Availability and Management of Groundwater Resources

Prof. Prasoon Kumar Singh
Department of Civil Engineering
Indian Institute of Technology (ISM) - Dhanbad

Lecture - 52
Rainwater Harvesting and Artificial Groundwater Recharge (Contd.)

Welcome to you all in the part 3 of the module 11 rainwater water harvesting and artificial groundwater recharge. So, in the last 2 different part of this module we have learnt what is rainwater harvesting what is the roof top rainwater harvesting and what is the need of the rainwater harvesting?

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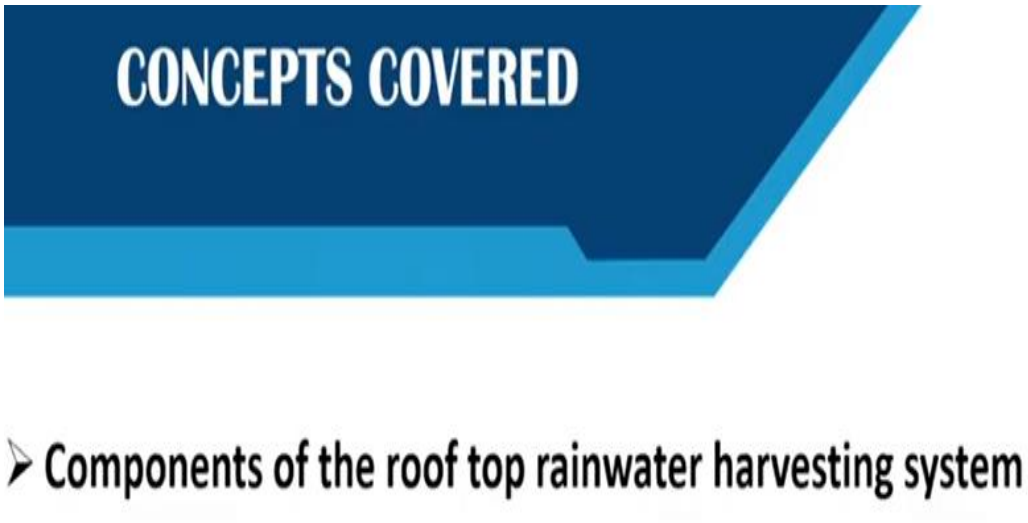

Now in this module in this module in the part 3 now I will discuss the components of the roof top rainwater harvesting system. So we have seen that the rainwater which is generally remains in the monsoonal season if we collect the volume of the rain in the roof area and if it is stored in some specific place. So in that way it is used in the storage rainwater is used or the stored rainwater is used during the different applications as well as in another term it can also recharge the underlying aquifers. So now I will discuss the components of the roof top rainwater harvesting system.

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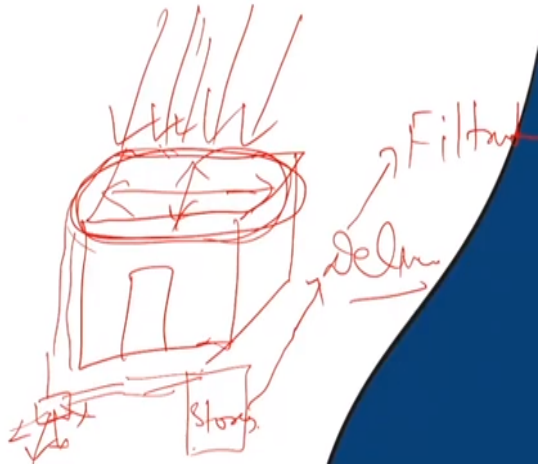
Components of the roof top Rainwater harvesting system.

1- Catchment area
2- Transportation
3- First flush
4- Storage system
5- Delivery system
6- Filtration system



See the component of the rainwater harvesting system is basically of 6 different units. The first is the catchment area, second is the transportation, third is the first flush, fourth is the storage system, fifth is the delivery system and sixth is the filteration system. So suppose this is the roof area of any house. So the point is that this total area is the roof top area and in the roof top area if the rain will fall it will stored first at the roof top area within the roof top area.

So in this area the roof top area the room will so this further rain drops for the rain drops this will become the catchment area. So this will become the catchment area. Now this water collected rain water on the roof top will be just circulated to some place where some of the impurities can be removed out. So in this way then after these this water will move to a place generally the storage space and then it is passed to the area that is the delivery wherever it is required after certain filtaration.

