Assessments of Ground Water Quality and Water Table Fluctuation after Construction of Check Dam at Sayala Village in Gujarat

Bachubhai Parmar[1] Prof. A.T. Motiani[2]
[1]P.G. Student [2]Associate Professor
[1]L. D College of Engineering, Ahmedabad [2]L. E. College, Morvi

Abstract— Check Dams are constructed with the objective of augmenting ground water resources and to improve its quality. Effects of check dam on ground water recharge both quantitative and qualitative are studied at Sayala village of Surendranagar District in Gujarat. There are four Check Dams are constructed at Sayala during study period. Rainfall data collected from nearby rain gauge station and data showing water level in the well are collected from observation well for the assessment of the impacts of check dam on ground water. The data collected from observation well for quality parameter of water (Na- and TDS) present in ground water is used to prepare line chart, both pre-monsoon and post-monsoon test data for assessing the ground water quality. The data collected for water level from observation well is plotted in column chart and discussed and assessed water table fluctuation.

Key words: Check Dam, Water Resources, Assessment, Water Table, Water Quality

I. INTRODUCTION

Check Dams are low cost dams (approximately below Ten Lacks rupees), which are built across streams to prevent rain water from flowing away into the sea. Check Dams serves mainly two purposes; the first is to provide direct irrigation when rain fails, and the second is to facilitate the recharging of surrounding wells through percolation of water. Additionally they also provide water for other purposes such as bathing, washing clothes, and drinking water for animals. Area selected for assessment of Ground water quality and water table fluctuation at Sayala village of Gujarat, situated at 22°32' North altitude and 72°29' East longitudes. This is a drought prone area with an annual rainfall of 490 mm and 80 percent variability of rainfall. It is very essential to set up water harvesting structure, especially check dams in all possible places for saving every drop of water. It has been observed that the study area have good aquifer to hold ground water.

II. METHODOLOGY

A. Check Dam Details

There were phase wise construction of Check Dams in study area from Year 2001 to year 2009 under Government and Non Government Organization. All these five Check Dams have their identification code with other details like latitude, longitude, and village name, name of stream and date of completion.

B. Methodology

The observation well data located within the area of Check Dam's influence is used for the study. The impact assessment of constructing Check Dams on the quality of ground water is also studied for this location after comparison of concentration of Na^- and TDS present using line charts. The behavior of water table is studied by preparing column charts for the data collected from the observation well over a period of time from 2000 to 2009 for interval of three year.

III. STUDY AREA

Area selected for assessment is at Sayala village of Gujarat, situated at 22°32' North altitude and 72°29' East longitudes. This is a drought prone area with an annual rainfall of 490 mm and 80 percent variability of rainfall. It is very essential to set up water harvesting structure, especially Check Dams in all possible places for saving every drop of water. It has been observed that the study area have good aquifer to hold ground water

IV. DATA COLLECTION AND DATA ANALYSIS

1) The average rainfall in the area obtained with the help of Meteorological data of Sayala as shown in Figure 1 for the period of 9 years span (2000 to 2009).
2) Details of Check Dam constructed at study area (Source: Rajkot Irrigation Project Circle, Rajkot).

Sr. No.	Code No of Check Dam	Name of Check Dam	Latitude of Check Dam in Deg/Min/Sec	Longitude of Check Dam in Deg/Min/Sec	Name of River, Steam or Vokli	Completion Date of Check Dam
1	361	CD - 1	22° 32' 30" N	71° 29' 30" E	Local vokli	31.07.01
2	615	CD - 2	22° 32' 55" N	71° 29' 30" E	Local Vokli	25.06.07
3	621	CD - 3	22° 32' 30" N	71° 29' 40" E	Simadi	25.06.07
4	700	CD - 4	22° 32' 50" N	71° 29' 40" E	Navan	26.05.09

Table 1:

3) Preparation of table showing the pre-monsoon and post-monsoon water depth (meter) from ground level in observation well and ground water quality contents TDS, Cl^- in ppm.(Source: The Geohydrologist, Unit-1, Data Center, Ahmedabad.)

Well No	Description	Year 2000		Year 2003		Year 2006		Year 2009	
		Pre	Post	Pre	Post	Pre	Post	Pre	Post
BAS 1	WL from GL in meter	15.50	13.62	10.0	7.85	4.65	1.85	6.50	3.50
	TDS in ppm	1780	1860	1710	1760	1820	1780	1760	1840
	Cl^- in ppm	390	430	390	450	400	470	456	490

Table 2:

4) Preparation of Column Chart to compare and correlate the water level fluctuation using pre-monsoon and post-monsoon past data of observation well for assessment of water table. Preparation of Line Chart to compare and correlate the chages in water quality using pre-monsoon and post-monsoon past data of observation well for assessment of ground water quality.

