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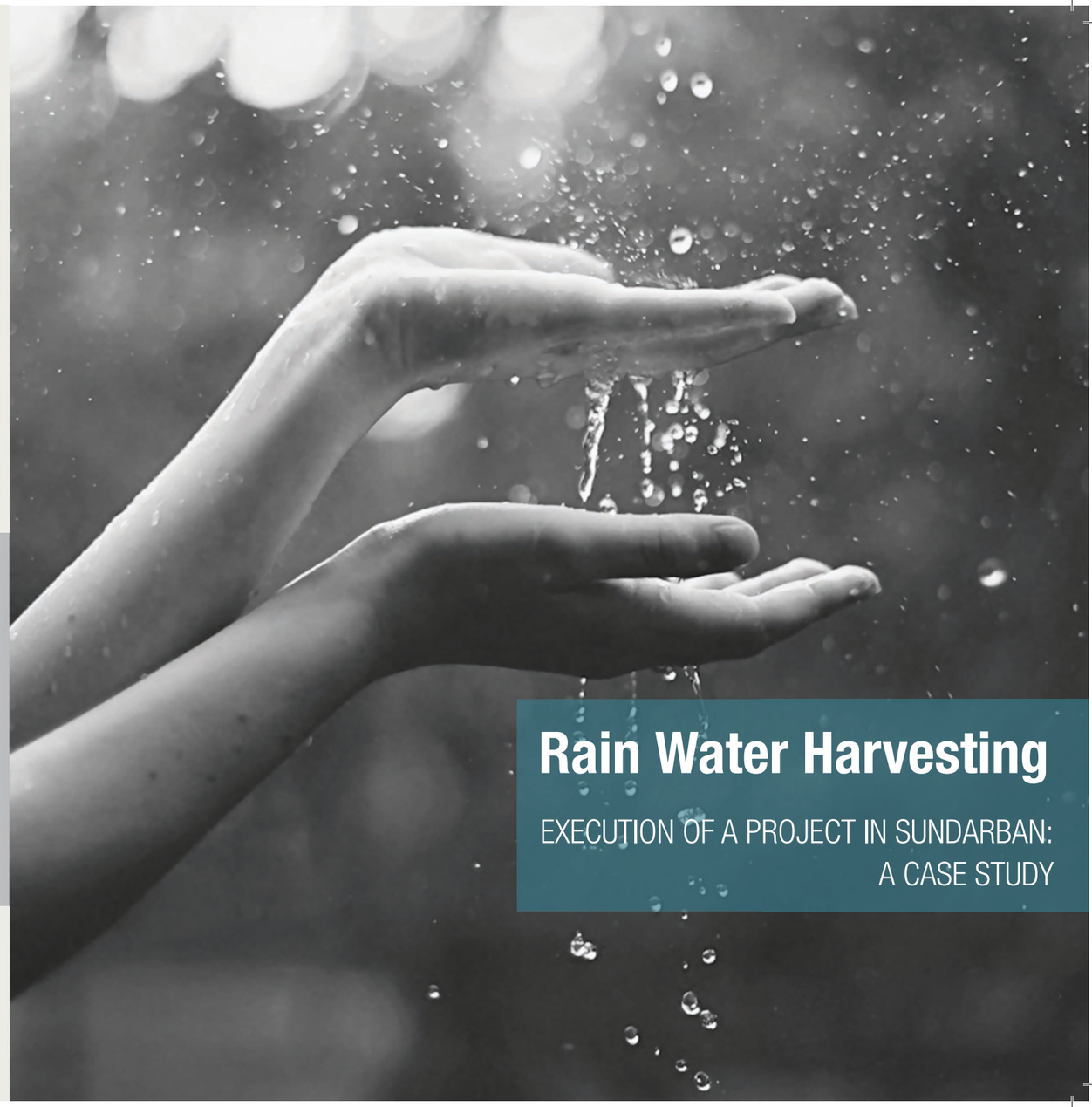
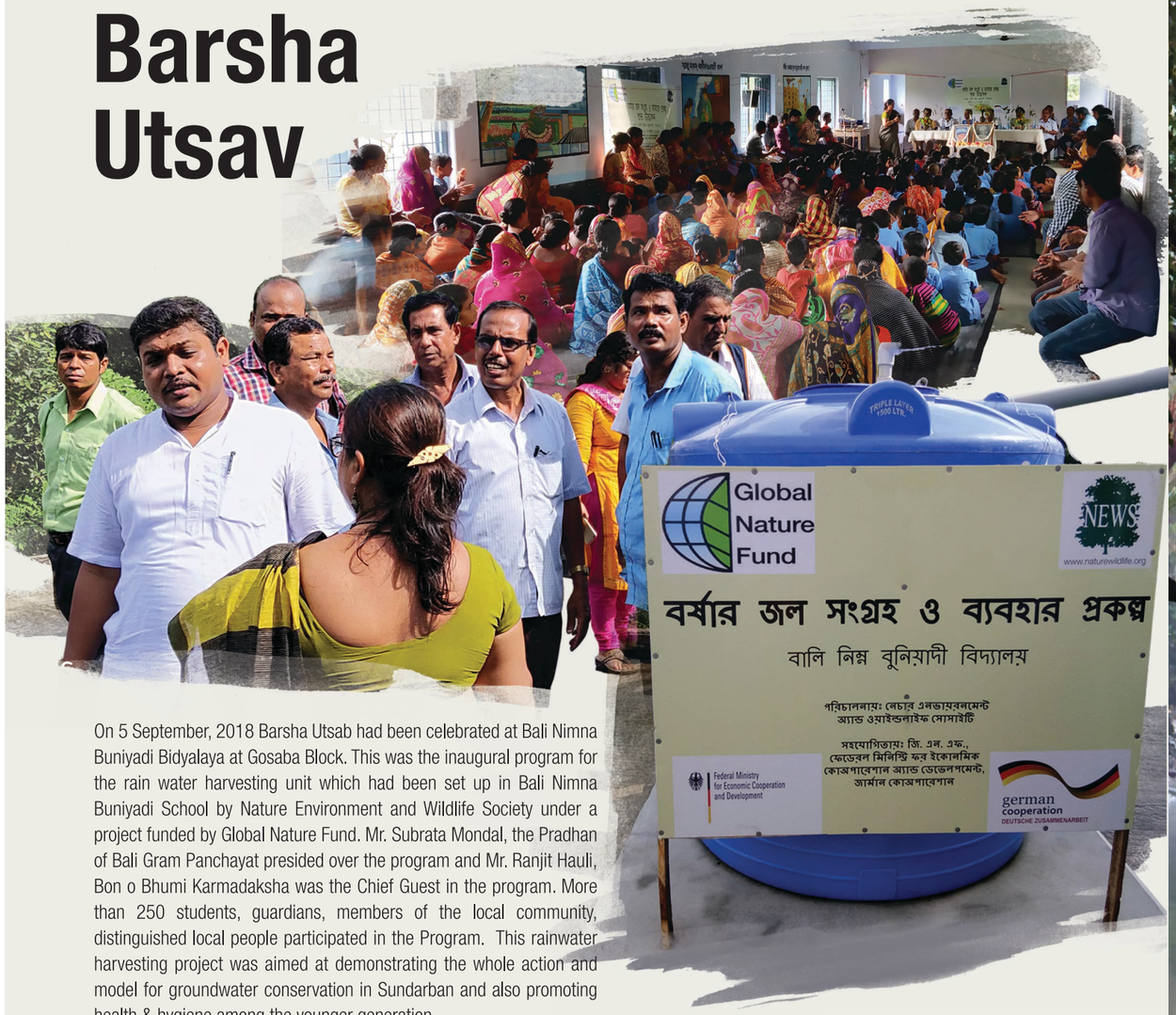


