Research Article

# Groundwater development in chevella basin, Ranga reddy district, Andhra Pradesh, India

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## Abstract

Groundwater is one of the fresh water sources which are neither unlimited nor protected deterioration. In most of the times due to excess usage of groundwater resulted in drying up of the open and tubular wells, increasing the salt concentration, causing sea water intrusion near coastal areas and depletion of the water resource. Now a days most of the people recognized water quality as one of the important aspect in their life as its quantity. Present study is an attempt to analyse the impact of rainwater harvesting structures on groundwater quality in the Chevella basin. pH, TDS, Hardness, Bicarbonates, Chlorides, Sulphates, Nitrates, Fluorides, Calcium, Magnesium, Sodium, Potassium and Iron are measured/estimated for the years 2010-2013 (Pre and Post-monsoon periods) using standard analytical techniques. The study supports that the rainwater harvesting has improved the quality of groundwater in Chevella basin.
**Keywords: G**roundwater, Andhra Pradesh.

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## INTRODUCTION

Groundwater, which is in aquifers below the surface of the Earth, is one of the Nation's most important natural resource (Revelle et. al. 2004). Groundwater is the source of about 33 percent of the water that county and city water departments supply to households and businesses. It provides drinking water for more than 90 percent of the rural population (Brown et. al. 1983). RangaReddy district is one of the ten districts of Telangana Region of Andhra Pradesh with ageographical area of 7,565sq.km. It for msa part of Deccan Plateau under Musi river basin and lies between North Latitudes 160 54' and170 48'and Eastlongitudes770 21' and780 51' falling intopographical sheetnos.56G,H, K and L of Survey of India. The Chevella basin has an area of 7565sq.km (Fig. 1). Most of the villages within the Chevella basin depend on groundwater for all their needs. About 42 percent of the water used for irrigation comes from groundwater (Singh et. al., 2004).

**Figure 1:** Location of Chevella Basin and Sampling points

About 23 percent of the freshwater used in Chevella basin came from groundwater source and remaining 77 percent came from surface water. Water table has depleted to an extent of 8-13m. Due to depletion the water quality gets deteriorated. Hence, the present study is aimed at studying the impact of existing RHS on water quality in the Chevella basin.

## OBJECTIVES

The objectives of the present study are;

1. Analysis of the water samples for quality parameters and
2. Study of impact of existing RHS on water quality in the Chevella basin for the period 2010 to 2013.

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## METHODOLOGY

Around 402 rain water harvesting structures (earthen bunding, loose boulders, check dams, percolation tanks, mini percolation tanks, sunken pits and farm ponds) were constructed in the basin from ridge to valley with the public participation in the Chevella basin. For the assessment of groundwater quality, 198 groundwater samples were collected from different locations of the each village (6 to 15 samples from each village) during pre and post-monsoons of 2010 – 2013. The samples are collected from dug wells, bore wells and hand pumps distributed throughout the Chevella Basin. A weighted sample bottle or sampler was used to collect sample from an open well. Samples from the tube wells were collected after running the well for about 5 minutes. The bottle is rinsed to avoid any possible contamination in bottling and every other precautionary measure has been taken. All the parameters were analyzed within a week. The precise locations of the sampling points were determined in the field through the development of the GARMIN 12 Channel Instrument, based on the principles of Global Positioning System (GPS). The location of the sampling points is shown in Figure 1.The standard methods APHA (1985) adopted for each parametric analysis of samples. All the groundwater quality test results of the Chevella are compiled and comparative study is done to reveal the overall impact of RHS on groundwater quality of the Chevella Basin.

## RESULTS

The minimum and maximum values of water quality parameters analysed during the years 2010 and 2013 are presented in table 1. pH varies (Table 1 and Fig.2) in between 7.22 and 7.24 (minimum) and 8.31 and 8.15 (maximum). There is no much variation from 2013. However, there is a lot of change in TDS values, i.e., 1300 to 406 and1796 to 808mg/l (Fig.3). Similar results are observed in the case of Total Hardness, Bicarbonates, Chlorides, Sulphates, Nitrates, Fluorides, Calcium, Magnesium, Sodium, Potassium and Iron (Table 1 and Figs. 4 to11). 43.4% groundwater samples are fresh quality but the brackish water is dominating on the Chevella Basin in 2010. But due to the heavy rainfall and construction of RHS in the Chevella Basin, the quality of groundwater is considerably improved and the brackishness is reduced to 0% of groundwater samples. It means that 56.6% of brackish water becomes fresh water.

