

Study and Analysis of Groundwater Level Variation in Catchment of Bambela Check Dam on Rivel Machhan

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Abstract

Continuous exploitation of groundwater and its increased use has created issues related to recharging. Water harvesting and recharging of ground water is gaining greatest important amongst many issues related to water resources management. Water harvesting by construction of check dams is one of the very popular approach which is at many places practiced through people's participation. Dahod district of the Gujarat state is a tribal area. It is a water scarce area with average annual rainfall around 900 – 1000 mm. Water harvesting by construction of check dams is practiced in this area. After construction of check dams scenario started changing and significant improvement in the water table conditions observed. Here an attempt is made to study water table fluctuations in catchment of one of the check dam named Bambela Check Dam on river Machhan.

Keywords: Ground water Level, Check Dam, Pre-monsoon, Post-monsoon

I. INTRODUCTION

Dahod district is located in the North-east direction of Gujarat. Machhan river is flowing through Jhalod taluka. The overall topography of the region is highly undulating and of varying slopes. The catchment of the river is 431 km^2 up to its meeting place with Anas which is a tributary of Mahi. Machhan river catchment receives much of its rainfall from the southwest monsoon during the period between June and September, its maximum intensity being in the months of July and August. The annual rainfall in the area varies between 800 to 1000 mm. Bambela check dam is 100 m long and 3.5 m. high. Following Table 1 gives salient features of Bambela check dam.

Table – 1
Salient Features of Bambela Check Dam on Machhan River

Name of Check Dam	Gross Length (m)	Crest Length (m)	Height (m)	FSL (m)	Bed Level (m)	Catchment Sq.Mile
Bambela	100	76	3.2	99.2	96	148.34



Fig. 1: Bambela Check Dam

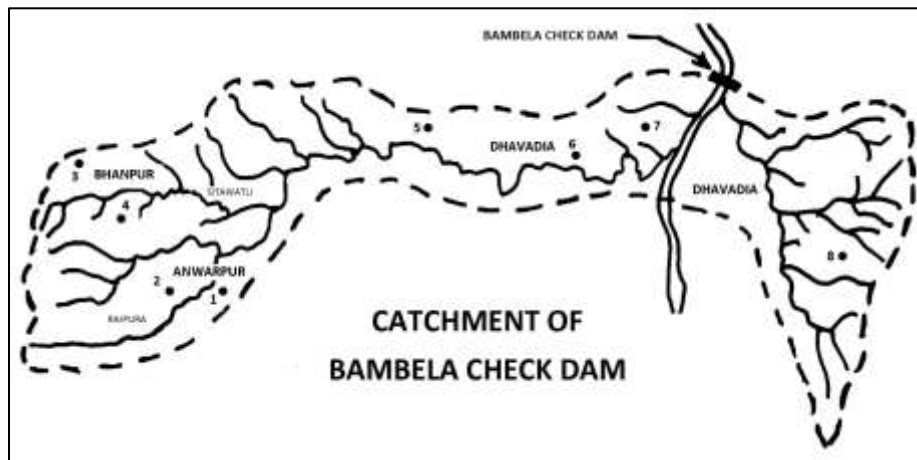


Fig. 2: Catchment of Bambela Check Dam

II. ANALYSIS

Pre and Post monsoon water levels for wells located in same village have been plotted on same graph for a period before construction and after construction of check dam at Bambela. Pre-monsoon ground water reduced levels before construction of check dam are compared with Pre-monsoon ground water reduced levels after construction of check dam. Similarly Post-monsoon ground water reduced levels before construction of check dam are compared with Post-monsoon ground water reduced levels after construction of check dam. To get better idea of effect of rainfall in post monsoon plots rainfall variation trend is also plotted on same graph. These graphs are shown below as Graph 1 to Graph 12.

Total 62 observation wells, scattered in 22 villages are selected in the entire Machhan River Basin out of which 8 wells well No. 50 to 57 are located in the catchment of Bambela Check dam. Amongst these 8 wells 2 wells are located in village Anwarpura, 2 in Bhanpur and 4 in Dhavadia. Table 2 gives details of these water levels in BGL. Data of water levels are processed by working out Reduced Water Levels and analysis is done by plotting pre and post monsoon Reduced Water Levels (R.W.L.) for the period before check dam construction and after check dam construction. Graphs 1 to 12 illustrate these plots. Post-monsoon water levels were also compared with trend of rainfall variation.