Rain Water Harvesting

EXECUTION OF A PROJECT IN SUNDARBAN: A CASE STUDY

Celebration of Rain festival:

Barsha Utsav

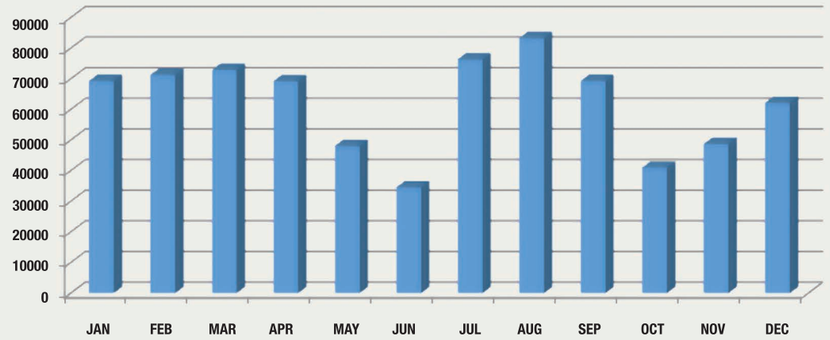


On 5 September, 2018 Barsha Utsab had been celebrated at Bali Nimna Buniyadi Bidyalaya at Gosaba Block. This was the inaugural program for the rain water harvesting unit which had been set up in Bali Nimna Buniyadi School by Nature Environment and Wildlife Society under a project funded by Global Nature Fund. Mr. Subrata Mondal, the Pradhan of Bali Gram Panchayat presided over the program and Mr. Ranjit Hauli, Bon o Bhumi Karmadaksha was the Chief Guest in the program. More than 250 students, guardians, members of the local community, distinguished local people participated in the Program. This rainwater harvesting project was aimed at demonstrating the whole action and model for groundwater conservation in Sundarban and also promoting health & hygiene among the younger generation.

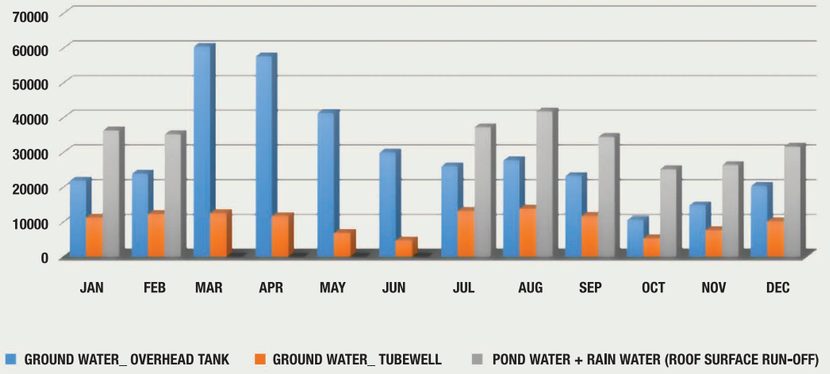
Sundarban: The riverine delta and its challenges

Freshwater is a scarce resource in the Sundarban Biosphere Reserve (SBR) area (19 blocks), particularly on the Indian side of the delta, though it is crisscrossed by numerous creeks and rivulets and receives a huge amount of precipitation during monsoon. Most of the rivulets are no longer connected to their parents in the mainland. Thus, the rivers in Sundarban have very high salinity. The groundwater is also saline in shallow aquifers. Fresh groundwater is only available at a depth of more than 250 metres. This makes it very difficult for the people to secure a decent livelihood in this area. According to Census 2011, hand-pump (operated manually) is the single major source of drinking water accessed by almost 76% of the households in the SBR. This is much higher than the Rural India (43.6%) average.

Average Monthly Water Demand (Lit)

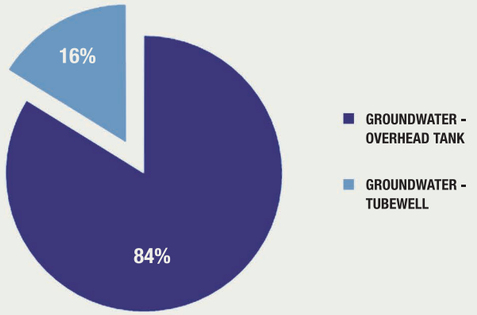


Monthly Water Supply from Different Sources (Lit)

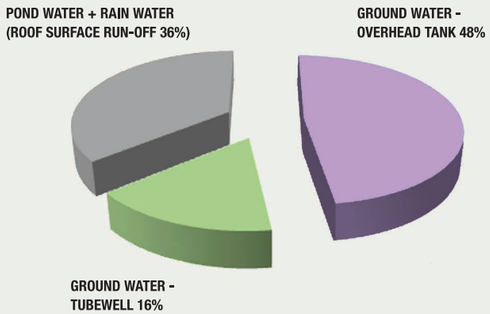


Water Demand for various purpose in Bali Nimna Buniyadi School

Source of Water supply without Rainwater harvesting Unit



Annual Water Supply Scenario after installation of Rainwater harvesting Unit (%)



Annual Water demand

- The annual drinking & domestic water demand in Sundarban blocks add up to 8.08 mcm and 105.1 mcm respectively.
- The average water requirement for the Winter & Summer cultivation is 641.25 mcm, whereas 2141.58 mcm is required for the Monsoon cultivation.
- The water demand for agriculture is highest in July (902 mcm) and lowest in April (1.22 mcm).
- The total annual average water demand in the 19 blocks of Sundarban is 2895.92 mcm.