So this step we will see by knowing about the different components from starting from the catchment area, transportation area, first flush storage system delivery system and filtaration system. Now one by one we will discuss the things.

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1. Catchment area

The surface that receives rainfall directly is the catchment of rainwater harvesting system.
It may be terrace, courtyard, or paved or unpaved open ground Catchment area.

So this is the catchment area the surface area which receives rainfall directly during the monsoonal season the rainfall directly on the roof surface. It is the catchment of area for the rainwater just it may be terrace, may be the courtyyard or paved or unpaved open ground catchment area. So whatever it may be something terrace some courtyard or paved or unpaved open ground area. Here you can see the river railway just falling on the roof top and there from there some mechanism it is storing in well.

So in this way it is also recharging the groundwater of the area. In this diagram if you will see here also the roof top area is here through this PVC pipe the water is stored at some place. Here some first class and circular technique we are being applied and then the pure water is just received and this is the storage area. So what we have seen in the catchment area generally the rainwater stores and then it moves ahead for the different processing.

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2. Transportation

- Rainwater from rooftop should be carried through down take water pipes or drains to storage/harvesting system.
- Water pipes should be UV resistant (ISI HDPE/PVC pipes) of required capacity.

So second is the transportation. So when the rainwater will collect at roof top now rainwater from the roof top is carried through down carried down through down take water pipes or drains to storage harvesting system to store the water to harvest the water at some specific point. So rain water which is being collected on the roof top is now stored at some place through some water pipes or drains. So water pipes should be UV resistant. Generally it remains of ISI mark HDPE/ PVC pipes of require capacity.

So volume of rainwater accumulating in the roof top can be calculated. So through this we can also analyze what should be the dia of the PVC pipes through which we are going to send the roof top rainwater. So this is the component this component is important and you can see in the previous pipe is just coming from the roof top and it is joining and it is just coming and joining through the your this tank.

So this is the brief about the transportation system here also you can see the collection. This is the roof top collection area. The collection areas or through the pipe or then it is coming and storing in this bucket or drum line structure. So this is the component of transportation system

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3. First Flush

- First flush is a device used to flush off the water received in first shower.
- The first shower of rains needs to be flushed-off to avoid contaminating storable/rechargeable water by the probable contaminants of the atmosphere and the catchment roof.
- It will also help in cleaning of silt and other material deposited on roof during dry seasons Provisions of first rain separator should be made at outlet of each drainpipe.

4.Storage System

All collected rain water are store in tank or barrels used

Now first flush is a device which is used to flush off the water received in first shower. So first shower when the rain starts the first rain drop may contain certain impurities with it. So this component is being fixed or remaining fixed in the rainwater harvesting system. Because this is just its sends back the contaminants which are coming through the first shower. First shower of the rain should be flushed off.

Because to avoid the contaminating storable or rechargeable water by the probable contaminants of the atmosphere and the catchment roof. So the contaminants may be added from that atmosphere itself or from contaminants may be from the roof top and through the roof top into the certain pipes orders it resists to a place where first flush machines are being installed. So that the impurities can be just kept out from the water.

So the first flush also help in cleaning of silt and other material. It also help in silt material and other material deposited on roof during the dry seasons. So the through the first flush the silt can also be removed. This silt generally removed present on the roof top and from the roof top this silt is coming along with the rain to the storage area. So before the water is reaching the storage area. This water should be clean and it is cleaned by the first flush only.

So provisions of the first rain separator should be made at outlet of each drainpipe. So the outlet of drainpipe just makes a first range separator first flush mechanism. So that the impurities can be taken out from the system or out from the rainfall. After this so first was the roof top catchment

area then the drain transportation system or pipe transportation system and third is the first flush. First flush through which the contaminants or impurities or even state can be removed and then the rainwater stores certain system.

So this storoge system is collection of rainwater in the tank or barrels. So now this water is stored in tanks or barrels. Because now the rainwater is not having any sort of impurity also why because in during the first flush stage already the contaminants the rechargeable contaminants rechargeable water by the probable contaminants of the atmosphere or by the contaminants of the catchment rule.

All can be removed during the first flush and thereafter even the silt is also removed in the first flush and thereafter the rain or rainwater which are just removed your impurities is collecting certain tanks or barrels. So this water is collecting certain tanks or barrels.

