RAINWATER HARVESTING

What is Rainwater Harvesting?

It is the principle of collecting and using precipitation (rainfall from a catchment's surface.

An old technology is gaining popularity in a new way. Rainwater harvesting is enjoying a renaissance of sorts in the world, but it traces its history to biblical times. Extensive rainwater harvesting apparatus existed 4000 years ago in the Palestine and Greece. In ancient Rome, residences were built with individual cisterns and paved courtyards to capture rainwater to augment water from city's aqueducts. As early as the third millennium BC, farming communities in Baluchistan and Kutch impounded rainwater and used it for irrigation dams.

Storage

Groundwater Reservoirs

Rooftop rainwater collected may be recharged to groundwater reservoir through:

- Abandoned dug well
- Abandoned/ running hand pump
- Recharge shaft
- Defunct bore well
- Trench/ pit with injection well

Small storages tank above ground level (suitable for individual houses)

A simple rooftop rainwater harvesting as practiced in some villages using split pipe or GI valley sheets or Bamboo directing the flow from rooftop to a small drum or plastic tank.

If there is a group of houses, the owners can collectively lead the rainwater into a subsurface tank situated in a common place.

Another simple method of storage is letting the rainwater into the exiting well through a filter media consisting of the following.

Layer 1: Layer of sand – fine to medium (150 to 300 mm)

Layer 2: Layer of gravel (200 mm)

Layer 3: Layer of medium pebbles bed (500 mm)

There are certain limitations in adopting storage method, in places where the monsoon period is only 3 to 4 months as we require a large quantity of storage tanks of bigger dimensions, and preservation of water in the tanks for longer period is also hazardous. Hence, we have to go in for recharging method.

Rooftop Rainwater Harvesting

The groundwater available in urban localities and Metropolis could not cope up with the ever increasing demand and results in the over-exploitation of groundwater with inadequate replenishment due to urbanization. The rainwater runs off into sea as the ground area available for percolation for recharging is meager/ insignificant. Hence the rooftop rainwater harvesting method is best suitable for conservation of rainwater and recharging the groundwater aquifer.

Runoff coefficient for various surfaces

Type of catchment	Coefficients (m sec^{-1})
Roof catchments	
Tiles	0.80 – 0.90
Corrugated metal sheets	0.70 – 0.80
Ground surface coverlings	
Concrete	0.60 – 0.80
Brick Pavements	0.50 – 0.60
Untreated ground catchments	
Soil on slopes less than 10 per cent	0.00 – 0.30
Rocky natural catchments	0.20 – 0.50

Under this method, the rain pouring on the top of the roof (whatever be the roof material) is drained thorough down pipes into a recharging pit (1 x 1 x 1 m) or 0.60 x 0.60 x 0.60 m made up of broken brick jelly for 0.60 m from the bottom of the top layer is filled with river sand for 0.40 m height of the pit covered by perforated precast RCC slab.

If the water source for the building is a bore well, the recharging pit is extended to at least 10 – 15 m depth by means of a tube well or 200 mm. Diameter filled with broken brick jelly and pebbles.

Rainwater harvesting for individual house of < 100 m^2 (*Recharging pit method*)

Pit Size: 1 x 1 x 1 m

S. No.	Description	Quantity	Rate	Amount
1.	Earthwork excavation for percolation pit	1 m^3	41	41
2.	Filling the pit with 40 mm size brick jelly	0.6 m^3	312.42	188
3.	Filling the pit top with river sand	0.4 m^3	326.92	131
4.	Perforated precast RCC slab 40 mm thick for covering the pit	1 m^3	175	175
5.	Connecting the drain pipe to the pit through 150 mm diameter PVC pipe including earth works, laying, joining and sand gravel packing	10 m	400	4000
6.	Unforeseen items			465
			Total	Rs. 5000

Rainwater harvesting for multi storied building of size 20 x 30 m

(*Recharging trench method*) Trench size: All round the building 1 x 1 x 1.5 m

S. No.	Description	Quantity	Rate	Amount
1.	Earthwork excavation for open trench	126	41	5766
2.	Filling the trench with brick jelly	84	312.42	26243
3.	Filling the trench with river sand	42	326.92	1373
4.	Provision of PVC pipe 150 mm diameter including bends and clamps	24 m	275	6600

5.	Filling with pebbles in the top layer of the trench	10 m	1500	15000
6.	Unforeseen items and petty supervision charges			8260
			Total	Rs. 75000

Recharge trench cum injection well

This technique is ideally suited for areas where permeable sandy horizons within 3 to 5 m below ground level and continuous up to the water level under unconfined conditions, by which copious water available can be easily recharged.

In this technique, 1 to 2 m, wide and 2 to 3 m, deep trench is excavated, the length of which depends on the site availability and volume of water to be handled. An injection well of 100 to 150 mm diameter is constructed, piercing through the layers of impermeable horizons to the potential aquifer reaching about 3 to 5 metres below water levels (1 to 10 m) from the bottom of the trenches. Depending upon the volume of water to be injected, the number of injection wells can be increased to enhance the recharging rate.

Benefits of rainwater harvesting

- Groundwater level is increased
- Recharges the well
- Reduces crack formation in walls and structures
- Dilutes the salt content of water in the wells *i.e.* improves the groundwater quality
- Improves moisture content in the soil
- Aids the growth of plants and trees
- Seawater intrusion into the land is arrested
- Reduces the soil erosion
- Improves the groundwater quality