Table – 2

Pre and Post-monsoon Water Levels in Anwarpura, Bhanpur and Dhavadia (Before construction of Check Dam)

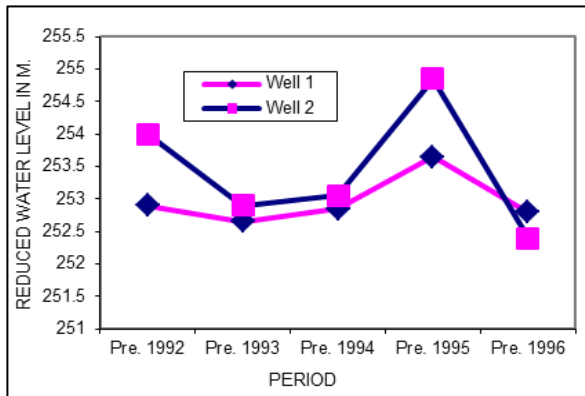
Period	Wells at Anwarpura		Wells at Bhanpur		Wells at Dhavadia			
	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Well 8
	W.L. in m. (B.G.L.)		W.L. in m. (B.G.L.)		W.L. in m. (B.G.L.)			
Pre-monsoon 1992	5.1	3.3	4.4	3.5	5.5	4	1.9	4.9
Post-monsoon 1992	4.4	2.25	2.9	8.1	4.3	3.6	1.65	2.45
Pre-monsoon 1993	5.35	4.4	4.7	8.9	5.2	4.5	1.85	7
Post-monsoon 1993	4.4	2.2	2.7	7.95	4.7	3.9	1.9	4.05
Pre-monsoon 1994	5.15	4.25	4.55	9.1	6.05	4.6	1.9	6.05
Post-monsoon 1994	3.8	1.35	2.5	3.85	1.85	2.8	1.65	2.3
Pre-monsoon 1995	4.35	2.45	3.8	7.55	3.55	3.1	1.9	4.8
Post-monsoon 1995	4.1	2.15	3.85	7.1	3.3	3.2	1.7	3
Pre-monsoon 1996	5.2	4.9	4.5	9.35	6.2	4.35	2	6.9
Post-monsoon 1996	4.1	1.9	2.8	5	1.8	3.1	1.7	4.3

Table – 2

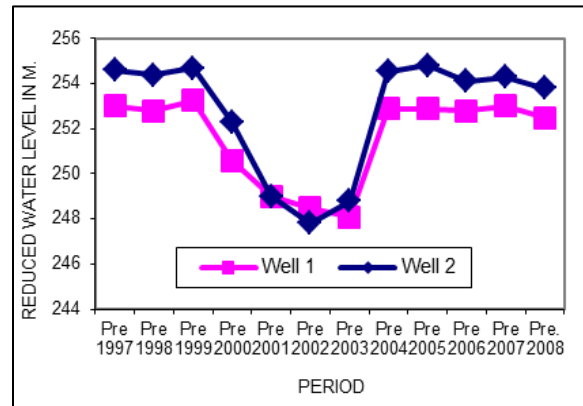
Pre and Post-monsoon Water Levels in Anwarpura, Bhanpur and Dhavadia (After construction of Check Dam)

Period	Wells at Anwarpura		Wells at Bhanpur		Wells at Dhavadia			
	Well 1	Well 2	Well 3	Well 4	Well 5	Well 6	Well 7	Well 8
	W.L. in m. (B.G.L.)		W.L. in m. (B.G.L.)		W.L. in m. (B.G.L.)			
Pre-monsoon 1997	5	2.7	3.8	7.85	3.4	3.35	1.9	5.2
Post-monsoon 1997	3.8	1.9	2.6	5.25	2.2	2.95	1.7	2.45
Pre-monsoon 1998	5.2	2.9	4.1	9	4.6	3.7	2	6
Post-monsoon 1998	3	0.75	1.65	2.5	0.85	1.45	1.35	1.45
Pre-monsoon 1999	4.75	2.6	3.4	7.95	4.1	3.5	2	5
Post-monsoon 1999	4	2.3	3.6	8.95	4.6	3.4	2	3.3
Pre-monsoon 2000	7.4	5	4.9	Dry	8	6.1	2.8	6.85
Post-monsoon 2000	7.6	6	5.2	10.45	8.7	7.2	2.8	7.3
Pre-monsoon 2001	9	8.3	5.2	10.45	11.45	7.9	5.75	8.35
Post-monsoon 2001	6.9	5.5	5.2	10.45	8.5	7.1	3	6.6