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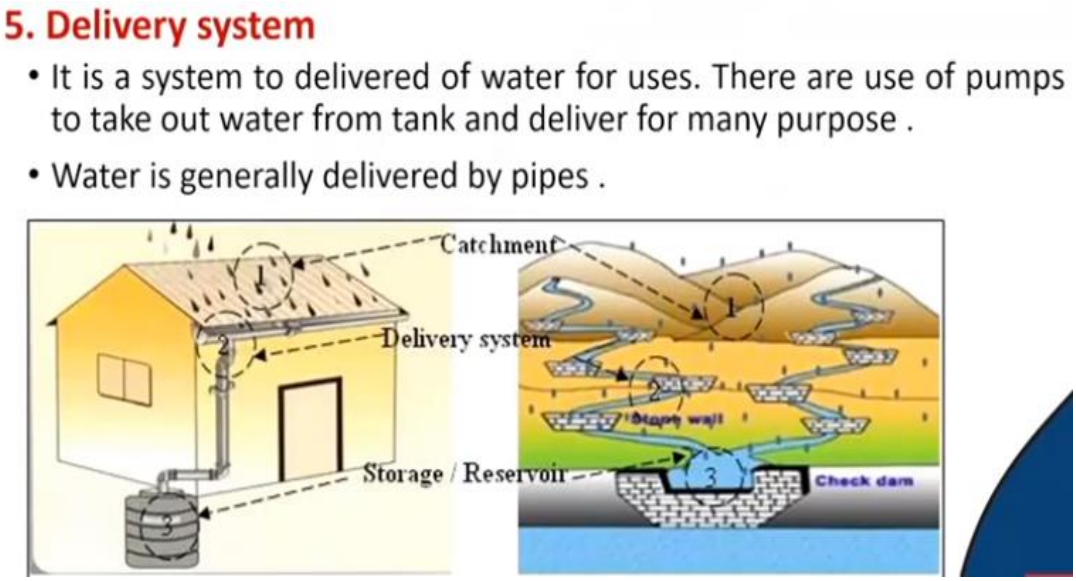

Now after this storage system now next system is the delivery system. It is the system to deliver the water for uses. So here also you can see that catchment area the room the rainwater stores here and from them this rainwater through the transportation system it is stored in the storage area system. For different uses generally a pump is being used. So that this pump can just send the water from this one and sends for different purposes it is delivered for different purposes.

So delivery system is a system to delivery of water for different uses. There are use of pump to take out water from tank and deliver for many purpose. Water is generally delivered by pipes. So this water rain water is delivered for different purpose through pipes through pipes only though this water can be moved from one place to another place and then it can be stored for different applications and different purposes.

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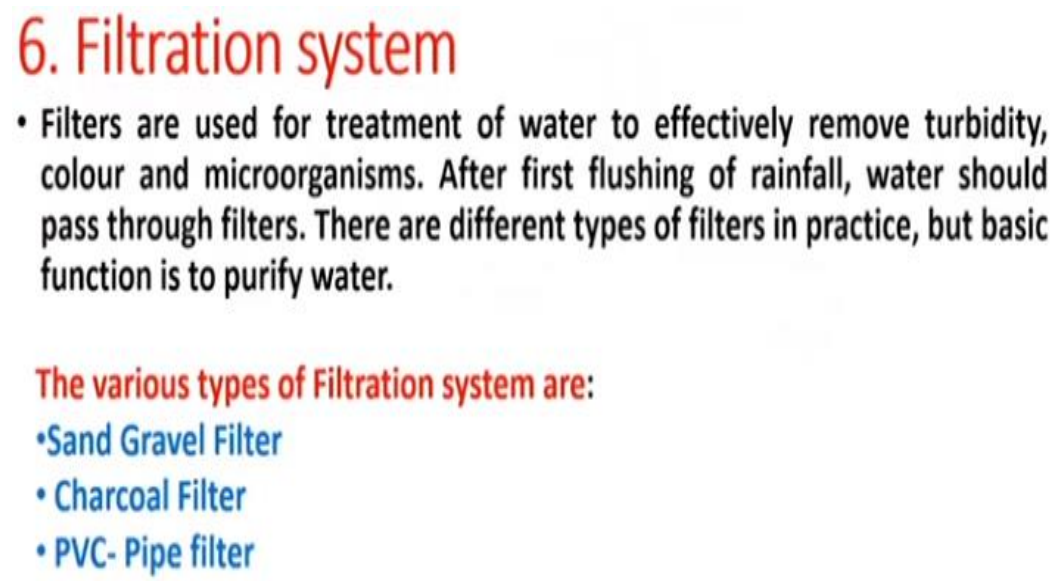

