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Rainwater Harvesting Approaches

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Abstract

Water is one of the most treasured resources which are of paramount importance to biotic environment. Rainfall occupies the lion's share of water source and it has significantly declined over past few years due to drastic changes in the weather pattern. Rainfall pattern and occurrence has become totally unpredictable. In this scenario, it has become a bounden duty to conserve the water at the instant of reach and to store / harvest the water for future use. Depending upon the utilization of harvesting water, the structure has to be designed. Factors like, annual average rainfall, soil properties and cultivation practices, should be considered before constructing a structure. The construction of structure should be at the place of utilization and versatile. The harvested water can be later utilized for the agricultural, domestic and industrial purpose depending on the quality and quantity of water.

Introduction

In India, agriculture lands which are unirrigated depend wholly on monsoon for crop cultivation. This rainfed agriculture practice has been denied due to the erratic rainfall and the situation can be overcome by in-situ moisture conservation practices. Modification of land slope by the adoption of practices like land leveling, ridges and furrows, tied-ridges, broad bed furrows and compartmental bunding in the rainfed areas serves as the resource conservation.

• *Ridges and furrows* formed for irrigation purpose conserves moisture under rainfed condition. It also increases rain water use efficiency and yield of rainfed crops.

• *Tied ridges* are another type of tillage practices in which the ridges are tied in short intervals to form rectangular basin which facilitates increase in infiltration rate of soils and conserves soil moisture.

• *Broad bed furrows* grows crop in bed and collects rainwater in furrows that prevents soil erosion and provides proper drainage during heavy rainfall season.

• *Compartmental bunding* divides entire field into small compartments which conserve rainwater *in-situ* and reduces soil erosion.

Apart from tillage practices, soil conditioning through organic conditioners will be an alternative to overcome the moisture conservation problems faced with land configuration measures which would also retain the moisture for the longer period of time. It modifies the physio-chemical properties of the soil resulting in high water holding capacity, nutrient efficiency and mainly as a drought resilient mechanism in case of intermittent dry spells at critical stages of crop growth. Even organic mulching regulates soil temperature, conserves soil moisture and maintains soil health.

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Integrated Farming

Water resource management plays a vital role in farming sector and its development. Construction of farm pond satisfies the needs in which water can be collected and stored for off season consumption and supplementary needs. In agriculture fields, proper drainage channels with gentle slope can be provided to collect the runoff during the excess rainfall which can be diverted to the farm pond and in the period of dry spells, without waiting for the downpour water from the pond can be utilized for irrigation purpose and number of crops can be cultivated in a year. Farm pond can be economically exploited by promoting the fish culture which in addition maintains ponds free from parasites and algae. Along with that water from the pond can be used for livestock growth and domestic purpose. Farm ponds can also be used for recreational activities.

Groundwater Recharge

Groundwater is being exploited unscrupulously over a period of time since access to surface water is limited. In order to satisfy the supply demand ratio, there should be construction of harvesting and artificial / induced recharge structures in the over exploited areas (Manikandan et al., 2011). Water flow below the ground surface is possible only through the infiltration. When the soil is saturated for the prolonged period there will be connectivity between the ground surface and underlying aquifer. Some of those structures for recharging ground water are:

Percolation ponds are constructed in highly permeable soils to harvest surface runoff which is allowed to percolate and recharge the water table aquifer. By studying the hydro geological properties of the site, a percolation pond should be designed to ensure maximum consumption, life span and optimum recharge to groundwater. Soil erosion and siltation should be monitored regularly in the catchment area to maintain the percolation efficiency and capacity of the pond (Figure 1).

Figure 1: Percolation Pond

Check dams are temporary or permanent structures which are constructed in the lower reaches of the river/ channel preventing erosion and reducing the runoff into the sea. If there is water spread in check dams for longer period, it enhances the infiltration rate if the soil is permeable which proportionally recharge the aquifer.

Recharge pits are excavated in the poor permeable strata where the recharge through flooding does not work. Pits with larger cross-sectional area penetrate deep as well as increase the lateral hydraulic conductivity in the soil. Similarly, *recharge shafts* are used in the recharge area with minimum cross-section where the shaft is induced vertically without contact with the water table and this method is more efficient and cost effective one.

Roof Top Rain Water Harvesting

Roof top rain water harvesting techniques which can be practised in the residence, institutions and industries for capturing the rain water to use in the site itself or to recharge ground water. Proper filter should be provided in collecting area to avoid debris reaching the storage tank. The water can be stored in tanks can be pumped for household purpose like flushing toilets and kitchen use. The ground water recharge can be done by providing shafts (Manikandan et al., 2011).

Conclusion

Once the natural resources are degraded, it will take years to regain its originality. If we take the responsibility in conserving the delimiting water resource, the rain water can be harvested efficiently. To avoid facing these serious issues the resources can be efficiently conserved to raise the friendly environment with rich resources.

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