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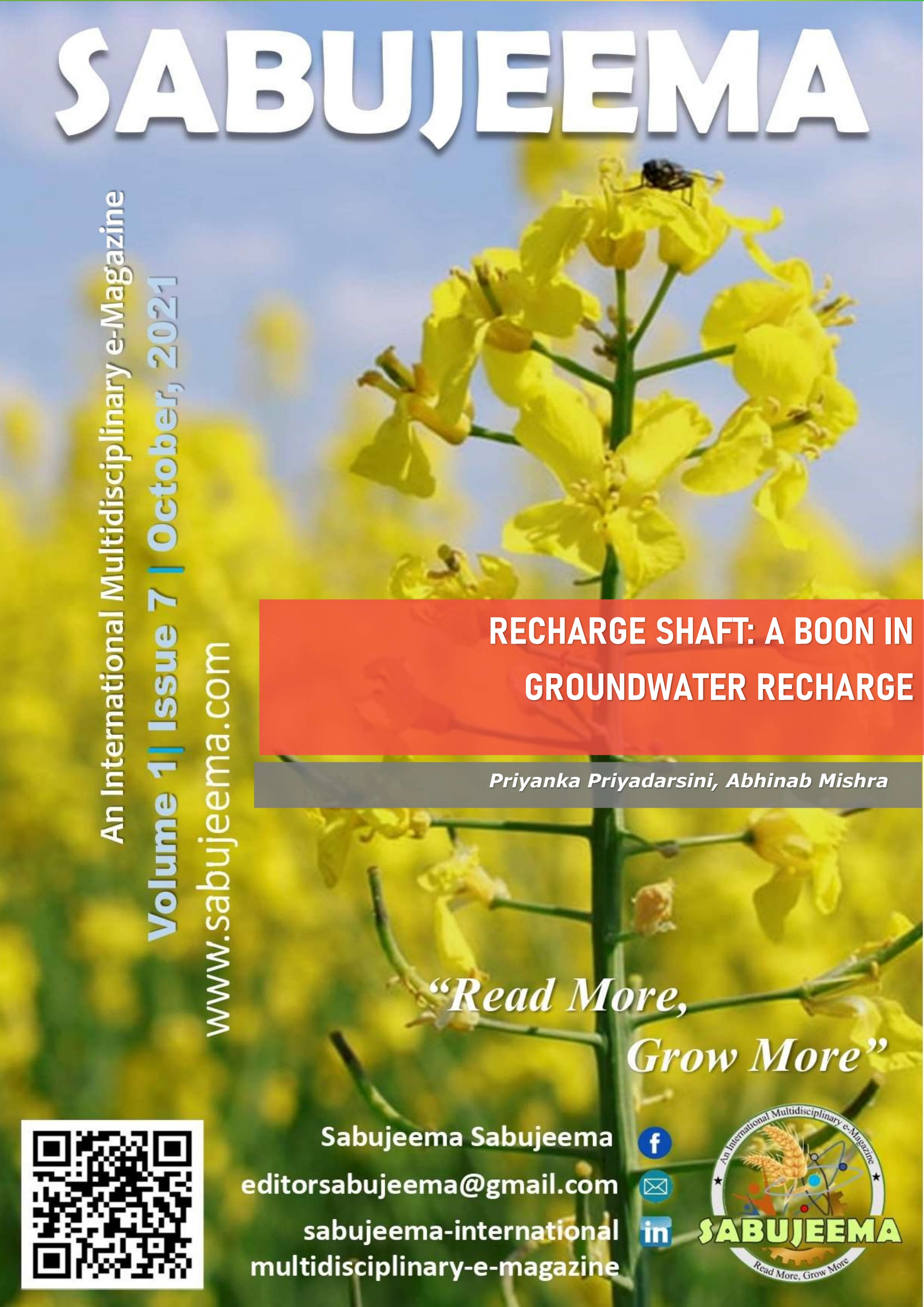