Annual Water availability

- Available water from Deep Tube Well (DTW) in Sundarban is 8.08 mcm that is used to meet the drinking water demand.
- Over 70,000 freshwater tanks and around 8000 Shallow Tube Wells (STW) are the major sources of irrigation in Sundarban.
- The STWs have a potential to supply 386.59mcm water during Rabi and summer cultivation whereas 43.02 mcm and 9.21 mcm water are available from tanks and canals.

Some of the major policy options to meet the water demand in Sundarban

- Rejuvenation/re-connection of disconnected rivers
- Large scale rainwater harvesting (closure dam)
- Roof-Top rain water harvesting (45mcm)
- Expansion of irrigation network
- Deepening of existing ponds
- Artificial recharge within shallow aquifer
- De-salinization of saline surface water

Increasing salinity in groundwater- a serious threat

- Powerful pumps and shallow wells used for drawing groundwater are taking a heavy toll on the only source of safe sub soil drinking water on several islands in Sundarban spread across the two districts of South and North 24 Parganas in West Bengal.
- Some of the pumps used last year, say local farmers, were powered by five-horsepower motors that can draw as much as 10,000 litres of water in 30 minutes.
- Several hundred acres are being irrigated with water drawn from depths of 50 feet and below.

Very clearly, the stock of fresh ground water is depleting fast and some effective measures need to be taken without delay.

Data source:
Rudra, K. (2009) A State of Environment Report on "Water Resource and Its Quality in West Bengal", West Bengal Pollution Control Board, SinhaRay, S.P. (2010) Status of Ground Water Condition in Sundarban area, West Bengal. Commissioned report, WWF-India.

Rain Water Harvesting: A unique solution

Rain water harvesting (RWH) is a technique of collection and storage of rainwater into natural reservoirs or tanks, or infiltration of surface water into subsurface aquifers (before it is lost as surface runoff). One method of rainwater harvesting is rooftop harvesting. Its' uses include water for gardens, livestock, irrigation, sanitation, domestic use with proper treatment, etc. The harvested water can also be used for washing, gardening, long-term storage, and for other purposes such as groundwater recharge.

The Need for Rainwater Harvesting:

- Fresh water becoming scarce
- Groundwater getting depleted and polluted
- Saline water ingress happening
- Soil erosion resulting from the unchecked runoff
- Health hazards due to consumption of polluted water

The Advantages of Rain Water Harvesting:

- Provides supplement water
- Increases soil moisture level
- Increases ground water table
- Mitigates flooding
- Rainwater is a comparatively clean and a totally free source of water
- Low water supply cost
- It can provide an excellent back-up source of water in emergencies
- It is socially acceptable and environmentally responsible
- It uses simple technologies that are inexpensive and easy to maintain
- It can be used in those areas which have insufficient water resources

Challenges of Rain Water Harvesting:

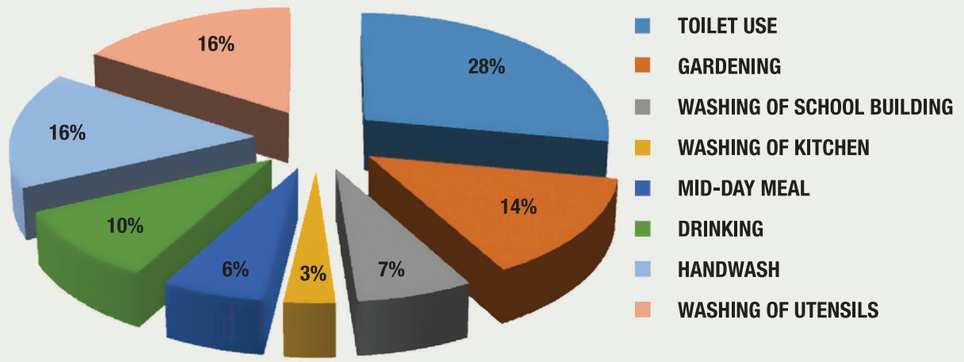
- Unpredictable rainfall: Rainfall is hard to predict and sometimes little or no rainfall can limit the supply of rainwater and the scope of harvesting it.
- Initial cost of installing the rainwater harvesting system is high.
- Regular Maintenance: Rainwater harvesting systems require regular maintenance as the stagnant water may breed mosquitoes, algae, insects and lizards.
- Certain types of roofs may release harmful chemicals. Also insects, dirt or animal droppings can harm plants if it is used for gardening purposes.
- Storage limits: The collection systems may not be equipped to hold and store all the rainwater considering the erratic rainfall pattern like heavy downpour in short span of time.

