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# **Inundation of Saline Water on Agricultural Land and rainwater Harvesting of Indian Sundarban : “A case Study of Canning 1 CD Block of South 24 Parganas.”**

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**ABSTRACT :** The present paper is an attempt to analyses the Inundation of saline water on agricultural land and rainwater harvesting of Indian sundarban. The total area of Indian Sundarban is about 9360 Sq. Km. comprising of 102 islands. The entire Sundarban region is the part of active delta. Canning – I is one of the most important community development block of South 24 Parganas district. Most of the area is faced with paradoxical situation in that there is excess rain water during the monsoon season causes severe water logging all over the area due to inadequate drainage facilities whereas in winter and summer months there is acute shortage of good quality water for irrigation purposes. The situation is further aggravated due to excessive accumulation of salt in the soil during the post rainy season. Embankment breaching also related to inundation of saline water on agricultural land or fishing ground of sweet water. During the months of April to October the tidal waves assume giant proportions and cause breach in mud dykes. The typical geographical and climatic features of the region are mainly responsible for the problem of water logging etc.

**KEYWORDS :-** Inundation of saline water, rain water harvesting, water logging, agricultural land, Kharif Crops, etc.

## **I. INTRODUCTION**

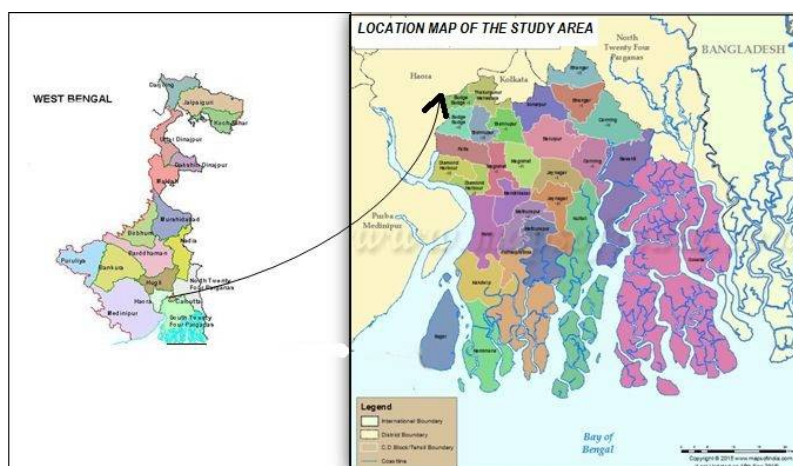
A sequence of structural and technological changes has occurred in Indian agriculture during last few decades. In Sundarban delta, more than 80 percent area is under mono-cropped kharif rice cultivation and about 62 percent area is low lying. Inundation of Saline water on agricultural Land, excessive usage and abuse of ground water are one of the most important problem of the study area. There is no availability of water for cultivation of Second Crop in rabi season. So, Rainwater harvesting is the suitable method of the study area.

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## Study Area :-

Canning-I is a community development block that forms an administrative division in canning sub-division of south 24 parganas district of West Bengal. Daria, a constituent panchayat of Canning – I CD block, is located at latitude  $22^{\circ} 17' 57''$  N, longitude  $88^{\circ} 35' 19''$  E.

The study area Canning – I CD Block is situated Western Bank of river Matla and average attitude is 3.0 metre (A.M.S.L.). Canning – I CD Block has an area of 187.86 Sq.Km. The block has 61 inhabited villages. Canning-I CD Block is bounded by Canning – II CD Block in the north, Basanti CD Block in the east and south, Kultali, Jaynagar - I and Baruipur CD Block in the West.

## II. OBJECTIVES OF THE STUDY

The present study has been under taken with the specific objectives which as following :

- To identify negative impacts of Saline Water in Agriculture.
- To specify the problem of major salt affected areas during the post monsoon.
- To identify the physical and socio-economic impact of saline water of the study area.
- To suggest depending on the depth of standing water and soil salinity of the field suitable rice variety can be selected which give maximum production.
- To suggest certain changes to improve the irrigation of the study area.

## III. METHODOLOGY

This study is based on primary as well as secondary data. Census data collected from the census office Govt. of India. Meteorological data collected from the CSSRI Canning town. Various types of maps provided by NATMO office, SDO Office and BLRO Canning etc. Literature review done by searching internet and from many reports of the Govt. of WB. CSSRI annual report 2015-16 collected from the internet.