RECHARGE SHAFT: A BOON IN GROUNDWATER RECHARGE

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Recharge Shaft: A Boon In Groundwater Recharge

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Groundwater development and management is one of the major challenges for the scientists and engineers worldwide. Sustainability of any source depends on the availability of water. The source of water may be groundwater or surface water. Majority of rural water supply schemes are based on groundwater and hence to enhance the sustainability of such water supply schemes, Groundwater recharge becomes imperative, especially in case of over exploited areas. Artificial groundwater recharge is a feasible option to tackle the problem of water table decline in many parts of the world. Water withdrawal pattern along with recharge components should be studied together for efficient groundwater management in any region. Natural recharge of an aquifer is directly related to the safe yield of aquifer system. Hence additional amount of rainwater can be added to the aquifer through artificial recharge techniques. Precisely, artificial recharge is the process by which the groundwater reservoir is augmented at a rate exceeding that under natural conditions of replenishment. Any man-made scheme or facility with the objective to add water to an aquifer may be considered as an artificial recharge system.

Recharge shafts are the most efficient and cost effective structures to recharge the aquifer directly. These can be constructed in areas where source of water is available either for some time or perennially. It does not require acquisition of large piece of land as in case of percolation tanks. There are practically no losses of water in the form of soil moisture and evaporation, which normally occur when the source water has to traverse the vadose zone. Unused or even operational dug-wells can be converted into recharge shafts, which does not involve additional investment for recharge structure. Technology and design of the recharge shaft is simple and can be applied even where base flow is available for a limited period. The recharge is fast and immediately delivers the benefit. In highly permeable formations, the recharge shafts are comparable to percolation tanks.

Recharge shafts are artificial recharge structures commonly used for recharging shallow phreatic aquifers, which are not in hydraulic connection with surface water due to the presence of impermeable layers. They do not necessarily penetrate or reach the unconfined aquifers like gravity head recharge wells and the recharging water has to infiltrate through the vadose zone. In areas where phreatic aquifer is overlain by poorly permeable strata, the recharge to ground water storage by water spreading method becomes ineffective or has very low

efficiency. This situation also occurs in ponds/depressions where due to siltation, an impermeable layer or lens is formed which affects hydraulic connection of surface water and phreatic aquifers. Recharge shaft is an artificial recharge structure which penetrates the overlying impervious horizon and provides effective access of surface water for recharging the phreatic aquifer. These structures are ideally suited for areas with deep water levels. Recharge Shafts are similar to recharge pits but are constructed to augment recharge into phreatic aquifers where water levels are much deeper and the aquifer zones are overlain by strata having low permeability. In order to meet out the shortfall, involvement of the community is very important which can fulfill supply side and demand side.

These are the most efficient and cost effective structures to recharge the aquifer directly. These can be constructed in areas where source of water is available either for some time or perennially. Following are the site characteristics and design guidelines:

• To be dug manually if the strata is of non-caving nature.

• If the strata are caving, proper permeable lining in the form of open work, boulder lining should be provided.

• The diameter of shaft should normally be more than 2 m to accommodate more water and to avoid eddies in the well.

• In the areas where source water is having silt, the shaft should be filled with boulder, gravel and sand to form an inverted filter most sandy layer has to be removed and cleaned periodically. A filter should also be provided before the source water enters the shaft.

• When water is put into the recharge shaft directly through pipes, air bubbles are also sucked into the shaft through the pipe, which can choke the aquifer.

The main advantages of this technique are as follows:

• It does not require acquisition of large piece of land as in case of percolation tanks.

• There are practically no losses of water in the form of soil moisture and evaporation, which normally occur when the source water has to traverse the vadose zone.

• Disused or even operational dug-wells can be converted into recharge shafts, which does not involve additional investment for recharge structure.

• Technology and design of the recharge shaft is simple and can be applied even where base flow is available for a limited period.

• The recharge is fast and immediately delivers the benefit. In highly permeable formations, the recharge shafts are comparable to percolation tanks.