



Rainwater Harvesting

... serves as a freshwater source in regions which are drying out

Definition and Objective

Rainwater harvesting (RWH) is the accumulation and storage of rainwater for later use. Possible uses include agricultural production in arid and semi-arid regions, domestic supply, and environmental measures, e.g. the refilling of aquifers.

RWH systems have been developed primarily in areas where rainfall is not sufficient to support crop production or where water sources were scarce, of poor quality or inaccessible e.g. due to very deep groundwater. Numerous historic examples of RWH exist throughout the world, particularly in Northern Africa, the Middle

East, Central Asia, and Latin America. Nowadays, RWH is often used as a tool to cope with climate change, more or less erratic rainfall, or extremely reduced surface water resources. RWH can also help to meet freshwater demands in regions which suffer from enhanced groundwater salinisation (caused by increased evaporation and less rainfall or by the intrusion of saltwater through rising sea levels). RWH can therefore be seen as a tool for resource diversification and is increasingly used in areas drying out due to climate change.

Types and Description

Technologies can be divided into two main areas: the in-situ and the ex-situ types of RWH. In essence, the in-situ technologies are soil management strategies which enhance rainfall infiltration and reduce the surface runoff. The ex-situ technologies are defined as systems which have separated catchment areas leading the water to the point of water storage. The most common ex-situ system is the rooftop rainwater collection.

Typically, the in-situ systems do not cover a distance of more than 5-10 m from the point of water intake to the point of infiltration into the storage medium, mostly the soil. Often, in-situ RWH primarily serves the recharge of soil water for producing crops and other vegetation and reducing the need for irrigation. In-situ RWH can also be used, e.g., for recharging shallow groundwater aquifers and/or supplying surface waters. Often, in-situ RWH is based on a range of soil conservation measures, such as terracing, pitting, and conservation tillage practices,

which are commonly implemented to counter soil erosion.

Ex-situ systems include catchment areas with usually low or little infiltration capacities like, e.g., rooftops, roads or pavements; yet also bits of ground or rocks are used. These catchment areas allow for a fairly easy collection of substantial amounts of water. This is then stored in wells, dams, ponds or cisterns and, when needed,

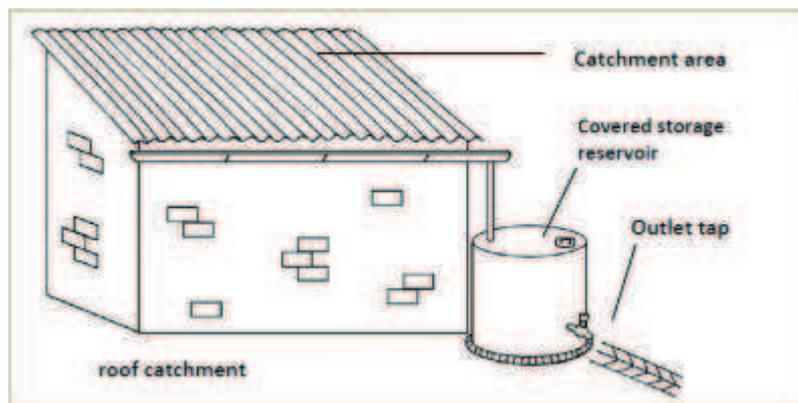
abstracted and distributed for irrigation or domestic, public and commercial uses.



RWH: Fetching water from a dry river bed in Mozambique (Chang, UNEP, SEI, 2009)

Issues to Consider

- ▲ First flush (first water of rainfall) must be separated to avoid drinking water contamination
- ▲ Prevention of microbial contamination
- ▲ Soil conditions as catchment area and/or storage
- ▲ Suitable storage medium, adapted to use
- ▲ Precipitation data of the area is required to calculate the needed catchment area and size of storage facilities
- ▲ Runoff structures in case of full storage



Schematic of a RWH system by UNEP IETC, 1998 (www.climatetechwiki.org)

Advantages

- ▲ Proven benefit with low environmental impact
- ▲ Low construction and running costs
- ▲ Easy to install and operate
- ▲ Usually readily available construction material
- ▲ Low-tech, flexible installations
- ▲ Less runoff of clean rainwater to wastewater treatment plants
- ▲ Decentralised water storage
- ▲ Reduction of soil erosion (in situ)
- ▲ Promotion of self-sufficiency and of diversification of agricultural production
- ▲ Additional freshwater resource
- ▲ Powerful tool to increase resilience towards climatic changes

Challenges

- ▲ Bridging dry periods while depending on an unreliable source and limited storage capacity
- ▲ Mitigating the depletion effect on water sources and ecosystem services (ex situ) with possible conflicts (downstream or within communities)
- ▲ Potential vector breeding habitat (e.g. for mosquitos)
- ▲ In communally owned systems, a RWH-committee has to be created in order to ensure maintenance
- ▲ Consideration of climate related risks (floods, winds)
- ▲ Subsidies may be required for poorer households
- ▲ Clear property rights needed

Published by:
Deutsche Gesellschaft für
internationale Zusammenarbeit (GIZ) GmbH

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn
T +49 61 96 79-1327
E water@giz.de
I www.giz.de

Author
IP Institut für Projektplanung GmbH
Martin Becher
E martin.becher@ip-consult.de
I www.ip-consult.de