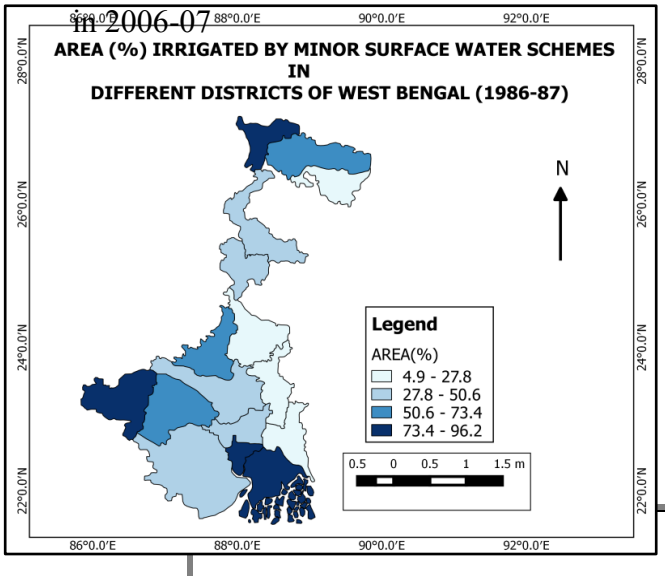
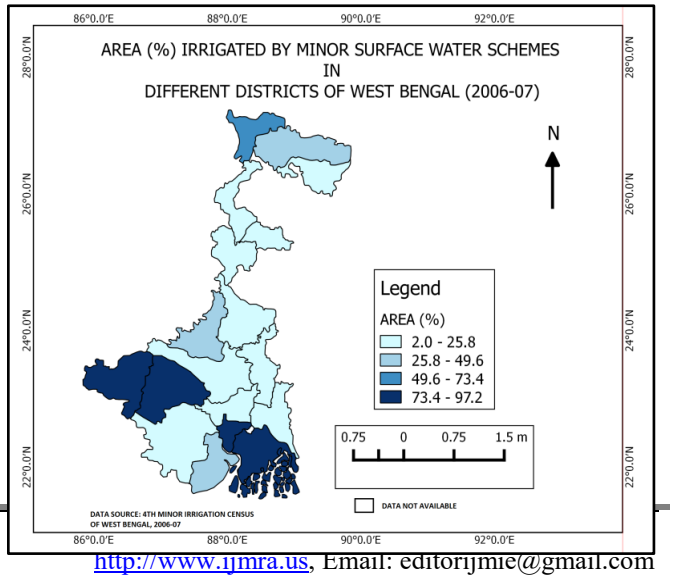


Fig3: Irrigated area (%) by SW schemes in 2006-07



Data Source: 1st M.I Census of WB Data Source: 4th M.I Census of WB

** SW= Surface Water

v) Percentage Gap between Irrigation Potential Created (IPC) and Irrigation Potential Utilized (IPU)

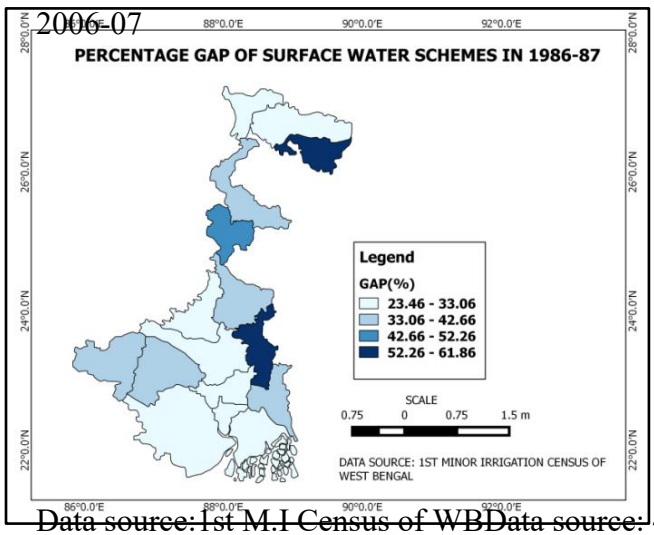
Surface Irrigation potential which was created is not utilised optimally. An increasing gap in between irrigation potential created and its utilisation is observed in almost all Districts. The gap was 31.46% in 1986-87 and it increased by 42.14% in 2006-07 in the State.Table-4 indicates that in 2006-07, highest gap is in Kochbehar district (74.93%) followed byMalda (72.36%), DakshinDinajpur (69.04%). At least nine number of Ditricts of the State experienced above 50% gap during 2006-07though during the period 1986-87 only in two Districts i.eKochbehar and Nadiathe gap wasabove 50% (52%)(Fig4 and Fig 5).