Now the next system after this is the filtration system. So different filters are used for treatment for water to effectively remove turbidity, colour and microorganisms etc. so different filter treatment are used for the treatment of turbidity colour microorganisms after first flushing of rainfall what we have seen after in the last slide. After in the first flushing of rainfall water should pass through the filters. It should pass through the filters only. There are different types of filters in practice, but basic function to purify water.

The various types of filtration system are the first is the sand gravel filter, second is the charcoal filter and third is the PVC-pipe filter. So filtration system is a important system for just filtering the rain water. Because certain other impurities of the atmosphere or at the roof top can be removed during the first flushing. But after that some turbidity remains their colour remains their microorganisms remains there which can only taken out from the filtration system only.

So few types of filters are available and these filters performs the function for purifying the rain water. These various types of filters are sand gravel filter, charcoal filter and PVC-pipe filter.

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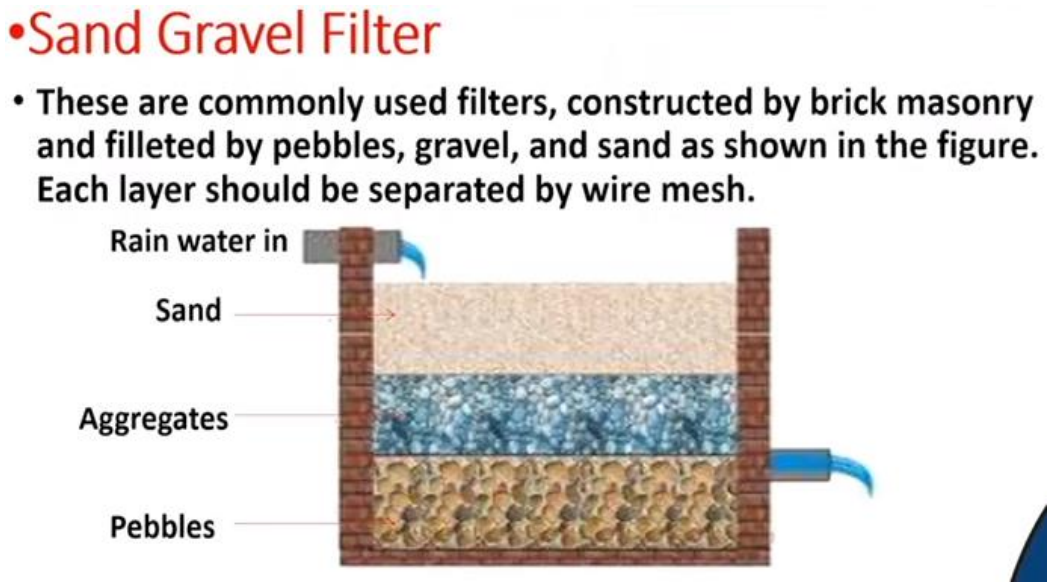

Now sand gravel filter these are commonly used filter, very commonly used filters, constructed by brick masonry and filleted by pebbles, gravel, and sand as shown in the figure. So now this is first gravel filters first filter is the sand gravel filter very commonly used filters, constructed by brick masonry you can see, these are constructed brick, this portion is considerably and pebbles, gravel, and sand are generally filled within it.

So this type of filter is filled up by pebbles or gravels or sand you can see here all are remaining here only. Each layer should be separated by wire mesh. So each layer 3 different layers are clearly shown here. It should be separated by some wire mesh. Some wire mesh should be remains at this place, this place also. Because this is the layer and this place also this should be the wire mesh. So the different layers sand and gravel, pebble remains separated by wire mesh between each other. So in this way this filter is composed of through which the water is passed.

