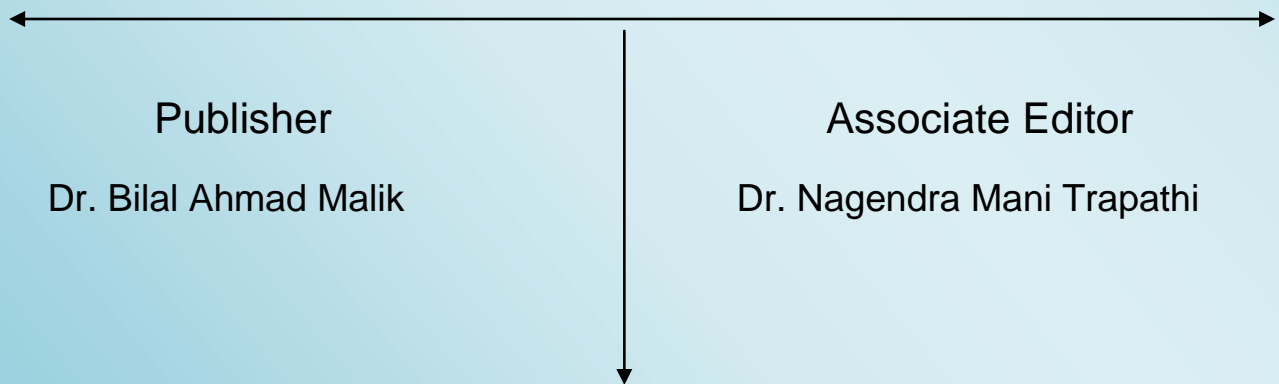


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RAINWATER HARVESTING-AN ULTIMATE NEED IN WEST BENGAL, INDIA

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ABSTRACT:

Water is an essential requirement for human life. India is one of the developing countries .Due to faster industrialization and urbanization & increase in population, water demand is increasing day by day. There is significant spatial imbalance in water resource available and water demand .In view of this, water management is very essential for the growth and development of any economy. It is common observation that underground water table is depleting due to uncontrolled exploitation of water. But the state of west Bengal receives a sufficient amount of water by rainfall. Rainwater harvesting can play vital role for solving the water problems .This paper focus all the above constraints in implementation of water harvesting system and benefits of its .

Keywords: *Industrialization, Urbanization, Uncontrolled, Exploitation, Rainwater harvesting Implementation, focus.*

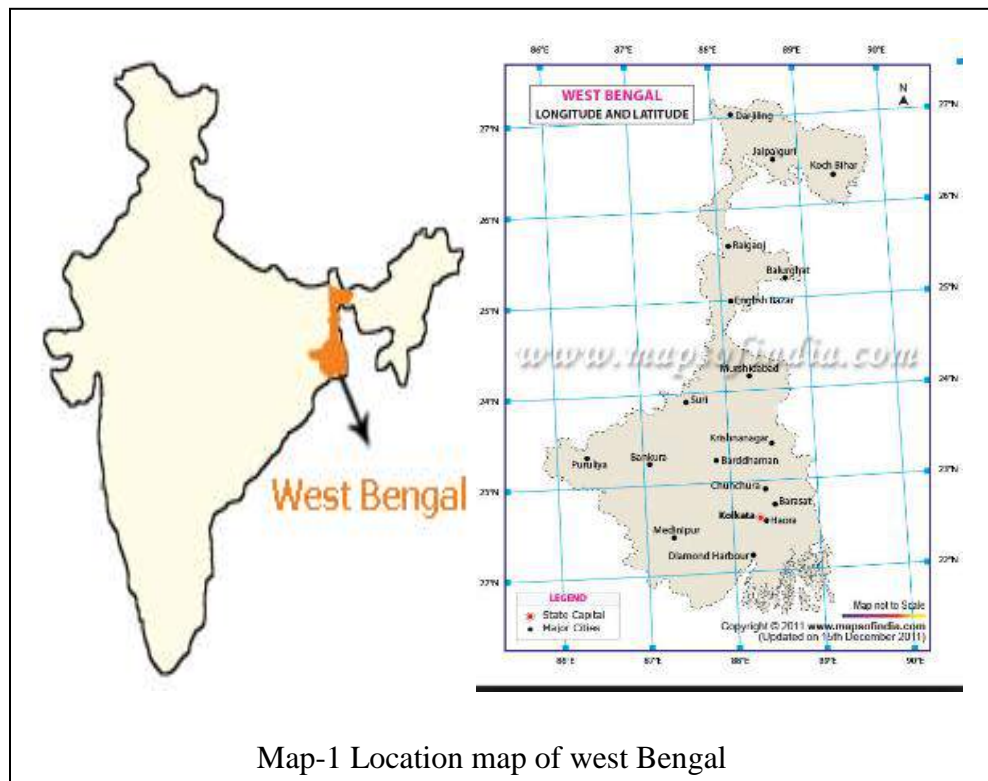
INTRODUCTION:

