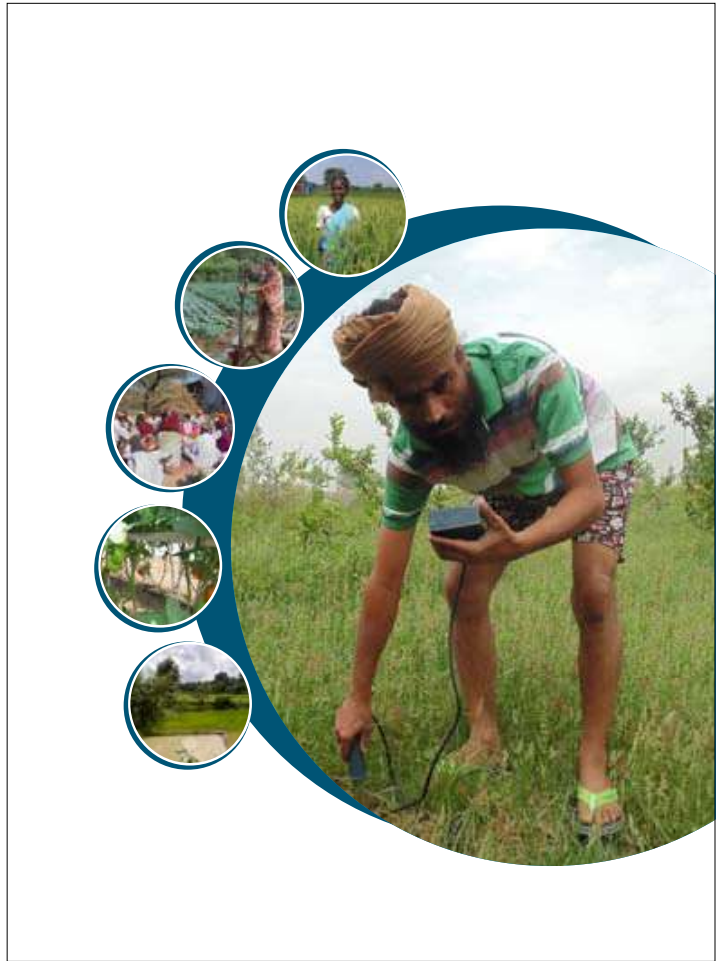




Compendium

Best Practices on Water and
Agricultural Sustainability





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Agricultural Sustainability

Centers for International Projects trust (CIPT)

The Centers for International Projects Trust (CIPT) is a non – profit organisation based in New Delhi and is India affiliate of Columbia Water Center, New York. CIPT works on developing and piloting new models for effective water and energy management across different regions in India. It works towards performing applied research in the areas of agriculture, water, climate change, energy and related socio – economic perspectives and provide rigorous research based knowledge as the foundation for various field based initiatives.

With its strong institutional mechanisms and innovative approach CIPT aims at holistically addressing the issues of water and agriculture in the country through different low-cost precision technologies, nexus modeling and extension methods.

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Roof rainwater harvesting for increasing access to potable water

A community managed system for rainwater harvesting in saline region of Haryana

BACKGROUND

Increased salinity is an important reason for deteriorating water quality. Salinity is caused by a relatively high concentration of dissolved salts in the water. Increased demand for groundwater has led to overexploitation and depletion of ground water tables. Depletion affects the flow (both direction and velocity) of groundwater, which may in turn cause polluted water from surrounding areas to flow into the freshwater aquifer. In coastal areas, it causes intrusion of sea water into the freshwater aquifer increasing groundwater salinity levels thus making it un-fit for drinking purposes.

Mewat district in Haryana, is one such area, badly affected by salinity. To address the intrusion of dissolved salts, this project aimed to develop and demonstrate a technology-based solution to create a localised source of freshwater in saline groundwater villages. The project duration was from August 2012 to August 2015.

STAKEHOLDERS

The project was funded by Department of Science and Technology (DST), Government of India. Beneficiaries of the intervention included students, teachers and other staff members of government schools.