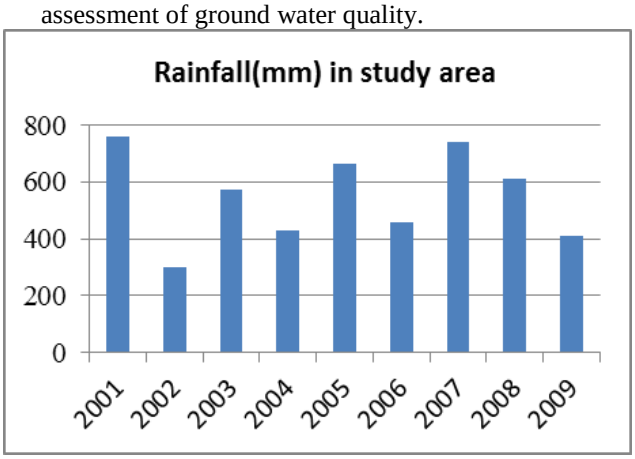

Fig. 1: Yearly Average Rainfall

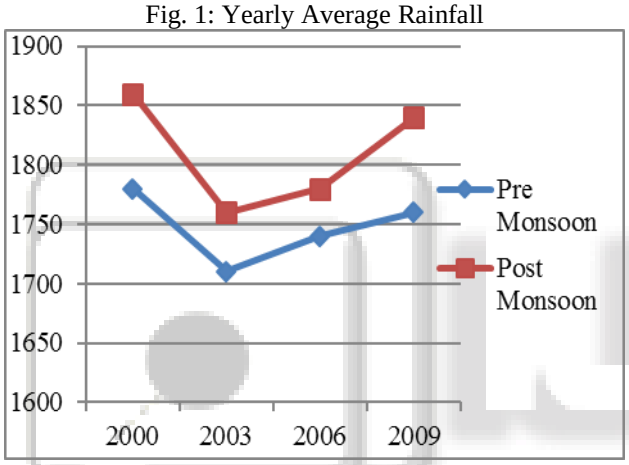

Fig. 2: Comparison of pre-monsoon and post-monsoon TDS (ppm) of water

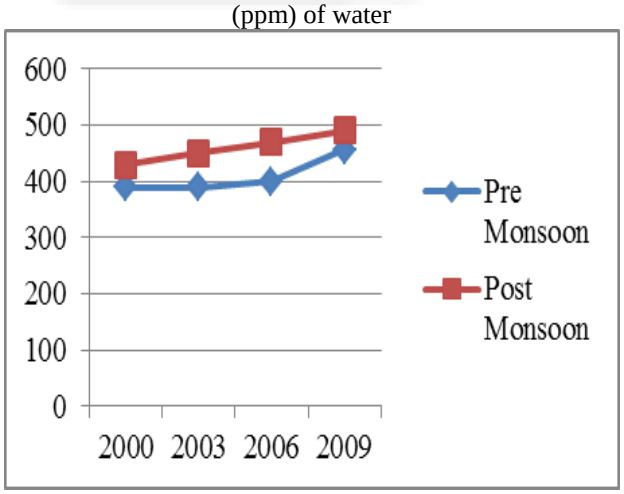

Fig. 3: Comparison of pre-monsoon and monsoon Cl-(ppm) value of water

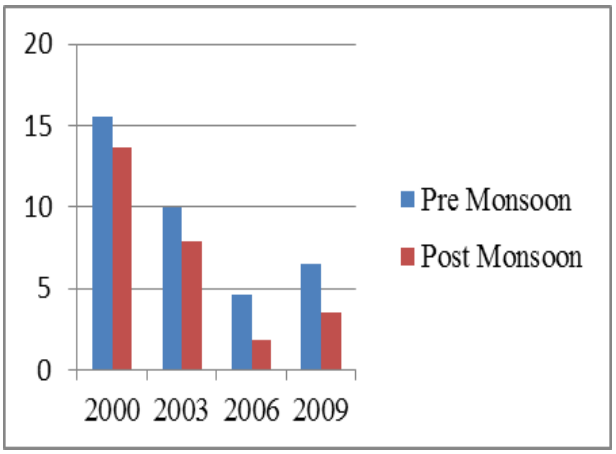

Fig. 4: Comparison of pre-monsoon and post-post- post-monsoon water depth (meter) from GL

V. RESULTS

1) A perusal of Table No. 2 indicates that concentration of TDS in ground water is decrees moderately.
2) Table No. 2 also indicates that concentration of Cl-elements in ground water is increases slightly and there is not an appreciable change in pre-monsoon and post-monsoon figure.
3) Further, Table No.2 indicates that the depth of water table from ground level decrees by 9.00 m for pre-monsoon period and 10.12 m post-monsoon period for period of nine year (2000 to 2009). There is significant rise in ground water table. The results reveal that the increased water level is stable even in case the moderate rainfall for year 2009.
4) The overall study from figure 4 and figure 2 indicates the rise of water table and has improved the ground water quality respectively after construction of Check Dams.

VI. CONCLUSION

Check Dam is small water harvesting structures present a major alternative to conventional water resource development. These small rainwater harvesting structures can be well distributed in place where the rainfall is moderate. Rain water harvesting by constructing check dam can be very useful in semi-arid and dry sub-humid regions where the variability of rainfall is large.

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Single Author

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