## IV. RESULTS AND DISCUSSION

### [A]. Physical Background of the study Area :

The Sundarban (including study area) is criss – crossed by innumerable tidal rivers and creeks forming 102 islands. The study area Canning I CD Block is situated western bank of river matla. There is almost no industrial growth and about 60 percent of the population depends on agriculture.

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• **Physiographic and relief :-** The study area is a part of active delta of Indian Sundarban. Topography is more or-less flat. Matla is a tidal river and it is main river of the study area . The average maximum and minimum elevation are 4 metre and 2 metre above the mean sea level respectively.

• **Hydrology :-** Hydrologically this area is very important to us. Many creeks which are locally known canal are developed in this region. Main river matla carries enormous loads of “sediment which is deposit at the confluence of river and sea and also river bed.

• **Climate :-** The climate of the study area can be classified as hot and humid (AM). Total annual rainfall of 1953.3mm was recorded during 2015. The maximum (838.4mm) rainfall as well as the maximum number (28) of rainy days was recorded in the months of July. The average mean monthly temperature of 19.3<sup>0</sup>C in January rises very rapidly to 31.5<sup>0</sup>C in the month of may. The highest average wind velocity (9.9 KmPH) was recorded in may. Area is characterized by three dominant seasons throughout the year. The following table gives an idea regarding weather parameters.

**Table : 1** Mean monthly weather parameters at canning Town (Latitude 22<sup>0</sup>15” N, longitude 88<sup>0</sup>40’ E, attitude – 3.0 m) during the year 2015.

Month	Temperature ( <sup>0</sup> C) (Mean)	RH (%)	Rainfall (mm)	Rainy Days	Wind speed (km/hr) (max)
Jan.	19.3	50.3	17.9	01	17.9
Feb.	22.7	42.1	15.0	01	19.7
Mar.	26.5	34.7	10.9	02	20.9
Apr.	28.9	50.0	106.9	07	29.5
May	31.5	55.9	89.6	04	30.2
Jun.	30.2	64.5	274.2	15	33.5
Jul.	28.7	79.5	838.4	28	27.8
Aug.	29.5	73.1	399.8	15	28.7
Sep.	29.4	66.4	172.2	11	24.7
Oct.	28.5	56.0	21.5	02	19.7
Nov,	25.0	46.3	1.4	0	16.0
Dec.	21.3	45.3	5.5	0	15.5

**Source :** CSSRI Annual Report 2015-16

• **Soil :-** The saline soils of sundarbans area are recognized by high plant mortality and often by white salt crust on the soil surface. Salinity of the soil varies with the season. The following table give an idea regarding the soil characteristics of the study area.

**Table : 2** Soil Characteristics

Soil Texture	:	Silty clay (Sand 10%, Silt 51.2% and clay 38.%)
Available Potash	:	450 Kg/Ha
Available Phosphorus	:	22.5 Kg/nn
Organic Carbon	:	0.98%
Zinc	:	1.0ppm
Boron	:	0.5 ppm
Month	:	Jan, Feb, Mar, Apr. May June. July Aug. Sep. Oct. Nov. Dec.
Average Sailing	:	6-9, 7-0, 8-8, 10-8, 11-4, 8-4,
(Elec. Con in mm hos / cm	:	3-0, 2.5, 2.1, 2.8, 4-0, 5.7

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**Source :** Central Soil salinity research institute , canning town.

The soil is slightly acidic to slightly alkaline in reaction, the pH range varies between 5.4 to 7.8. The parent deposit is rich in magnesium and calcium. So, soil condition of this areas is not very good because soils are mainly saline which is less productive.

**[B] WATER AVAILABILITY :** Rain water is the major Freshwater source in Sundarbans. Sundarban has receives rain mainly from South-west monsoon. The average annual rainfall is 1625 mm but this may increase to 2000 mm in the high rainfall year and drop to 1300 mm in lowest rainfall year (Dasgupta, 2008). The following table gives an idea regarding water availability.