The water crisis has taken considerable space in our lives. The problem of water shortages has become a national and universal theme of discussion.

One third of the world's population will experience severe water scarcity by the end of this century. To meet our water demand we entirely depends upon rivers, lakes, and ground water. However the rain is the ultimate resource that feeds all these sources. The state of west Bengal receives a mean annual rainfall of 2739mm in sub Himalayan region and 1439 mm in Gangetic region of which about 80 percent is concentrated in the period of May to August. Further, the rainfall is very irregular both in area and time. This fact makes it necessary that proper assessment and conservation of this vital resource be done for the development of the state.

STUDY AREA:

The state of west Bengal is located in between 21° 20' north to 27° 32' north latitude and 85° 50' east to 89° 52' east longitude, bordering Bangladesh, Nepal and Bhutan. Geographical area of the state is 88752 s.q km which is 2.7 percent of the total area of the country.



The state has two distinct natural divisions: 1. The north Himalayas and 2. The south alluvial Gangetic plains.

OBJECTIVES OF THE STUDY:

The present work is devoted to appraise the possibility of conservation of water resources in future for a small part of the country named west Bengal.

The main objectives of this study are as follows:

1. To find out the spatial distribution of rainfall in west Bengal.
2. To assess the proper utilization of water resources.
3. To evaluate the present status of conservation of water resources.

4. To identify the various ways to recharge the ground water.
5. An ideal solution to water problem in areas having inadequate water resources.

A brief note about the concept of rain water harvesting: Rain is the ultimate source of fresh water. Rain water harvesting and conservation is nothing but means understanding the importance of rain and to make optimum use of rain water at the place where it falls.

Rain water harvesting is a system by which, the rain water that collects on the roofs and the area around the building is directed into open wells. Through a filter tank or into percolation chamber, built specially for this purpose.

The nature of rainfall in west Bengal is erratic, realizing this fact it is necessary to opt for rainwater harvesting measures for fulfillment of water requirement.

NEED FOR RAINWATER HARVESTING IN WEST BENGAL:

Major parts of our state have been facing continuous failure of monsoon and consequent deficit of rainfall over the last few years.

Also , due to over increasing population of west Bengal , the use of ground water has increased drastically leading to constant depletion of ground water level causing the wells and tube wells to dry up . In view of uncontrolled ground water exploitation , there is not only significant lowering of water level, in many areas of the state including Kolkata, North 24 Pargana etc. , such exploitation is also resulting in intrusion of saline water as also arsenic in the aquifer, besides subsidence of land in specific areas.

In some places of west Bengal excessive heat waves during summer create a situation similar to drought. But the rainfall is highly erratic. It is not evenly distributed over the entire area and over the period. As soon as the rains are over, water scarcity starts.

