



## Study on the Salinity of Water Resources in Sundarbans for Crop Production

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Quality water is one of the most important inputs required for crop production. Supplementary irrigation is necessary in *Sundarban* as the rainfall is seasonal and erratic. Farmers are trying expeditiously to cultivate the fallow lands by using pond and river water as well as by tapping the underground water. Rice is the most preferred crop to the farmers along with vegetables. Majority of the water resources in *Sundarban* contain high concentration of salts particularly in dry seasons. The degree of salinity of water plays a critical role in productivity, which needs to be assessed for judicious and efficient management for profitable agriculture.

In order to assess the quality of water in *Sundarban* areas, water samples were collected twice a month at three positions for three years from sluice gates at the joining of Piyali and Matla rivers (0 km, 10 km and 20 km), a number of ponds and tube wells along Piyali river which covers the blocks namely Kultali, Joynagar I and II of South 24 Parganas district, West Bengal. The sluice gates prevented the ingress of the Matla water into the Piyali river during the high tides. On month basis, EC of the water samples from different sources were analyzed by the methodology described by Jackson (1967).

Field demonstrations were conducted during 2011-12 in farmers' fields at around Kella (near 0 km), at around Mahishmary (near 10 km) and at Dosha (near 20 km) from sluice gate. Different sources of waters and soil test based fertilizer dose were used in field demonstration. 10 farmers of each crops i.e. paddy (Lal Minikit), beans, cabbage, tomato, chilli, cucumber and potato irrigated by separate sources of water (i.e. pond water along Piyali river (PW-PR), tube well of 350-450 feet depth along Piyali river (TWW-PR) and Piyali river water at 0 km (PRW-0), at 10 km (PRW-10), and at 20 km (PRW-20) from sluice gate were selected for our observation and yield of the each crop was recorded separately based on the use of different sources of water. The yield of the above crops irrigated with good quality (average of EC < 0.5 dSm<sup>-1</sup>) of pond

water (PW-KVK) and with same agronomic management around KVK-Nimpith in the aforesaid blocks were also recorded. To study the effect of different sources of water on crops growth and yield, the data were analyzed statistically and relative productivity (%) of crops are presented in tabular form.

Month-wise salinity range and their average value of different water sources in *Sundarban* are given in Table 1. Table 1 shows that the salinity of water samples collected at 20 km distance from sluice gates (EC value varied from 0.30 to 20.00 dSm<sup>-1</sup> throughout the year) are lower than the salinity of water (EC value varied from 0.20 to 33.00 dSm<sup>-1</sup> throughout the year) at sluice gates (0 km distance). The value of EC at 10 km distance are intermediate (EC value varied from 0.24 to 24.15 dSm<sup>-1</sup> throughout the year) between 0 km and 20 km distance. The salinity variation along the river Piyali may be due to the mixing of saline Matla water with the rain water. Average EC values of water collected from other sources viz., pond water were from 0.24 to 3.10 dSm<sup>-1</sup> throughout the year and of tube well water were from 1.13 to 4.81 dSm<sup>-1</sup> throughout the year. The salinity of the different water resources varies among themselves perhaps due to which they are fed. The variation in EC of pond and tube well water may be due to hydrological influence of saline Matla river. Thus, both pond and Piyali river water of these areas are partly fed by the underground water giving their maximum EC values in summer season. The seasonal variation in the salinity of the underground water resources in *Sundarban* (Table 1) are in close agreement with the findings of Baskran (1994) and Mahendran (1999).

The yield of boro paddy using different water sources and their relative productivity are presented in Table 2. Using pond water (PW-PR) during January to April, the rice production was about 20% less than that of the production of rice where good quality of water (PW-KVK) was used. It also observed that boro paddy yield was reduced by about 25-30% by irrigating Piyali river water (PRW) one or two times