**Table 1:** Variation between 2010 and 2013 Post-monsoon minimum and maximum values (Post-monsoon period)

| Sr. No | Parameter | 2010 | | 2013 | |
|---|---|---|---|---|---|
| | | Minimum | Maximum | Minimum | Maximum |
| 1 | Ph | 7.22 | 8.3 | 7.24 | 8.15 |
| 2 | TDS | 1300.72 | 1796.50 | 406.50 | 808.33 |
| 3 | Hardness | 358.55 | 761.87 | 222.00 | 352.89 |
| 4 | Calcium | 66.33 | 121.33 | 35.16 | 56.21 |
| 5 | Magnesium | 52.90 | 112.40 | 32.90 | 52.06 |
| 6 | Bicarbonates | 180.12 | 570.15 | 75.50 | 180.56 |
| 7 | Chlorides | 157.83 | 335.37 | 38.00 | 175.22 |
| 8 | Sodium | 104.38 | 221.79 | 55.80 | 121.31 |
| 9 | Potassium | 3.26 | 6.93 | 1.75 | 3.53 |
| 10 | Sulphates | 63.97 | 117.03 | 17.44 | 93.46 |
| 11 | Nitrates | 18.90 | 34.54 | 3.57 | 19.83 |
| 12 | Fluorides | 0.780 | 1.27 | 0.60 | 1.32 |
| 13 | Iron | 0.03 | 0.08 | 0.02 | 0.4 |