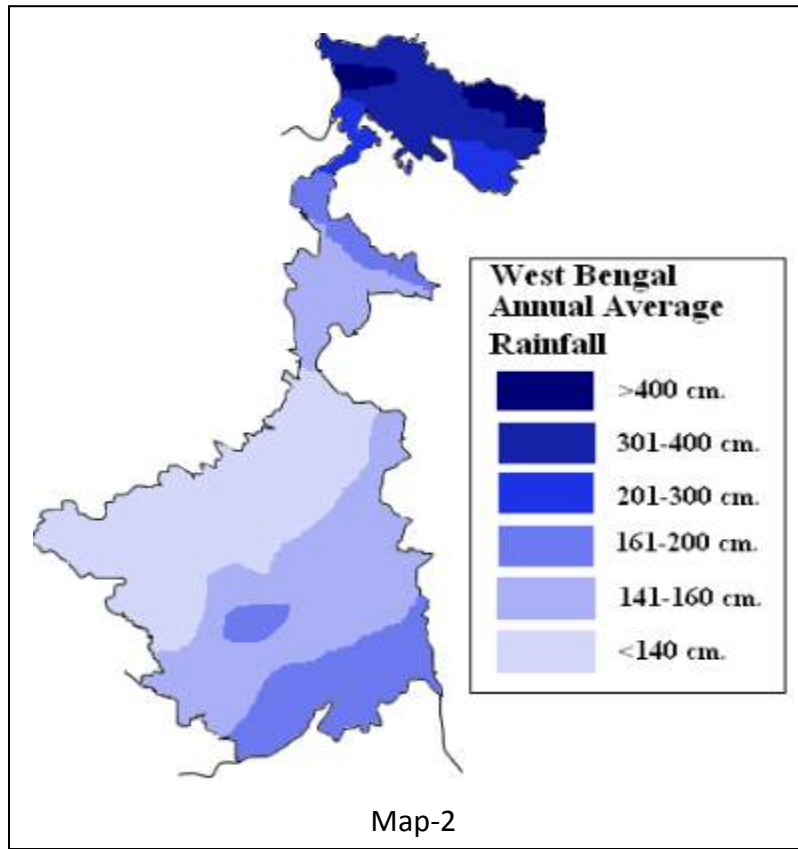
West Bengal receives a fair amount of rainfall in almost all parts during monsoon. However in absence of any structured strategy for harvesting the rainwater excepting some piecemeal approaches most part of the rainwater finds its way to drains as runoff .The following table shows the amount of rainfall received in the state of west Bengal during last few years.(Table-1)