**Table 1.** Month-wise average salinity (EC) of different water sources in Sundarban

Water Sources	Particulars	Jan.	Feb.	Mar.	Apl.	May	Jun	Jul	Aug.	Sept.	Oct.	Nov.	Dec.
PRW-0	Range	2.63-6.78	7.29-11.24	12.35-25.00	20.00-33.00	14.00-28.00	1.14-6.00	0.70-2.49	0.20-1.60	0.30-0.60	0.20-0.92	0.40-1.94	1.0-3.86
	Mean + SD	4.90 + 1.35	9.97 + 1.79	20.34 + 8.05	21.80 + 7.74	22.30 + 11.30	3.17 + 1.88	1.10 + 0.72	0.74 + 0.62	0.62 + 0.29	0.65 + 0.30	1.23 + 0.61	2.81 + 1.18
PRW-10	Range	2.31-6.48	6.53-11.00	10.23-18.46	11.20-24.15	8.35-22.38	10.3-5.67	0.49-2.34	0.24-1.42	0.31-0.68	0.34-0.86	0.40-1.37	1.0-3.40
	Mean + SD	4.79 + 1.34	8.61 + 2.00	13.46 + 3.42	16.74 + 4.86	14.64 + 5.86	2.38 + 1.43	1.07 + 0.66	0.68 + 0.40	0.56 + 0.30	0.61 + 0.28	0.95 + 0.50	2.19 + 0.96
PRW-20	Range	1.02-6.56	4.58-10.60	8.30-13.00	9.68-20.00	4.80-12.20	1.12-4.80	0.49-2.01	0.34-1.00	0.30-0.66	0.34-0.83	0.40-1.23	1.02-2.63
	Mean + SD	4.06 + 1.82	7.71 + 1.81	10.87 + 2.64	13.36 + 4.00	9.42 + 4.58	2.16 + 4.58	1.06 + 0.54	0.61 + 0.33	0.54 + 0.24	0.61 + 0.26	0.87 + 0.41	2.02 + 0.70
PW-PR	Range	0.34-1.85	0.31-2.61	0.90-2.96	1.03-2.98	1.09-3.10	0.65-1.74	0.27-1.10	0.24-0.86	0.34-1.20	0.51-1.24	0.45-1.34	0.57-1.70
	Mean + SD	1.09 + 1.08	1.15 + 1.11	1.80 + 1.03	2.04 + 0.75	2.10 + 1.07	1.07 + 0.55	0.65 + 0.35	0.68 + 0.33	0.76 + 0.39	0.84 + 0.39	0.75 + 0.41	0.94 + 0.60
TWW-PR	Range	1.55-2.54	2.24-3.20	2.31-3.39	2.43-4.81	3.14-4.50	1.96-3.59	1.34-3.02	1.13-1.88	1.16-1.52	1.19-1.89	1.58-2.38	1.78-2.42
	Mean + SD	2.34 + 0.42	2.65 + 0.45	2.96 + 0.81	3.34 + 0.94	3.24 + 0.66	2.46 + 0.66	1.58 + 0.82	1.31 + 0.33	1.19 + 0.31	1.42 + 0.39	1.88 + 0.29	2.02 + 0.23

**Table 2.** Yield of Boro Paddy (Lal Minikit) using different water sources in Sundarban at farmers' fields

Location	Treatment of water sources	Yield Range (Mon/Bigha)	Mean + SD	Relative Productivity (%)
Around KVK-Nimpith	PW-KVK	16.1-18.1	16.95 + 0.62	100
Along PR	PW-PR	12.7-15.3	13.65 + 0.95	80.53
Along PR	PW-PR+ TWW-PR	11.58-14.66	12.48 + 1.02	73.63
Along PR	TWW-PR	10.0-13.0	11.21 + 0.99	66.13
Dhasa	PRW-20	00.0	00.0	00.0
Mohish mari	PRW-10	00.0	00.0	00.0
Kella	PRW-0	00.0	00.0	00.0

N.B.: Mon/Bigha = 0.3 t ha<sup>-1</sup>**Table 3.** Relative productivity (%) of vegetables using different water sources at farmers' fields during October to January

Vegetables Name	Around KVK- Nimpith (Joy-I, Joy-II and Kultali blocks)		Relative Productivity (%) using water of different sources					
	Yield Range	Mean + SD (kg/Kata)	PW-KVK	PW-PR	TWW-PR	PRW-20	PRW-10	PRW-0
Beans	100-146	126.3 + 14.66	100	65.0	30.0	38.0	35.0	30.0
Cabbage	146-203	171.9 + 17.50	100	80.0	70.0	75.0	65.0	55.0
Tomato	266-315	290.46 + 17.0	100	90.0	75.0	80.0	67.5	60.0
Green Chili	53-100	76.55 + 15.92	100	95.0	90.0	42.5	25.0	16.5
Cucumber	80-120	98.38 + 13.61	100	90.0	67.5	75.0	60.0	53.0
Potato	146-200	175.16 + 17.08	100	82.5	57.2	60.0	55.0	46.0

N.B.: 1 kg/kata = 0.15 t ha<sup>-1</sup>; (PW-KVK) Pond water around KVK-Nimpith; (PW-PR) Pond water along Piyali River; (TWW-PR) Tube well water along Piyali River; (PRW-0) Piyali River Water at 0 km.

during the period of last week of December and first week of January and rest of the irrigation were given from pond water (PW-PR) during January to March. If the farmers continue the irrigation from Piyali river after January then rice production was a total failure (Table 2). Using tube well water (TWW) during January to April farmers have produced about 30-35% less rice yield (Table 2) in comparison with paddy yield irrigated with the good quality of water (PW-KVK). The salinity level of water (TWW) is categorized as medium degree of limitation (Ayers and Westcot 1985) and almost similar rice production were reported by Minhas and Gupta (1992) in similar salinity level.

The percentage of relative productivity of vegetables namely beans, cabbage, cucumber, tomato, chilli and potato in comparison with good quality of water (PW-KVK) are shown in Table 3. The water of pond, tube well and Piyali river were used from October to January for the aforesaid vegetables production along the river Piyali in the

aforesaid blocks. The vegetables were produced by reduction in their yield ranged from 10% to 83.5% with respect to good quality of water (PW-KVK). In case of potato and beans average 64% and 40% yield were observed respectively using different sources of water. Similar results were also reported by Ayers (1977) using similar quality of water.

From the results of the present study, it may be concluded that after the month of January, only pond and shallow tube well water are suitable for irrigation. If good quality of water from other sources is mixed with tube well or river water, then these natural water will be more suited for irrigating wide spectrum of crops in these areas with slight to moderate reduction of yield.

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