

UNIT 5

Rain water harvesting – meaning, purpose, Benefits of using rainwater, components of rain water harvesting system, Methods-surface runoff and roof top rain water harvesting.

INTRODUCTION

Water is a precious, essential and an abiotic component of the ecosystem. Today we all are heading toward the scarcity of water, and this is mainly because of the lack of water conservation and pollution of water bodies. So, let us not waste a drop of water and start conserving water for further use.

With rapid climatic changes, increase in global temperature and population growth, there is a scarcity of potable water in many countries across the world.

The gradual falling of water levels, are a cause of serious concern not only because it leads to shortage of usable water but also because in coastal areas it causes imbalance in salinity of the area.

Rapid industrialization and disposing chemical waste into water-bodies leads to pollution of rivers, lake and water-bodies. This is a global problem and needs a speedy solution. The supply of fresh water in this planet cannot be increased. So an alternative method must be sought for. One such method is harvesting rainwater.

Rainwater harvesting is an easy and economical way to deal with this crisis. As men are becoming environment responsible, rain water harvesting is gaining popularity leading to eco-conservation and constructive use of natural resource. Falling water tables are widespread and most people in urban areas are dependent on bottled water which is neither cost-effective nor dependable.

The possibility of pollution cannot be completely ruled out. The question of water security is at present a major issue in many parts of the world. One way to deal with this crisis is to adopt rainwater harvesting.

MEANING

Rainwater harvesting is the simple process or technology used to conserve Rainwater by collecting, storing, conveying and purifying of Rainwater that runs off from rooftops, parks, roads, open grounds, etc. for later use.

Rainwater harvesting refers to a technique of collection or storage or harvest of rainwater into natural reservoirs or tanks for future use rather than allowing it to run off.

In other words, rainwater harvesting is defined as the simple process or method or technology which is used to conserve rainwater by the process of storing, collecting, conveying and purifying of rainwater that runs-off from various surfaces for later use.

PURPOSE

1. Rainwater is a safe form of water because it is not contaminated with chemicals and industrial refuse. This is the best way to make freshwater available.
2. Houses that have rainwater harvesting are self- sufficient. They will not need to buy water and this makes the process economically viable as well.
3. If rainwater is stored properly, we will not need to exploit natural resources like groundwater and rivers.
4. Rainwater harvesting will also help manage water crisis and avoid flood and droughts.
5. With rainwater being used and reused, we will be able to better manage the underground water table. This will avoid water crisis in the future.

BENEFITS OF USING RAINWATER

BENEFITS/ADVANTAGES OF RAINWATER HARVESTING

Owing to the current conditions, it is not long before the price and availability of water would be more valuable and precious. Due to this, rainwater harvesting has become essential and important due to the following reason:-

The benefits of rainwater harvesting system are listed below.

1. Less cost.
2. Helps in reducing the water bill. It helps you and lowering your utility bills by collecting and harvesting rainwater and storing it in the tanks by reducing dependency on municipal water supply.
3. Decreases the demand for water.
4. Reduces the need for imported water.
5. Promotes both water and energy conservation.
6. Improves the quality and quantity of groundwater.
7. Does not require a filtration system for landscape irrigation.
8. It reduces storm water runoff, flooding, and pollution of surface water with fertilizers, pesticides, metals and other sediments.
9. It is an excellent source of water for landscape irrigation with no chemicals and dissolved salts and free from all minerals.
10. Rainwater harvesting to recharge the groundwater level is better for the environment and the planet.
11. It will ensure the availability of water whenever you need it regardless of any adverse situations like supply cut-off or shortage of water.
12. Rainwater has been the source of growth for the environment and ecosystem for millions of years. Therefore, it is better for gardening as well as it is relatively pure and free from toxin.
13. The collected rainwater reduces flooding and helps in decreasing soil erosion by reducing the chances of run-off during the times of heavy rainfall.

14. Setting up and installing a rainwater harvesting system is very easy and cost-effective. Moreover, it allows quick access to the stored water once collected.

15. It serves as a sustainable and eco-friendly practice which reduces the carbon footprint and promotes environmental-friendly method.

COMPONENTS OF RAINWATER HARVESTING

In the rainwater harvesting system, there are various components that are used at various stages of success transporting rainwater, filtration, and storage.

A rainwater harvesting system comprises components of various stages such as transporting rainwater through pipes or drains, filtration, and storage in tanks for reuse or recharge. The common components of a rainwater harvesting system involved in these stages are illustrated here.

The components involved in a rainwater harvesting system are as follows:-

1. Catchments
2. Coarse mesh
3. Gutters
4. Conduits
5. First flush
6. Filters
7. Storage tanks and
8. Recharge structures

CATCHMENTS

The area which directly receives rainfall and provides the water to the system further is the catchment. A catchment can be a paved area like a courtyard or terrace of a house or building.