Districts		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1 Darjeeling	RF	18.7	24.5	36.6	109.7	237.9	585.0	805.0	588.9	493.5	148.3	22.5	14.0	3084.6
	RD	1.5	2.3	3.2	6.8	13.3	19.1	24.2	20.9	17.0	5.4	1.2	1.0	115.9
2 Jalpaiguri	RF	14.5	23.1	33.6	124.6	361.1	692.1	928.0	616.0	528.8	155.7	19.2	11.6	3508.3
	RD	1.0	1.6	2.2	7.0	14.0	18.3	21.9	17.5	15.3	5.8	1.1	0.7	106.4
3 Coochbehar	RF	9.8	15.0	28.3	123.8	321.0	580.3	792.9	535.8	488.7	127.1	11.0	7.9	3041.6
	RD	0.7	1.2	1.9	6.3	13.2	16.7	19.6	14.5	14.2	4.8	0.7	0.6	94.4
4 Uttar-Dinajpur	RF	10.9	10.8	16.6	59.8	183.8	346.5	515.6	408.4	364.3	106.0	10.9	8.3	2041.9
	RD	0.9	0.9	1.2	3.3	7.7	11.7	16.4	13.3	12.6	3.9	0.7	0.6	73.1
5 Dakshin Dinajpur	RF	10.4	7.1	13.8	59.4	192.6	288.9	400.1	312.8	347.6	103.9	9.9	8.6	1755.1
	RD	0.7	0.9	0.9	3.0	8.0	10.7	17.4	11.9	11.6	4.1	0.6	0.7	70.5
6 Malda	RF	10.9	10.8	11.0	39.1	117.5	229.4	353.1	302.4	296.6	91.8	12.3	10.3	1485.2
	RD	0.8	1.0	1.0	2.3	5.9	10.0	15.0	12.9	11.1	4.0	0.7	0.7	65.4
7 Murshidabad	RF	8.8	20.0	22.2	46.2	110.9	236.5	309.3	258.2	236.9	102.1	17.1	9.9	1378.1
	RD	0.8	1.6	1.8	2.9	6.2	11.1	15.0	13.6	11.2	4.5	1.0	0.6	70.3
8 Nadia	RF	8.5	28.8	31.7	59.9	138.5	245.9	308.5	269.8	228.7	88.4	18.6	16.6	1443.9
	RD	0.8	1.8	2.1	3.4	7.2	11.5	15.3	14.1	11.0	4.5	1.0	0.7	73.4
9 Birbhum	RF	9.7	23.2	23.3	40.7	88.7	234.2	324.5	295.7	258.2	105.4	17.5	9.4	1430.5
	RD	0.9	1.8	1.9	2.9	5.6	10.8	15.6	15.2	11.8	4.7	1.0	0.7	72.9
10 Bankura	RF	10.9	25.8	28.6	41.4	90.0	241.4	299.8	296.3	235.4	82.3	18.9	15.1	1385.9
	RD	1.0	1.9	2.1	3.1	5.4	11.3	15.4	15.1	11.4	4.4	1.0	0.9	73.0
11 Purulia	RF	12.1	20.0	22.2	30.6	59.0	252.9	298.5	290.9	233.8	70.0	19.3	12.6	1321.9
	RD	1.3	1.6	2.0	2.7	4.4	11.2	15.4	15.4	11.4	3.6	1.1	0.9	71.0
12 Burdwan	RF	9.0	24.4	28.3	47.8	108.9	229.3	289.2	279.4	221.3	82.6	15.7	12.4	1348.3
	RD	0.8	1.7	2.0	3.0	5.9	11.0	14.7	14.3	10.7	4.2	0.9	0.6	69.8
13 Hooghly	RF	11.3	31.5	33.6	61.6	117.6	248.3	313.9	300.0	236.0	94.2	19.1	9.1	1476.2
	RD	1.0	2.0	2.3	3.7	6.5	11.4	15.8	15.5	11.6	5.0	1.0	0.7	76.5
14 Purba Medinipur	RF	11.3	27.8	39.8	47.6	127.6	280.3	315.6	367.1	303.3	132.5	40.7	7.9	1701.5
	RD	0.9	1.8	2.0	3.0	6.0	11.1	14.2	15.8	12.4	5.7	1.6	0.4	74.9
15 Paschim Medinipur	RF	13.5	24.7	34.8	60.1	110.3	258.5	319.6	334.5	263.5	92.6	18.5	7.9	1538.5
	RD	1.0	1.7	2.2	3.8	6.2	11.3	15.2	15.7	11.7	4.7	1.0	0.6	75.1
16 Howrah	RF	12.3	28.5	34.0	54.7	109.5	249.8	315.6	338.2	263.3	93.2	24.5	11.3	1534.4
	RD	1.0	1.9	2.4	3.4	5.8	11.8	15.3	15.9	12.0	4.8	1.1	0.7	76.1
17 Kolkata	RF	15.3	19.5	29.5	49.2	102.3	269.7	329.2	321.3	295.0	142.8	17.1	7.2	1598.1
	RD	0.8	1.4	2.2	3.0	6.0	12.4	6.6	17.1	13.6	7.2	1.1	0.4	81.8
18 Uttar 24-Parganas	RF	8.6	36.4	40.9	65.3	144.3	287.8	333.7	303.6	265.8	95.3	28.1	13.9	1623.7
	RD	0.7	2.0	1.9	3.7	7.3	12.1	16.5	16.2	12.5	4.8	1.0	0.6	79.3
19 Dakshin 24-Parganas	RF	10.8	24.4	31.2	52.8	122.7	309.7	386.9	409.3	340.2	135.0	42.4	10.9	1876.3
	RD	1.1	1.6	2.0	3.0	6.1	12.5	16.6	17.0	13.7	5.9	1.8	0.5	81.8

RF—Rainfall in millimeter RD—Rainydays.