APPROACH AND METHODOLOGY

The first phase of the project included an assessment of available water technologies and the development of a model of roof rainwater harvesting as a source of potable water. Based on the results of this assessment, an innovative roof rainwater harvesting system was developed and tested in the project area. Several factors specific to the region and local constraints led to the need to innovate. These included:

- High dependence on groundwater;
- Short rainy season of 31 days with a low average annual rainfall of 594 mm;
- Shallow groundwater table with high levels of salinity;
- Non-availability of reliable grid electrical supply;
- Inability to afford alternatives such as reverse osmosis; and,
- Difficulty in operation and maintenance of high-end technology.

Tapping rain potential

Rainwater is one of the primary sources of freshwater. Particularly in areas with saline groundwater it is the only source of potable water also but its availability is limited due to seasonality of rains. Due to this fact, roof rainwater harvesting emerged as the most preferred method during the preliminary assessment done as part of the project.

Existing water harvesting models have limitations such as high costs and spreading and mixing of fresh harvested

rainwater. Though roof rainwater harvesting (RWH) is widely acknowledged as an effective solution to address water scarcity, the need was felt for a model more suitable to saline groundwater areas. Unlike surface water sources or storage of harvested rainwater, the rainwater is stored in the aquifer under the ground. It is not subjected to loss due to evaporation. It is also not limited by storage tank capacity. This means that the harvested water can also provide an essential basis of water security for potable uses during low-rainfall years.

In the new model, depth of the recharge wells was increased to make them lower than the groundwater table. With it, a desired freshwater pocket is created by pushing away and replacing the existing saline groundwater. The harvested freshwater remain in a consolidated mass due to the pressure exerted by surrounding saline groundwater. The harvested water from this pocket can be extracted through a pump without the usual problem of mixing with surrounding saline groundwater. This model was tested in a government school in Untka village and in three government schools in Nagina and Nuh blocks of Mewat. The systems have been functional for over two years.





CASE STUDY: Provisioning for sweet water in schools

In Untka village, groundwater is highly saline, with total dissolved solids (TDS) at 5,980 mg/l. The government school in this village catered to 297 students without any source of water. Its daily requirement of water for drinking and midday meal cooking was estimated to be 750 liters and the total annual water demand is 150,000 liters for 200 working days per year.

In 2013, a roof rainwater harvesting system was put in place to recharge the aquifer with rain water using the model described. The financial resources given by the DST, Government of India, enabled setting up a RWH unit to capture rainwater over a roof area of 638 square meters. The average annual rainfall of 594 mm translated into an annual harvest of 3.2 lakh liters of water, considering a run off factor of 0.85.

Since July 2013, the school has used recharged water that is made safe for drinking by filtering through a bio sand filter so as to reduce the risk of biological contamination. The salinity of water pumped from the freshwater pool is below 100 mg/l (the permissible levels of TDS), and is made available year-round. The present water harvesting capacity surpassed the total water needs of the school.

RESULTS AND OUTCOMES

The major component of the intervention was the design, test, and demonstration of a viable RWH model for exploiting harvested rainwater. Some of the key direct impacts observed included:

- Reduced girl school dropout rate
- Improved sanitation and hygiene conditions in schools
- Regular cooking of midday meals

The model omits the need for construction of expensive storage structures. The cost involved in the construction, operation, and maintenance of this model is comparatively lesser than other methods of water treatment, such as reverse osmosis.

By helping to make rainwater potable, this model reduces the demand for transported freshwater from the already overstressed sources lying outside this saline area. It also saves the distribution losses,

energy and transportation costs, and their footprint on the environment.

Says Mohammad Musaraf, Untkaschool, Mewat. "Earlier, we were dependent on irregular and unclean tanker supply for drinking water. We used to go back home to drink water and not come back." Informs an excited Vajika Nazia, Malab school, Mewat, "We learned about a new scientific concept and water conservation model that works on our school premises."

Sustainability and scale up

The experience at Untka school and demonstrations proved the model to be highly affordable for replication. The model is appropriate for regions with saline groundwater, including semi-arid areas and coastal areas with seawater ingress. This model can also be adapted for deeper saline aquifers and seawater intrusion-affected areas.

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