It can also be an area like an open ground or a lawn. For rainwater harvesting, often roofs or areas made of reinforced cement concrete, corrugated sheets, or galvanized iron are used.

COARSE MESH

The coarse mesh is a net that prevents the passage of big chunks of debris or other material from the catchment area to the further system.

This ensures that any visible impurities are prevented from getting into the system and contaminating the water.

GUTTERS

Gutters are the channels which are placed all around the edge of the catchment or sloping roof. It collects and transports rainwater to the storage unit or tank. They can be of different shapes like semi-circular, rectangular, etc. They can be made using different materials like:-

1. Locally available material such as plain galvanized iron sheets
2. Cutting PVC material into desired shapes
3. Bamboo or betel trunks

The size of these channels depends on the flow during the highest recorded intensity or amount of rain. It is always best to over-size them to support heavy rainfall and water flow. This is because the amount or intensity of rainfall cannot be predicted accurately.

However, they can fall off when loaded with water. They need to be supported or welded into the roof to ensure a smooth flow and efficient system.

CONDUITS

The drains or pipelines which have the work to carry rainwater from the catchment or rooftop area to the harvesting system are conduits. They can be made of any commonly available material like galvanized iron or polyvinyl chloride. The diameter of pipe installed depends on the intensity of rainfall.

FIRST-FLUSH

It is a valve that ensures that the water from the first rainfall does not enter the system and is flushed off. This is done as the water from the first rain has a relatively larger amount of pollutants.

FILTERS

Filters are used to eradicate the pollutants available in water collected from the catchment area. The filter unit is a chamber that has filtering elements which are coarse sand, gravel, fibre, and charcoal.

It removes the debris and dirt from the water before it enters the storage unit or recharge structure.

There are two most prominently types of filters used which are:-

- **Sand Filter** which has sand and gravel placed in layers for filtration purposes.
- **Charcoal Filter** which has layers of gravel, sand, and charcoal. Charcoal is added to provide additional filtration of the water.

STORAGE TANKS

The tanks or units where the rainwater is ultimately stored are the storage tanks or units. These can be of various shapes, materials and sizes depending upon the requirement.

The shapes used are rectangular, square and cylindrical. The construction materials often used are plastic, reinforced cement concrete, metal sheets etc.

Also, they can be placed depending on space availability. Also, it requires maintenance measures to be ensured beforehand.

RECHARGE STRUCTURES

Rainwater Harvested can also be used for charging the groundwater aquifers through suitable structures like dug wells, borewells, recharge trenches and recharge pits.

Various recharge structures are possible – some which promote the percolation of water through soil strata at shallower depth (e.g., recharge trenches, permeable

pavements) whereas others conduct water to greater depths from where it joins the groundwater (e.g. recharge wells).

At many locations, existing structures like wells, pits and tanks can be modified as recharge structures, eliminating the need to construct any fresh structures.

Some of the few commonly used recharging methods are recharging of dug wells and abandoned tube wells, Settlement tank, Recharging of service tube wells, Recharge pits, Soakaways /Percolation pit , Recharge troughs, Recharge trenches, Modified injection well.

METHODS OF RAINWATER HARVESTING

1. Surface runoff and
2. Roof top rain water harvesting.

Surface runoff Harvesting

1. Surface run off harvesting is most suitable in urban areas. Here rain water flows away as surface run off and can be stored for future use.
2. Surface runoff rain water in ponds, tanks and reservoirs built for this purpose. This can provide water for farming, for cattle and also for general domestic use.
3. Without sufficient water health and hygiene are severely affected. This adds to the environmental pollution.
4. Surface water can be stored by redirecting the flow of small creeks and streams into reservoirs on the surface or underground.

Rooftop Rainwater Harvesting

1. Roof top water harvesting can be done in individual homes or in schools.
2. For this the first requirement is to intercept the rainwater to flow towards a definite direction
3. The water should reach a bucket or a tank through pipes made from wood or bamboo. In urban areas pvc pipes can be used.

4. The rain water can be directly collected by keeping a bucket or container beneath the roof.
5. The first flow of rain water will usually carry with it dust particles, leaves, insects and bird droppings. So it is best to use a detachable downpipe to divert the first rain water.
6. Recharge pits can be constructed to hold rain water. These can be of any shape or size, depending upon the amount of rain the area receives. These pits need to be filled with , boulders, gravels and coarse sand, which will act as a filter for the impurities that are carried along with the first flow of water.
7. Roof top rain water can be harvested through existing tube wells. In areas where the aquifer that holds the ground water has dried up, tube wells source deeper into the soil for water.
8. Roof top rain water harvesting can be done through these dried up tube wells to rehydrate the dried subsoil water level.

CONCLUSION

Rainwater harvesting is an ancient practice that stills holds many benefits and value for our modern times. It provides an alternative water source while allowing you to control and operate the system as you see fit. Rainwater collection can also teach valuable lessons in water conservation which is becoming more important as our freshwater resources get stretched further and further.