## pH

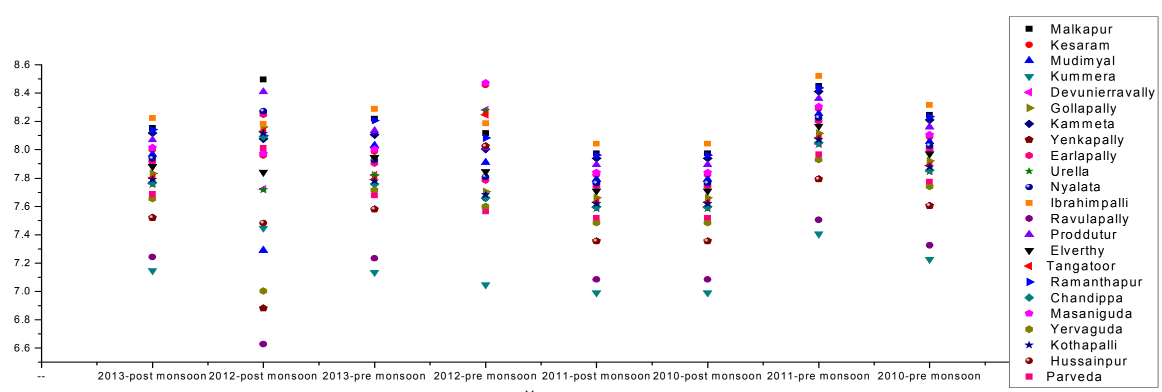

**Figure 2:** pH variation during 2010-2013

## DS

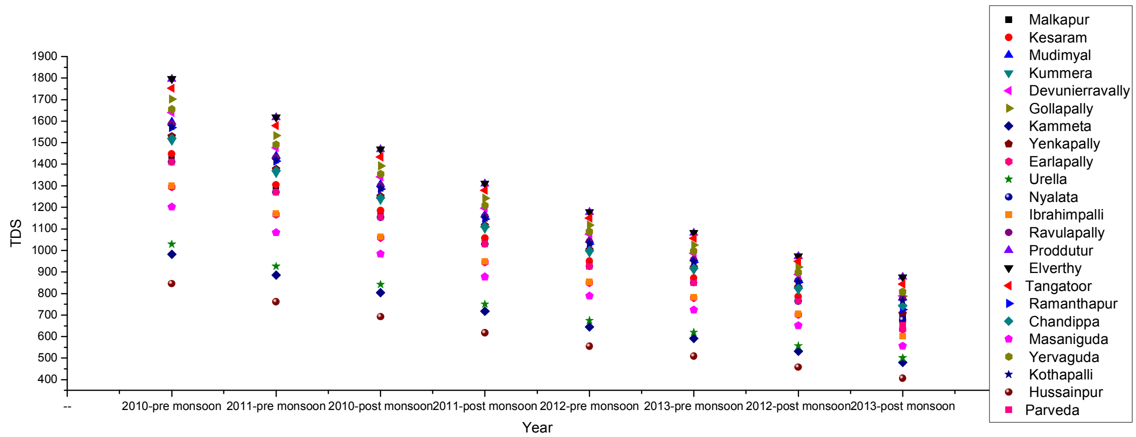


**Figure 3:** TDS variation during 2010-2013

## Hardness

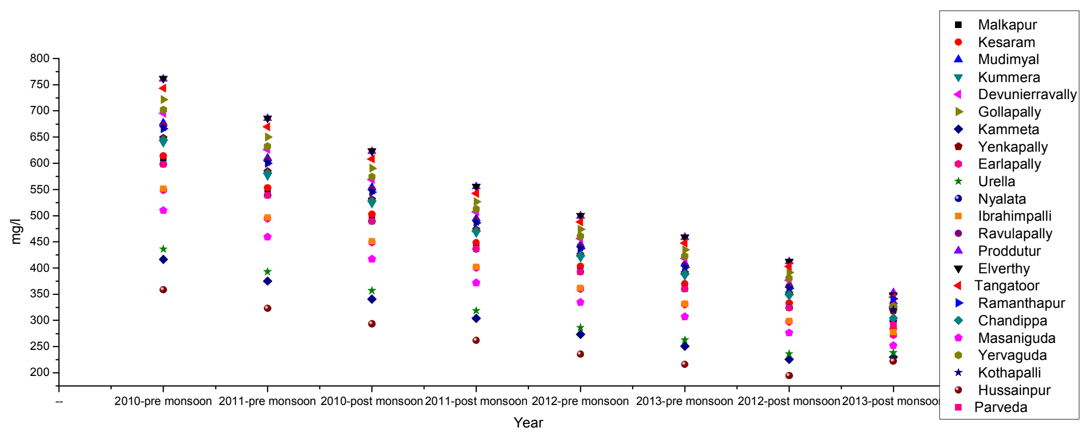


**Figure 4:** Hardness variation during 2010-2013

## Calcium and Magnesium

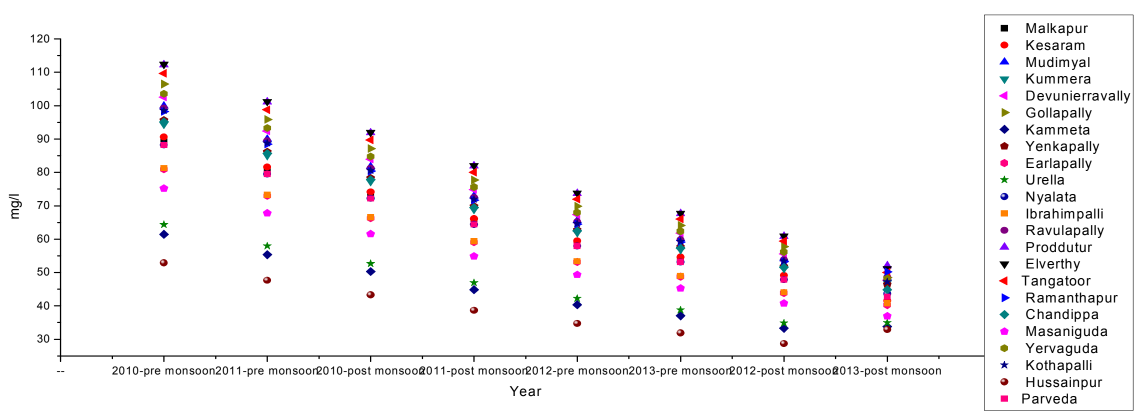


**Figure 4:** Hardness variation during 2010-2013

## Bicarbonates

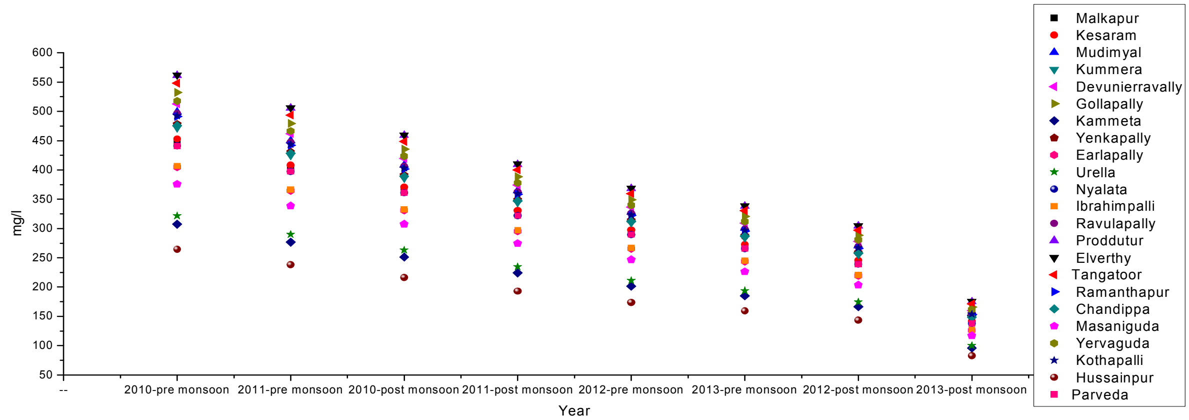


**Figure 5:** Bicarbonates variation during 2010-2013

## Chlorides

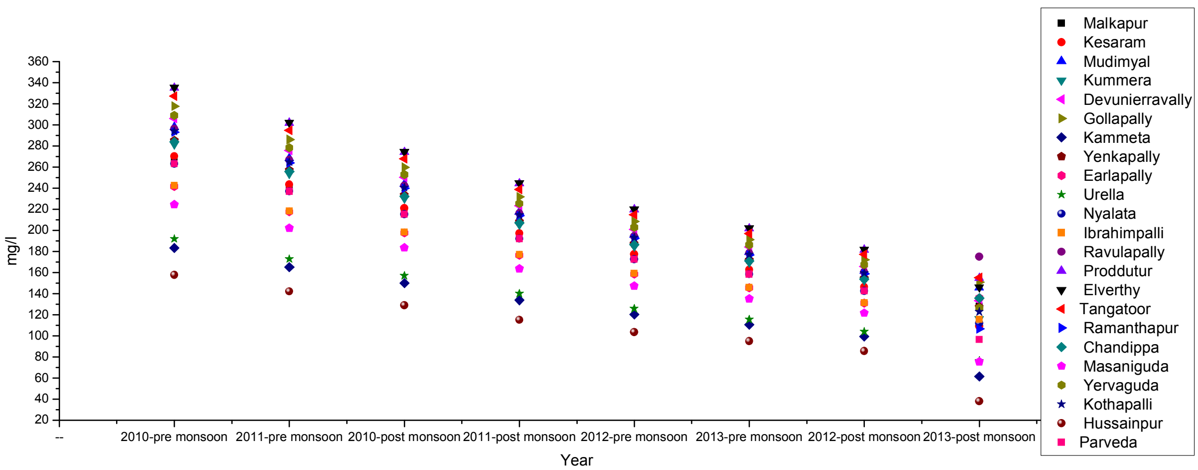