**Table : 3** Annual Sectoral water availability in Indian Sundarban (2010-11)

Area	DTW Drinking	STW irrigation	Total GW	Tank irrigation	Canal Irrigation	Total SW	Total
	(mcm)	(mcm)	(mcm)	(mcm)	(mcm)	(mcm)	(mcm)
Indian Sundarban	8.08	386.59	394.67	43.02	9.21	52.23	

**DTW :** Deep Tube Well, **STW :** Shallow Tube Well, **GW :** Ground Water, **SW :** Surface water.

**WATER DEMAND :** The consumptive water demand of Indian Sundarban includes the water demand of drinking, domestic use and agriculture. The annual demand for drinking water in Indian Sundarban blocks is 8.08 Mcm whereas the annual demand for domestic use is 105.1 Mcm. The total annual water demand for drinking, domestic use and agriculture in the 19 blocks of Indian Sundarban has been estimated as 2895.92 Mcm.

**Table : 4** Annual Sectoral Water demand in Indian Sundarban (2010-11)

Area	Drinking	Domestic	Agriculture	Total
	(Mcm)	(Mcm)	(Mcm)	(Mcm)
Indian Sundarban	8.08	105.01	2782.83	2895.92

## **[C] INTRUSION OF SALINE WATER ON AGRICULTURAL LAND :**

The Sundarban is intersected by a complex network of tidal waterways, mudflats and small island of salt-tolerant mangrove forests. The people, living in the Sundarban depends for their daily use of water on ground water and also on inland sources of water and as a result the possibility of arsenic, pesticide contamination and intrusion of saline water is quite high and life threatening.

### **• Why saline water inundate on agricultural land :**

- Cyclonic Strom
- Tidal water during high tides
- Deep submergence of water on the surface
- Breaching of embankments
- Heavy rainfall concentrated in a short monsoon period.

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## ● Effects of saline water on agriculture :

A crop field in the saline soil usually has barren spots, stunted growth of the plants with considerable variation in size and a deep blue-green foliage. Each of these symptoms may arise under different conditions but the above combination will occur only in saline soils. The electrical conductivity (Ec) or salinity of ground water of the sub soil water ranges from 2 ds/m in monsoon season to 20 ds/m in summer.

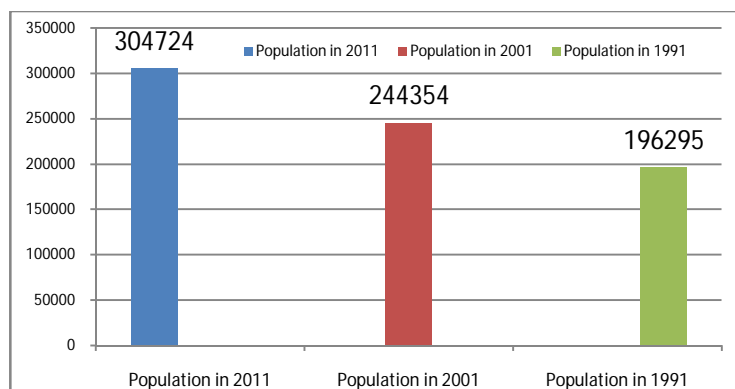
## ● Demands of Fresh water :

Study of land area made by transported soil or sediment soil by nature has heavy texture, which protects to percolate or leaching of the surface water and delay the storage of ground water. People of Canning 1 CD block have been increased with time to time. They are depended on ground water for different type of uses. So, demands of fresh water have been also increased with the ever increasing population.

**Table : 5**

Year	Total Population
2011	304724
2001	244354
1991	196295

## Increase of population Canning 1 CD Block (1991-2011)



● **Tube well and ground water contamination :** There is so many tubewells which supply drinking water of inhabitant of this area. Level of drinking water stay below 500-1100 meter from the ground. People of this area totally depend on ground water as a result the possibility of arsenic, pesticide contamination and saline water intrusion is quite life threatening.

## [D] RAIN WATER HARVESTING AND GROUND WATER RECHARGE :

We get a lot of rain, yet we don't have water. Because we have not realized enough the value of each raindrop. Because the rainwater is not conserved but allowed to drain away. Thus it does not matter how much rain we get if we don't capture or harvest it. Rainwater harvesting is a technique of collection and storage of rainwater into natural reservoirs or tanks, or the infiltration of surface water into subsurface aquifers. The activity of collecting rainwater directly or recharging into the ground to improve ground water storage in the aquifer is called as Rainwater harvesting (RWH).