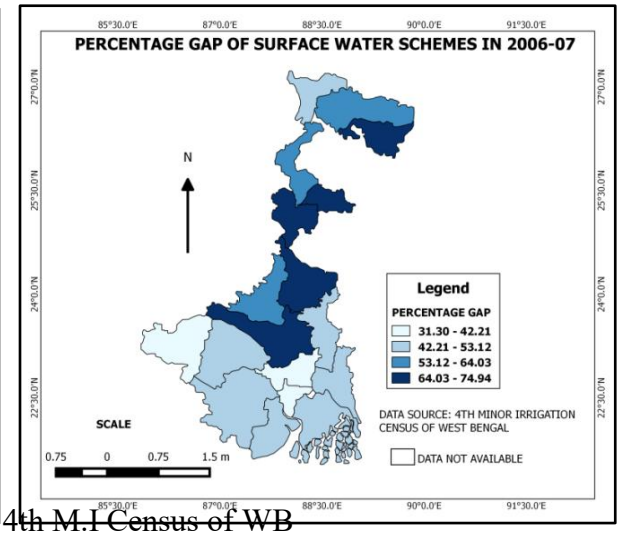
Table 4: Percentage gap between Potential Created and utilisation of Surface Water Schemes (2006-07)

Percentage Gap between IPC and IPU of Surface Water Schemes					
District Name	**1986-87**	**2006-07**	**District Name**	**1986-87**	**2006-07**
Bankura	34.27	45.92	Nadia	61.85	48.39
Barddhaman	24.12	68.79	North 24 Parganas	33.08	52.58
Birbhum	23.46	60.11	PaschimMidnapore	26.69	50.85
Darjeeling	26.06	49.07	PurbaMidnapore		43.79
Haora	24.10	41.04	Purulia	36.85	41.02
Hooghly	27.12	31.3	South 24 Parganas	31.43	44.14
Jalpaiguri	31.36	53.27	UttarDinajpur	40.48	58.38
Kochbehar	61.21	74.93	DakshinDinajpur		69.04
Malda	44.58	72.36	TOTAL	31.46	42.14
Murshidabad	34.26	64.22			

Source: computed by the Researcher

Fig 4: Percentage Gap of SW schemes in 1986-87 Fig 5: Percentage Gap of SW schemes in 2006-07





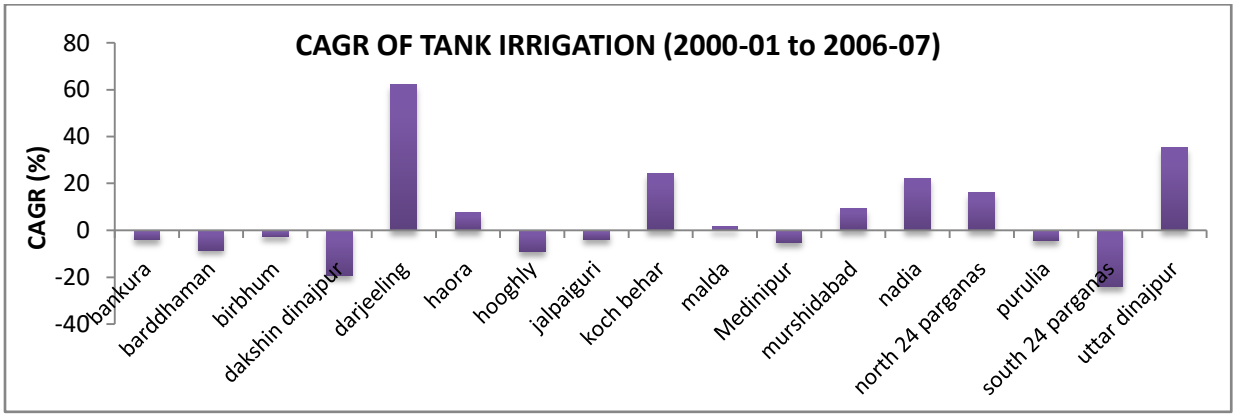
Data source: 1st M.I Census of WB Data source: 4th M.I Census of WB

** SW= Surface Water

vi) Development of Tank irrigation

The data on Tank irrigation is not included in 1st and 2nd irrigation census report. It is available from 3rd M.I census year (2000-01).Hence growth of tank irrigation is calculated separately. CAGR of number of tanks used for irrigation purpose from 3rd to 4th M.I Census year (2000-01 to 2006-07) for District Darjeeling is highest i.e62.10 % per annum. It is followed by Uttar Dinajpur (35.13%), Kochbehar (24.33%), and Nadia (22.23%). On the other hand a high negative growth observed in the Districts ofDakshinDinajpur, South 24 parganas Districts i.e. 19.42%, -24.22% annuam respectively (Fig 6).

Fig 6: CAGR of number of Tank used for irrigation from 2000-01 to 2006-07



Source: 3rd and 4thM.I census of West Bengal, CAGR computed by Researcher

5. Findings:

Surface Water structures are drastically declining in West Bengal. Irrigation potential utilization is also declining sharply. Even whatever surface irrigation potential has developed is not being used optimally. Most remarkably the Districts which experience frequent occurrence of drought and scarcity of ground waterikePurulia ,Bankura, the created potential is not used in full extent.

6. Reasons behind Observed slowdown in Growth rate

It is stated in the report onWater Resource Investigation and Development, West Bengal, 2012that the reason behind the decrease in surface flow structures and surface lift structures is that the schemes which were enumerated in earlier census have become derelict and are non-existent. This may be due to degradation of surface water bodies by silting and lack of maintenance. Moreover, excavation of irrigation tanks through MGNREGS Schemes is being popular in present day. But Irrigation potential created by the tanks is much less than other sources of MSI. It also contributes in decline in growth rate.

7. Conclusion

Underutilisation of created irrigation potential as observed in this study means wastage of resources. The real reasons that impede the optimum use of created potential must be identified first at local level. Besides, role of Water Users' Association as well as Participatory Rural Governance might be prioritised for harnessing the full potential of existing Minor Surface Irrigation Structure of the State.

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