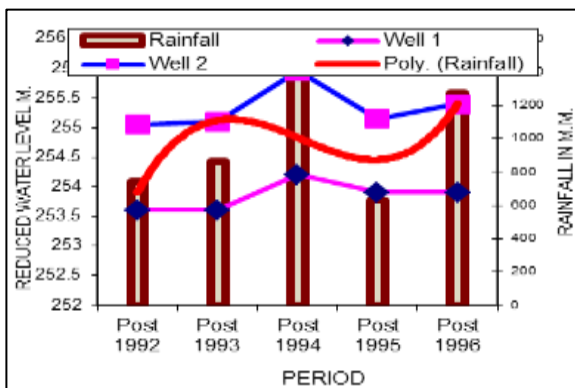
Pre-monsoon 2002	9.5	9.5	5.2	10.45	10.2	7.9	6.6	8.35
Post-monsoon 2002	6.5	5.4	5.2	10.45	6.9	6.4	3.2	7.2
Pre-monsoon 2003	9.9	8.5	5.2	10.45	11.3	9.7	7	8.35
Post-monsoon 2003	4.5	3.4	5.6	10.45	4.1	3.6	1.6	4.2
Pre-monsoon 2004	5.1	2.75	4.7	9.45	7.2	3.6	2.7	7.4
Post-monsoon 2004	3.9	1.7	3.2	5.25	2.7	2.4	1.1	2.1
Pre-monsoon 2005	5.1	2.5	4.2	7.85	8.1	5.1	2.7	5.9
Post-monsoon 2005	3.8	2	3.8	8.55	3.6	2.6	1.25	2.8
Pre-monsoon 2006	5.2	3.2	5.4	9	9	6.9	3.9	6.7
Post-monsoon 2006	3.6	1.3	2.7	3.05	1.6	1.9	1.1	1.7
Pre-monsoon 2007	5	3	5	7.85	6.6	4.4	1.6	5.2
Post-monsoon 2007	3.5	1.2	2.7	2.85	1.5	1.8	1	1.4
Pre-monsoon 2008	5.5	3.5	5	7.85	6.8	5	1.6	5.2



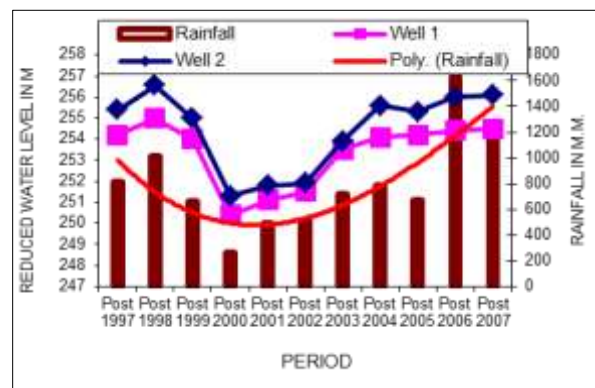
Graph 1 : Pre-Monsoon RWL Variation at Anwarpura (Before Check Dam)



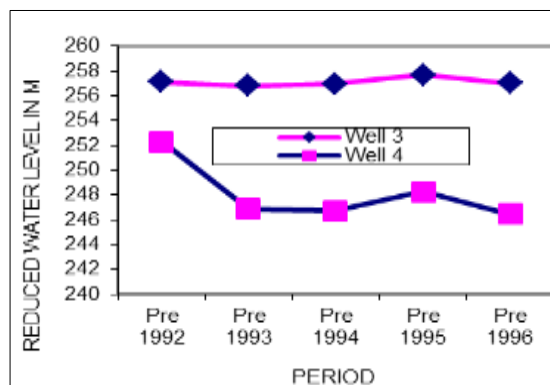
Graph 2 : Pre-Monsoon RWL Variation at Anwarpura (After Check Dam)



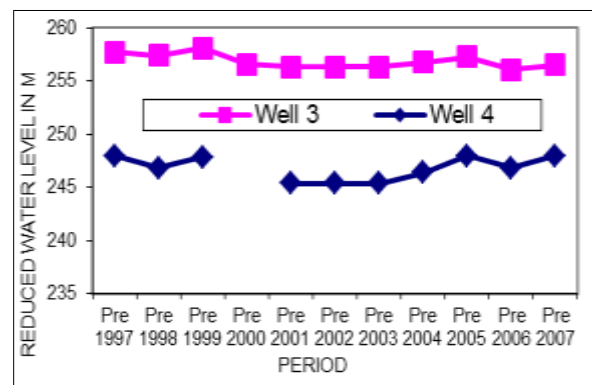
Graph 3 : Post-Monsoon RWL Variation at Anwarpura (Before Check Dam)