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## • **Benefits of Rainwater Harvesting :**

- It makes readily available potable, filtered water for immediate consumption e.g. 5000 liters on every 2400 sq.ft. surface from every inch of rainfall.
- In coastal area it prevents saline water intrusion into our subsoil water.
- Rainwater harvesting help sustain the moisture level in the sub soil.
- It can save water from arsenic contamination.
- It can save water from solid material, pesticide etc.
- It can save ground water level.
- To prevent the desertification harvested rain water is supplied from nearest rained area to desert area.
- To supply water for agriculture, it is very useful method to us.
- It can supply water during hazard time.
- Rain-water is used to clean different type things like house, car etc.
- The scope for natural re-charge become little in urban areas like Kolkata city and therefore suffer inconveniences like flood and water stagnation even for a short spell of rainfall. RWH helps to avoid such situation

• **Methods of rain water harvesting :** Rain water may be collected and recharged in the ground water aquifers through the following methods : [a] Rooftop harvesting [b] Harvesting rainwater from open spaces.

• **Steps of rainwater harvesting :** Rain water harvesting system :



- Step – I** : Precipitate rain water is caught by the different type of construction like roof of house, school, college, govt. construction and pond and using plastic etc.
- Step – II** : Captured water is transported along the pipeline from captured area.
- Step – III** : After filtration water is stored in storage tank or ground.
- Step – IV** : And finally this storage water may be used in different purpose.

• **Roof top rainwater harvesting of canning – I CD Block :** For sustainable usage of water especially ground water and inland rain water in different purpose and promotes the sustainable use of pure water in this area. Every year, the ground water level of the study area goes down a few centimeters for excessive use and abuse of ground water. So, rainwater harvesting is the alternative source of the study area.

The following table shows the potential roof top rain water harvesting of the study area.

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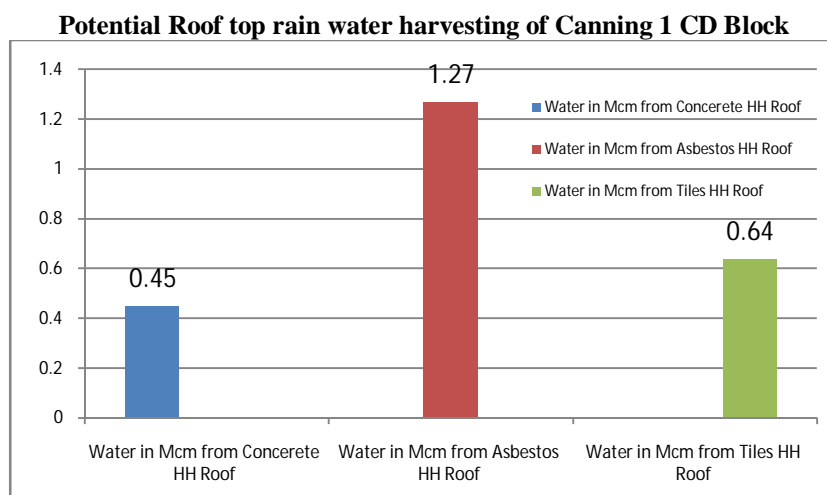
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**Table – 6 : ROOF TOP RAIN WATER HARVESTING**

Block		No of HH Concrete Rf.		No of HH Asbestos Rf.		No. of HH Tiles Rf.		Total Water (mcm)
			Water		Water (MCM)		Water (mcm)	
Canning - I Basanti, Gosaba, Joynagar – I, Joynagar – II, Kultali, Mathurapur-I Mathurapur-II	Total	37498	3.60	127329	10.18	79464	5.09	18.86
	Average	4687	0.45	15916	1.27	9933	0.64	2.36

**HH** : House holds, **R.F.** : Roof

**Source** : Hazra, Bhadra and Sinha Roy, 2016



## V. CONCLUSION

As the fresh water aquifer of South 24 Parganas is facing threats from arsenic contamination and saline water intrusion, so rain water harvesting is the alternative source of canning – I CD Block. The villages which located near the river site where inundation of saline water more happened to the agricultural land. Protection of embankments, provision of sluice gate and people awarness, coastal zone management, block disaster management plan and proper planning from the very grass root level can save the entire region. So, Rain water harvesting is the most important method of the study area for sustainable development.

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