Table- 1 (source: weather & climate, Swadesh Mishra)

The map shown the uneven distribution of rainfall in west Bengal (Map-2). It's appropriate application by rain water harvesting can influence changes in the well- being of both human and ecosystem .



For reasons stated above, it is the time to immediate start harvesting rainwater, specially in urbanized and drought prone districts of the state .The following figure showing the unevenness of rainfall in west Bengal.(Fig-1)

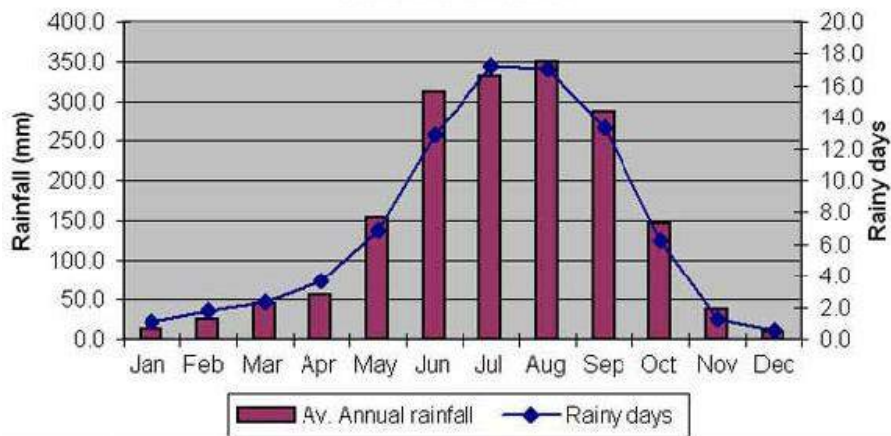


Fig- 1

FACTORS SUITABLE FOR RAINWATER HARVESTING POTENTIAL FOR WEST BENGAL:

There are various factors which are available for rain water harvesting potential in west Bengal, such as;

1. Geography of its area, topographical features of this state.
2. Ecological and climatic condition
3. Availability of enough rainfall in rainy season
4. The geology and sufficient catchment area makes suitable for rain water harvesting in the state of west Bengal.

Present scenario: ‘The ministry of environment forest,’ Govt. of India has issued notification for rain water harvesting. The west Bengal pollution control board (WBPCB) advocates the matter of rainwater harvesting in west Bengal.

Rain water harvesting system has been installed in few schools and one colleges in the district of Birbhum, Bankura and Purulia in collaboration with various government and non- government agencies and funded by the WBPCB The government of west Bengal recently launched a programme for this purpose named as ‘Jal Dhoro Jal Bhoro’ .

PLANNING & BENEFITS FROM RAIN WATER HARVESTING PROJECT:

1. **Reduces demand on ground water:** With increase in population and industrialization, the demand for water is also increasing. The end result is that many residential colonies and industries are extracting ground water to fulfill their daily demands. Rainwater harvesting can play significant role for solving the problems. So proper planning have adapted so that the excessive rain water can stored.
2. **Suitable for irrigation:** The economy of west Bengal is agrarian for its fertile land and geographical condition. The agriculture is based on monsoon rainfall. Rainfall is free from chemicals, making it suitable for irrigation.
3. **Easy to maintain:** Utilizing the rain water harvesting system provides certain advantages to the community. Rain water harvesting technologies are flexible and can be built to meet almost any requirement, construction; operation and maintenance are not labour intensive.

4. **Cost effective and maintenance the quality of water:** It is the most scientific and cost effective way of recharging the ground water and receiving the water table. It offers advantage in water quality for both irrigation and domestic use. Rain water can provide clean, safe and reliable water for drinking so long as the collection system is properly constructed and maintained & treated appropriately for its intended use.
5. **Reduces drought and floods:** West Bengal is a state where every year some part of its suffer either drought or floods causes extensive and enormous damage to agriculture and natural vegetation. Rain water harvesting mitigating the effect of drought as well as flood from the state of west Bengal.