**Figure 6:** Chlorides variation during 2010-2013

## Sodium and Potassium

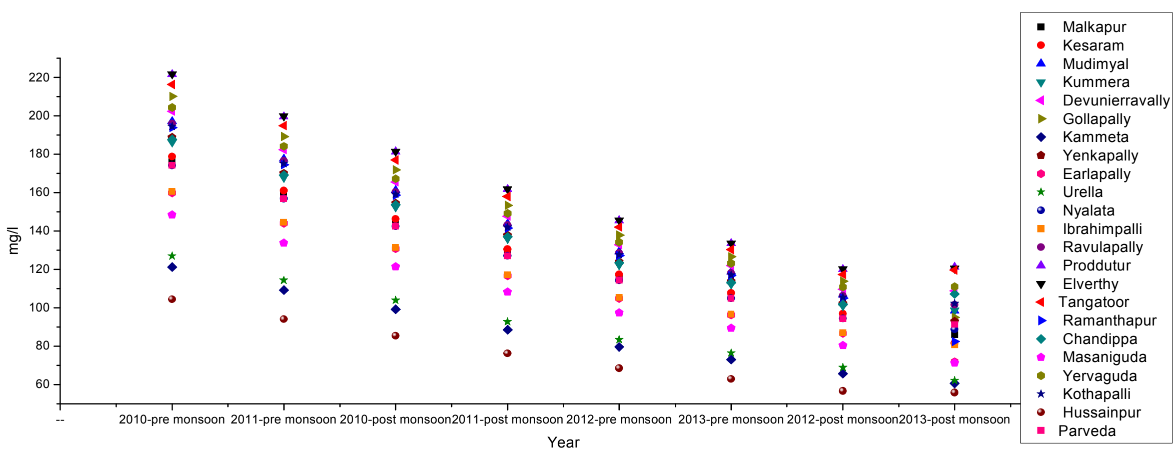


**Figure 7:** Sodium and Potassium variation during 2010-2013

## Sulphates

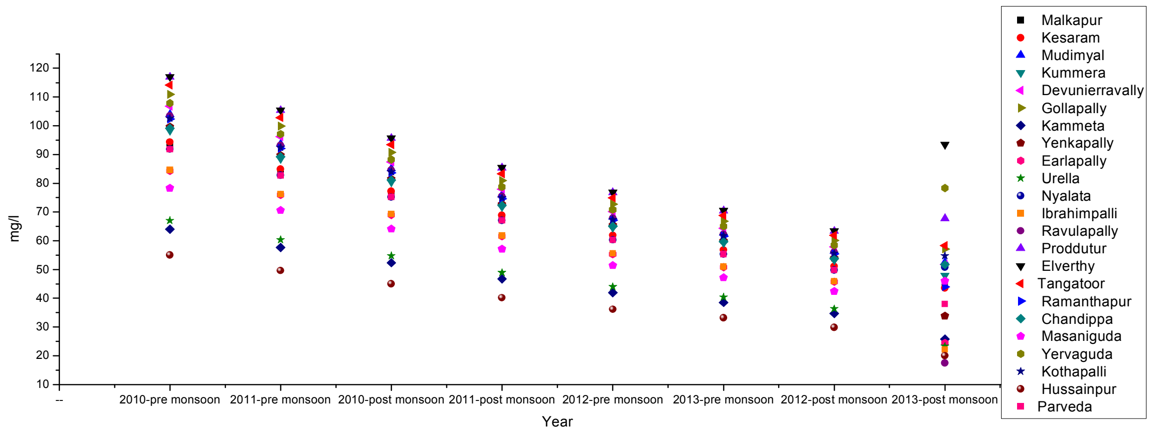


**Figure 8:** Sulphate variation during 2010-2013

## Nitrates

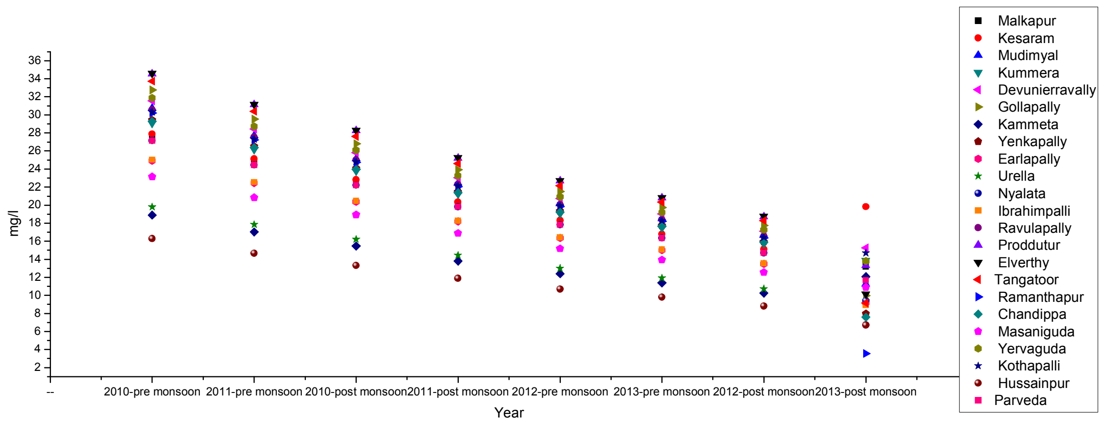


**Figure 9:** Nitrate variation during 2010-2013

## Fluorides

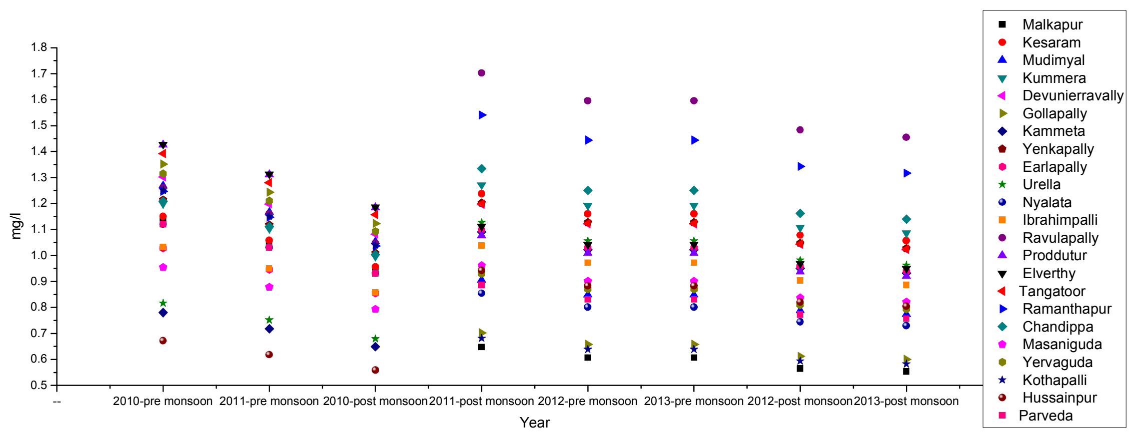


**Figure 10:** Fluoride variation during 2010-2013

## Iron

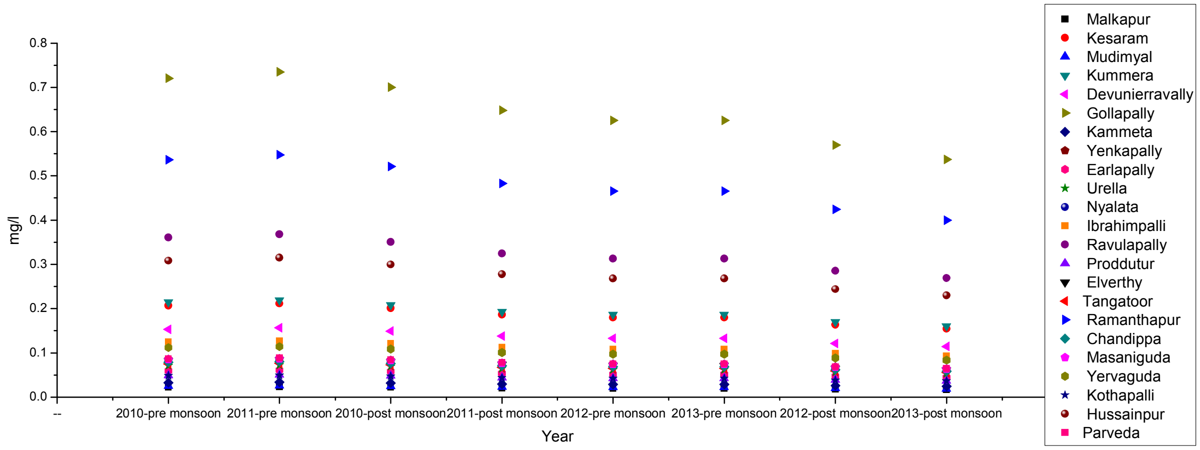


**Figure 11:** Iron variation during 2010-2013

## DISTANCE FROM RHS AND CONCENTRATION

pH, TDS, Nitrates, Fluorides concentrations are studied with reference to distance from RHS and concentration and found that the concentrations are low near the structure and increase with the distance from RHS (Table 2).

**Table 2:** Quality of ground water from RHS, during June 2010 – October 2013

| Distance from well from RHS (m) | pH | EC | Total Hardness | Nitrates | Fluorides |
|---|---|---|---|---|---|
| **0-100** | 8.28 | 734 | 202.33 | 9.18 | 0.456 |
| **100-300** | 8.24 | 985 | 271.52 | 12.33 | 0.586 |
| **300-800** | 8.36 | 1348 | 371.59 | 16.87 | 0.986 |

## CONCLUSION

Almost all the water quality parameters are decreased from 2010 to 2013, i.e. after creation of Rain water harvesting structures. It is also evident from the table.2, where the concentrations are more away from the RHS. So, it is conclude that RHS dilute the concentration and change the water quality poor to good.

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