Journal Home: www.bioticainternational.com

Popular Article

Article: RT610

Biotica Research Today

Vol 3:5 406/408 2021

Accelerated Recharge Techniques

G. Thiyagarajan[1*], A. Raviraj[2] and S. Panneerselvam[1]

[1]Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu (641 003), India

[2]Dept. of Irrigation and Drainage Engineering, AEC&RI, Tamil Nadu Agricultural University, Kumulur, Tamil Nadu (621 712), India

Open Access

Corresponding Author

G. Thiyagarajan

e-mail: thiyagu@tnau.ac.in

Keywords

Abandoned well recharge, Percolation Pond, Recharge borewell, Recharge shaft

Article History

Received in 29th May 2021

Received in revised form 29th May 2021

Accepted in final form 30th May 2021

E-mail: bioticapublications@gmail.com

How to cite this article?

Thiyagarajan *et al.*, 2021. Accelerated Recharge Techniques. Biotica Research Today 3(5): 406-408.

Abstract

Alarming levels of groundwater abstraction has resulted in the declining of water table in many parts of the state. The general measure to sustain the groundwater depletion is the construction of percolation ponds. But, the effectiveness of percolation ponds in recharging the aquifers are in question due to the siltation occurring in due course of time and associated costs of renovation. The water balance studies revealed that sedimentation reduced the percolation pond capacity by 7% every year and 32% of ponded water goes as evaporation loss. Hence, it is recommended to adopt the accelerated groundwater recharge techniques in hard rock area to increase the rate of recharge and also to reduce the evaporation losses.

Introduction

Tamil Nadu is an agrarian state with 38 districts and 1129 firkas. The State is characterized by diverse climatic, physiographic and hydro geologic conditions with 73% of the area is underlain by hard rock formations and 27% occupied by sedimentary formations. About 95% of the surface water being tapped since late sixties, groundwater resource is, therefore the only alternative source for further development. The groundwater development in the state is more than 80%. As per the latest categorization, it was observed that out of the total firkas of 1129 in the State, about 374 are in the over exploited category, 48 firkas in the critical category, 235 firkas in the semi critical category, 437 firkas in the safe category and 35 firkas in the saline category. The groundwater recharge in the hard rock formations is very limited and restricted to the fissures and cracks and hence artificial recharge of groundwater through accelerated techniques is essential to sustain the groundwater table (Ravi *et al.,* 2008).

Recharge Shaft in Percolation Pond

Artificial recharge through recharge shaft in percolation pond was taken up by way of allowing the runoff water to pass through silt detention tank, water collection tank cum treatment chamber and shaft with filtering chamber. Slotted PVC pipe was erected for easy recharging. The recharge shaft in percolation pond is presented in figure 1 and 2.

Recharge Bore Well

Artificial recharge through bore wells has been attempted in India only during the last decade. The recharge bore wells directly feed depleted aquifers with fresh water from ground surface. The recharge through this technique is fast and negligible evaporation losses.

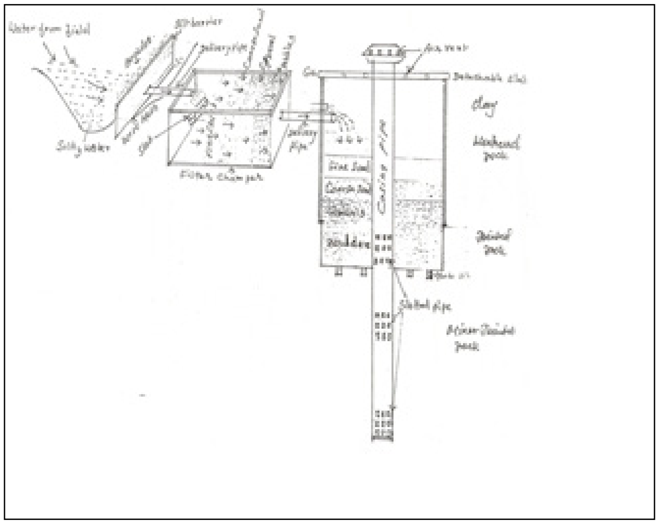

Figure 1: Schematic diagram of recharge shaft in percolation pond

Figure 2: Recharge shaft in percolation pond

Table 1: Technical specifications of recharge shaft in percolation pond

Sl. No.	Particulars	Specifications
1.	Silt detention tank	Pit of size 30 m × 30 m × 1 m
2.	Filtering chamber before shaft	5 × 3 × 2 m filled with boulders, gravels, coarse sand and fine sand separated by grill and mesh
3.	Recharge shaft	6.5" diameter to depth of 100 m
4.	Filtering chamber surround the shaft	Circular pit of 5 m diameter and 4.5 m depth around the shaft filled with filtering media
5.	Slotted PVC casing pipe	Diameter = 6.5'', length = 12 m

Artificial recharge through recharge bore well was taken up by way of allowing the runoff water to pass through bore well with filtering chamber. Slotted PVC pipe was erected for easy recharging (Figure 3).

Figure 3: Recharge bore well

Table 2: Technical specifications of recharge bore well

Sl. No.	Particulars	Specifications
1.	Depth of bore well	100 m (based on geological formation
2.	Size of bore well	6.5"
3.	Slotted casing pipe	Diameter = 6.5", Length = 6 to 12 m (Based on geological formation)
4.	Filter pit	Square = 3 × 3 × 1.5 m or Circular = 1.2 m diameter, 1.5 m depth

Abandoned Well Recharge

Recharge water should be silt free and for removing the silt contents, the runoff water should pass either through a desilting chamber or filter chamber filled with boulders, gravels, coarse sand and fine sand. The runoff water is guided through open channels and pipesfrom desilting chamber to the open or bore well.

Table 3: Filter chamber specifications

Description	Abandoned Open well recharge	Abandoned Bore well recharge
Filter chamber size	11 × 6 × 2 m	2.5 × 1.25 × 6.5 m

Benefits

- In hard rock areas, 6-7% increase in recharge rate in percolation pond.

Figure 4: Filter chamber

Figure 4: Filter chamber

- 8 percent reduction in evaporation loss in percolation pond.
- Zone of influence ranges from 1.0 to 1.5 km.
- Recharge through these techniques is fast (17%).
- Water quality is improved in nearby observation wells.

Conclusion

In Tamil Nadu, almost all the dug wells are of more than 30 meter in depth, are not productive and used at present as storage tanks to collect the discharge of bore wells. The bore wells drilled in hard rock formations often become unproductive as the weathered/ partly weathered rocks as well as the shallower water bearing fracture zones progressively become desaturated. In such areas, bore wells are drilled deeper year after year with the hope of encountering deep fracture zones leading to mining of groundwater, since there is no replenishment of the deep fracture zones taking place. To alleviate the problem of groundwater exploitation and to rejuvenate the failed wells, the existing and abandoned dug wells, bore wells may be utilized as recharge structure after cleaning and desilting the same.There are about 1.6 lakh abandoned wells in the state and there is scope to divert the run-off water during heavy rains.

References

Ravi, E., Mayilswamy, C., Raviraj, A., Thiayagarajan, G., Ranghaswami, M.V., 2008. Groundwater recharge estimation in Noyyal river basin. Proceedings of Groundwater resources assessment, recharge and modeling, pp. 229-237.