For that purpose construction of small dams and reservoirs on perennial and seasonal big and small rivers, tanks and ponds should be given more importance to store excess rainwater to be used during dry seasons of the years as is done in Maharashtra, Madhya Pradesh and Rajasthan in India.

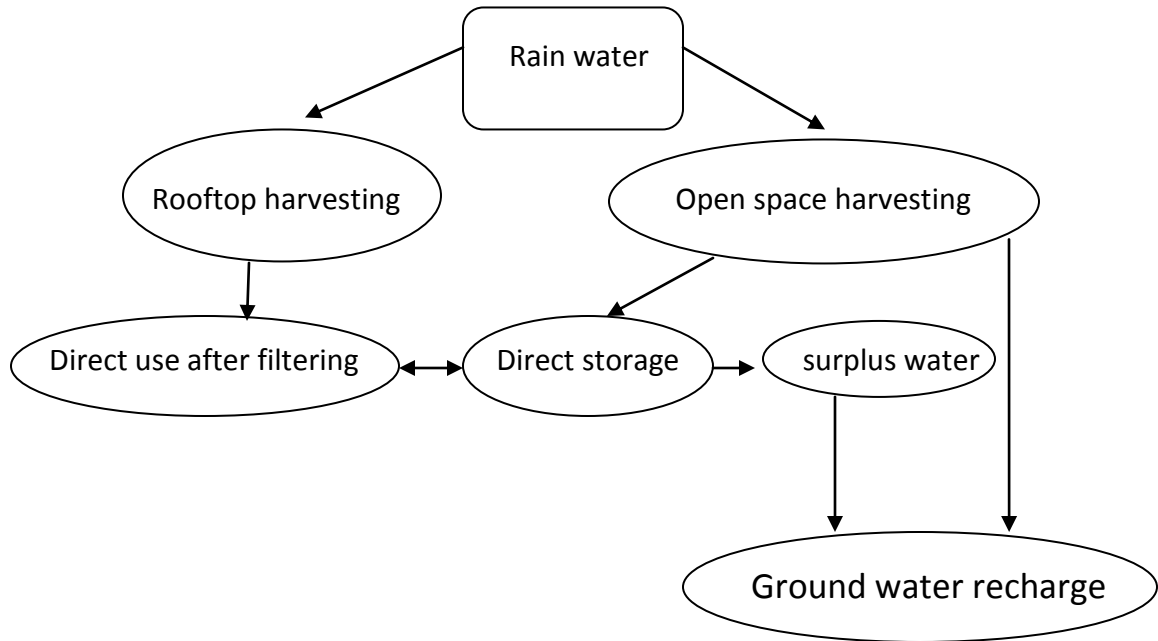
6. **Climate change adaption:** Climate change will effect rainfall and increase evaporation, which will put increasing pressures on our ecosystem services. At the same time development by a growing population will effect on ecosystem as we increase our demands for services, including reliable and clean water. Rain water harvesting will continue to be an adaption strategy for people living with high rainfall variability, both for domestic supply and to enhance crop, livestock and other forms of agriculture.

METHODS AND TECHNIQUES OF RAINWATER HARVESTING SUITABLE FOR WEST BENGAL:

Typically a rain water harvesting system consists of three basic elements; the collection system, the conveyance system and the storage system .The quantum of harvested rainwater depends on: 1.Frequency, duration and intensity of rainfall. 2. Nature of catchment. 3. Run-off characteristics.

There are different ways by which rain water harvesting is carried out. Some of the important which are suitable for the state of west Bengal are as follows;

1. Directly from roof tops and stored in tanks
2. Monsoon runoff and water is swollen streams during the monsoon and storing it in underground tanks.
3. Water from flooded rivers can be stored in small ponds.