Comparison between Water extraction scenario with and without RWH

GROUND WATER USE	WITHOUT RWH (%)	WITH RWH (%)
Tube well	16	16
Over head tank	84	48
Rain Water	---	36

Water Demand for various purpose in Bali Nimna Buniyadi School

Annual Water Demand for Different Purpose (%)



Project Implementation Process:

PREPARATORY	✔ Inspection of the school and measurement of roof-top and collection pipe line ✔ Meeting with the School Head to discuss scope and modalities
PLANNING	✔ Development of technical plan ✔ Endorsement from the expert and finalization
IMPLEMENTATION	✔ Procurement of raw materials from the local market ✔ Install pipes and tank with distribution lines
WISE USE & CONSERVATION	✔ Awareness program on utility of the system and linkage with conservation

USE OF WATER	BEFORE PROJECT		AFTER PROJECT	
	SOURCE	DURATION	SOURCE	DURATION
Drinking water	Tubewell	12 Months	Tubewell	12 Months
Cooking of mid-day meal	Tubewell	12 Months	Tubewell	12 Months
Washing utensil	Ground water pumped to overhead tank	12 Months	Ground water pumped to overhead tank	12 Months
Washing of hand and mouth	Ground water pumped to overhead tank	12 Months	Ground water pumped to overhead tank	12 Months
Use in toilet	Bucket from tube well	12 Months	Overhead tank for rainwater (roof run-off + pond water)	9 Months
Gardening	Ground water pumped to overhead tank	12 Months	Overhead tank for rainwater (roof run-off + pond water)	9 Months
Washing of school building	Ground water pumped to overhead tank	12 Months	Overhead tank for rainwater (roof run-off + pond water)	9 Months

Rainwater harvesting potential in Sundarban

In Sundarban, the land of brackish water, there is a severe scarcity of fresh water. Fresh water is a priceless resource in this area that needs to be suitably conserved. In this respect, rain in Sundarban has a great potential, but unfortunately there is limited effort to harvest it. In this context, an initiative has been taken to demonstrate an ideal model for water conservation with the participation of the younger generation. This would provide inspiration to the locals and is going to have a huge impact on the tapestry of life in Sundarban.

Rain Water Harvesting: the project in a school

The schools in Sundarban generally depend on ground water extraction for drinking purposes and for arranging the mid-day meal. They use tube well or hand pump for this purpose. Some of the schools have installed solar driven water pumps to extract ground water and fill up overhead tanks. These tanks provide water to wash basins in common areas and kitchens. Most of the toilets have no direct water supply. Only buckets are provided to carry water from the common area. So proper hygiene cannot be maintained.

In the present project, a rain water harvesting model has been set up in a school in Sundarban (Bali Nimna Buniyadi School) where surface runoff on the top roof of the building is being collected with the help of PVC pipes and stored in two PVC tanks installed on the lower roof. At present nearly 3000 litres of rain water are being collected per day from the tanks of the school building in peak rainy season. The 2 PVC tanks with the capacity of 1500 litres each are being used to hold this water. This water is supplied directly to the student toilets. This ensures health and hygiene of the students. The water is also utilized in the kitchen, for gardening purposes and for washing the school building. An extra outlet pipe has been fixed to handle the overflowing of water from the tanks during prolonged rain. This overflowing water and open area runoff are being stored in a nearby pond (1430 sq m). Rainwater stored in pond is being utilized during dry months.

Objective:

- To conserve ground water resources
- To promote health, hygiene and proper sanitation among school students
- Use the water for cleaning the school building and in the kitchen and for minor horticulture projects
- Can be an additional source of water during the dry months
- To demonstrate water conservation model to the young generation
- To build awareness and integrate the water conservation program into the school curriculum

System setup for roof top rainwater harvesting:

Rainwater harvesting systems can range from being simple models to complex ones, from systems that can be installed with minimal skill, to automated systems that require advanced setup and sophisticated installation. The basic rainwater harvesting system is more of a plumbing job than technical, as all the outlets from the building terrace are connected through a pipe to an underground /above ground tank that stores water.

Systems are ideally sized to meet the water demand throughout the dry season, and it must be big enough to support daily water consumption. Specifically, the rainfall capturing area such as a building roof must be large enough to store adequate volume of water. The water storage tank size should be large enough to store the captured water.

In this case, an additional pipeline is set up to drain out overflowing water to a pond adjacent to the school building. This pond is receiving surface run off and storing the water throughout the year. Except for the lean period (approximately 4 months) this water is pumped out to fill up the overhead tank made for rain water storage and students get uninterrupted water supply in toilets and wash basin.