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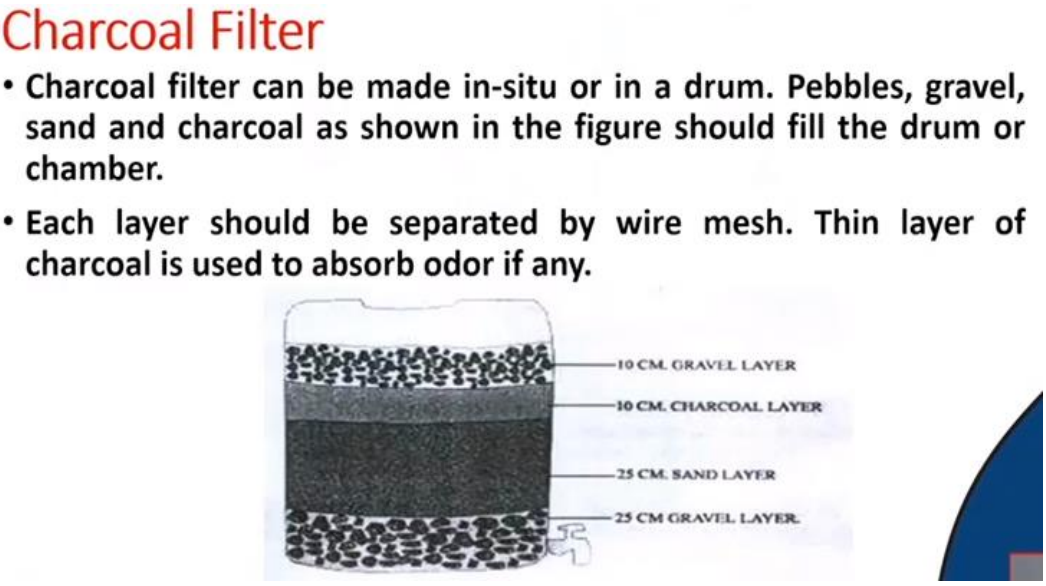

Now second filter is the charcoal filter. Charcoal filter can be made in-situ or in a drum. So this can be constructed in-situ or in drum also. Here pebbles, gravel, sand and charcoal can we kept you can see here also the thickness 10 centimeter to 25 centimeter then 25 it was 25 centimeters. So in this way assuming the different types thickness this the different types of pebbles, gravel sand and charcoal are just assembled at either in-situ or in a certain drum area certain area certain your specific your location.

Each layer should be separate by wire mesh. So here also just like the previous sand viewer filter. Here also each layer is separated by wire mesh. The thin layer of the charcoal is used to absorb odor if any. So if odor is remaining with the rain water. So in that case thin layer of charcoal is generally used to absorb the odor.

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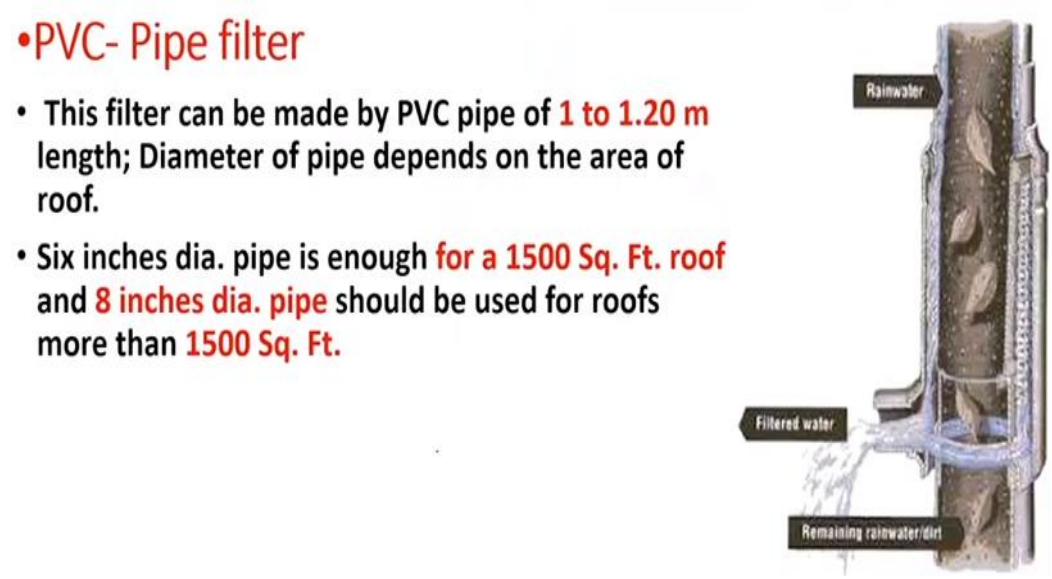

Now next filter is the PVC filter. PVC pipe filter this filter can be made by PVC pipe. This type of filter can be made by PVC pipe of 1 to 20 meter length. So the PVC pipe of 1 to 20 meter 1.20 meter length. Generate this type of filter can be assembled diameter of pipe depends on the area of the roof. So it depends on the roof area. So this filters generally remains of 1 to 1.20 meter length remains 6 inches dry pipe is enough for a 1500 square feet roof top area and 8 inches their pipe is enough for roof area of more than 1500 square feet .