Rooftop rain water harvesting: In atypical domestic rooftop rainwater harvesting system, rainwater from the roof is collected in storage vessel or tank for use during periods of scarcity .Such system are usually designed to support the drinking and cooking needs of the family and comprise a roof, storage tank and guttering to transport the water from the roof to the storage tank. A typical rooftop rain water harvesting system comprises of following; catchment area; drain pipe; gutters; Down pipe and first flush pipe; filter unit; storage unit and collection pit. (Fig-2)

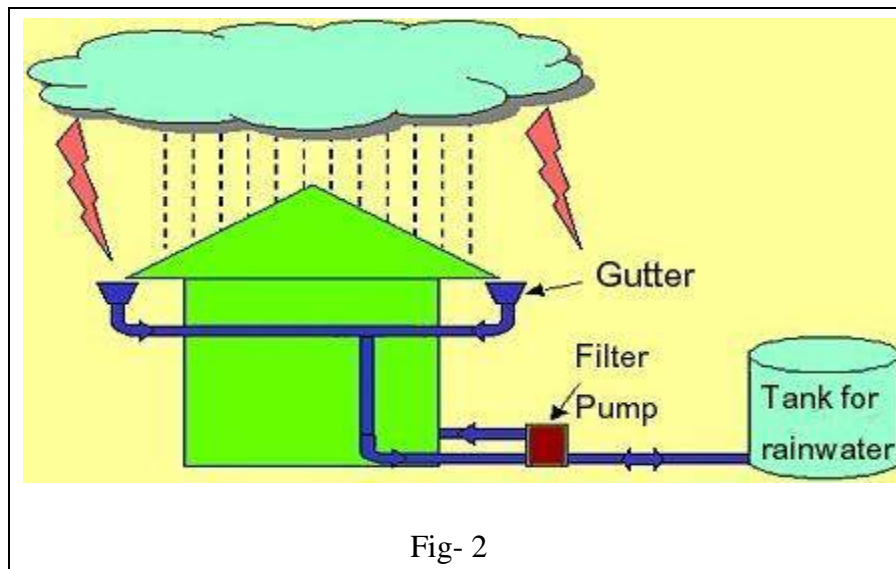


Fig- 2

The estimation of water available from top of roof is worked out by multiplying the roof area with normal rainfall data for monsoon period. Total quantity of rain water available from top to be used for harvesting is about 70 percent to 90 percent, due to losses like evaporation, absorption and leakages etc.

Considering hypothetical case following calculation shows as to how much rain water can be harvested consider a building with a flat terrace area is 100 sq. mt.

Average rainfall in the area is 1200mm .suppose there is no loss of water from the terrace floor, then in one year will be rain water on the terrace floor to a height of 1200mm. height of the rainfall =1200 mm. volume of rainfall $100 \times 1200 = 120000$ liters .Assuming that only 80 percent water harvested, volume of water harvested 96000 liters. A schematic diagram of roof top rain water harvesting. (Fig- 3)

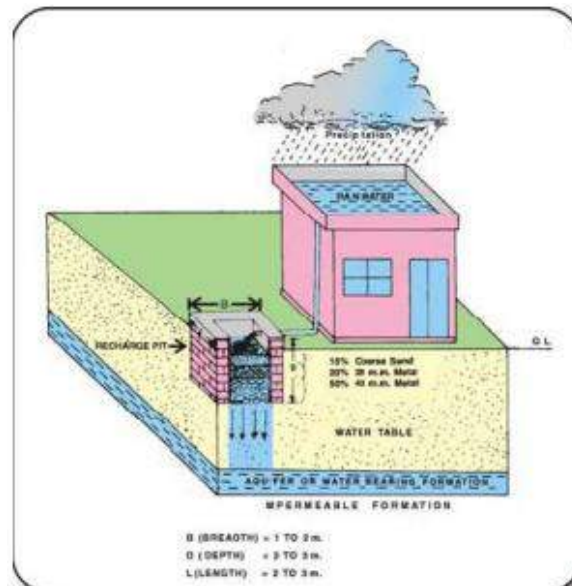


Fig-3

Realizing this equation west Bengal has a ample opportunity for rain water harvesting.

Artificial ground water recharge: In order to store the surplus water the artificial surface reservoirs are constructed by building dams, in the summer , artificial underground reservoirs are now a day's developed by artificial recharge for storing water underground by rain water harvesting.