So for a 1500 square feet roof top 6 inches dia-pipe is sufficient enough. But for more than 15 feet 1500 square feet area roof top area the 8 inches that pipe is required for the separation of the impurities. So these is the different types of filters which is generally used in the case of real water harvesting system.

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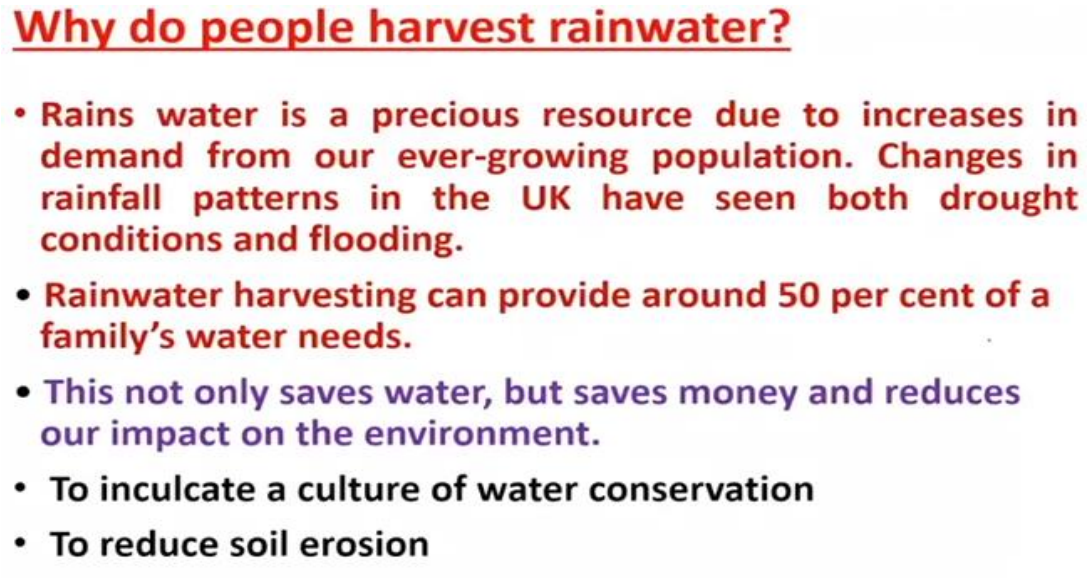

Now why do people harvest rainwater? This is the question generally what the need? So need we have discussed very well rainwater is a previous resource due to increases in demand from our ever-growing population. Changes in rainfall patterns in the UK have seen both drought conditions and flooding. So I have not mentioned you are not in India because India is also every place on the globe changes in rainfall patterns will bring drought conditions or flooding conditions.

So rainwater harvesting can provide around 50% of a family's water needs. So if you are able to collect the rainwater at the specific duration then definitely you can take you can cover the 50% water needs of a family. This not only saves water, this rainwater harvesting system or root over in our system not only saves the water but saves money and reduces impact on the environment. So inculcate a culture of water conservation aspects definitely a roof top rainwater harvesting system is a better one.

Is a better option on although rainwater is collected on the roof top but it is stored somewhere from where it can be utilized because this storage of rainwater is now filtered already. So this is safe for users also and this rainwater harvesting system also in own way or other reducing the soil pollution of the area. Because if there will be collection system there will be catchment system then the roof top rainwater will collect there.

But if the rain will fall directly on the land surface what will happen? We may get the problem of the soil erosion. So this is better mode for just conservation of the rain water and this rain water

may be used after purities removed or some contaminants removed may be used for the specific purposes. Or for we can keep it in some storage good storage system and during the need we can utilize it. So this is all about the different components and about your rainwater harvesting system thank you very much to all.