The following methods are being generally adopted for ground water recharging;

1. **Spreading method:** The topography and the geology of west Bengal is suitable for rain water harvesting by this method. This method consists in spreading the water over the surfaces of permeable open land and pits, from where it directly infiltrates to rather shallow aquifers.
2. **Recharge well method:** this method consists in injecting the water in to bore holes called recharge wells.(Fig- 4)

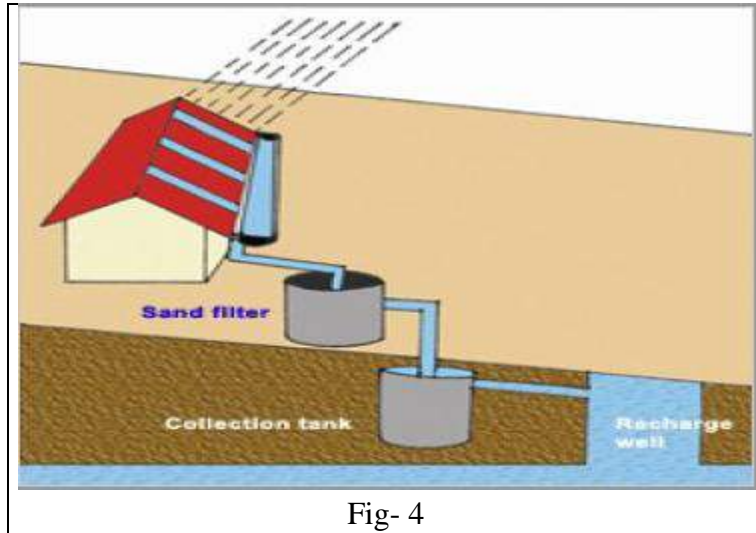
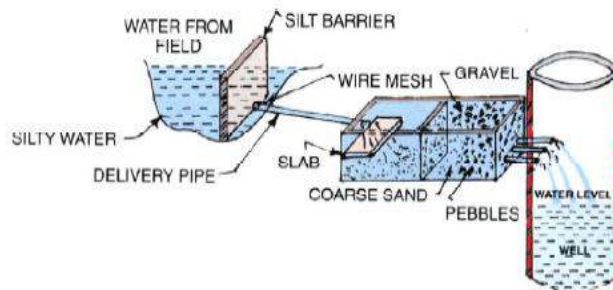


Fig- 4

In fact the ordinary wells are many a times could directly used for recharge during the off season, when the water is not required in use.

3. **Infiltration method:** It is the most important methods for rain water conservation .In this method renney type wells are constructed near the river banks. The recharge to ground water is accomplished by using some of the structure; 1. Pits 2.Trenches 3.Dug wells (Fig-5)



Schematics of a Dug Well

Fig-5

CONCLUSION:

Rainwater harvesting is a coping strategy in variable rainfall areas. In the future climatic change will increase rainfall variability and evaporation and population growth will increase demand on ecosystem services in particular for water. Rainwater harvesting will become key intervention in adaption and reducing vulnerabilities.

To proper conservation and maintenance are careful use of water resources, along with developing additional storages may considerably reduce the chance of water famines for further generation to come. It is about building our relationship with water and environment. Harvest rain. Learn the prestigious value of each rain drop. It is capable of solving all the water related problems not only through west Bengal but also from the whole world.

REFERENCES:

- 1) A.Mitra (1998) Resource Studies
- 2) Singh (1984) water resources in India
- 3) Gupta Planning natural resources
- 4) Duncan (1962) Resource utilization & conservation concept
- 5) M. Husain (2009) Geography of India
- 6) Govt. of India, central public works department.
- 7) Santosh Kumar Garg ‘Hydrology and Water resource Engineering’
- 8) Pranab Kumar Ghosh (2004) ‘ Rainwater Harvesting- A Ray of hope’
- 9) Kushal kishore (2004) ‘ Rain water Harvesting’
- 10) Sunita Narain & Rahul Ranade (2003) A water Harvesting Manual, New Delhi.
- 11) Handbook for planning water shed management works, Govt. of India. Ministry of water resources

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