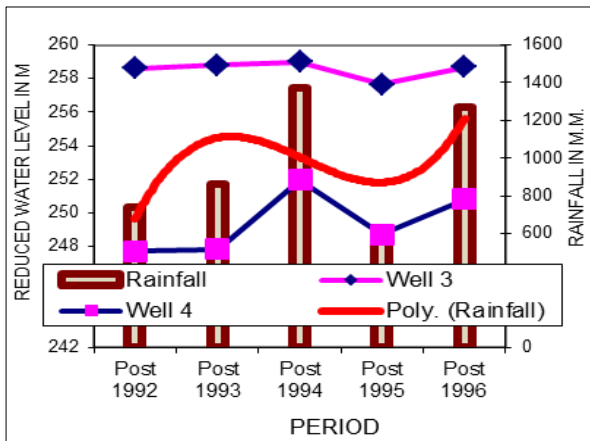
Graph 4 : Post-Monsoon RWL Variation at Anwarpura (After Check Dam)



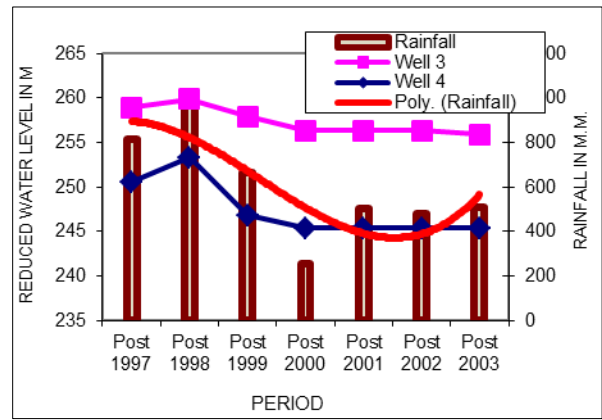
Graph 5 : Pre-Monsoon RWL Variation at Bhanpur (Before Check Dam)



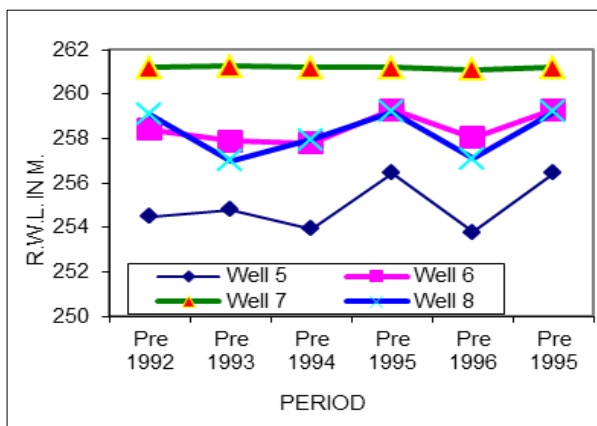
Graph 6 : Pre-Monsoon RWL Variation at Bhanpur (After Check Dam)



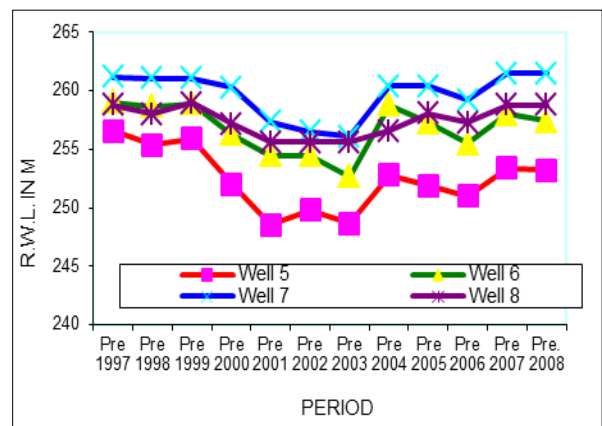
Graph 7 : Post-Monsoon RWL Variation at Bhanpur (Before Check Dam)



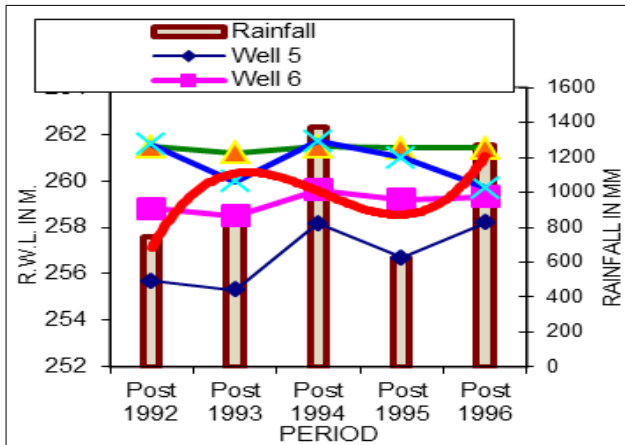
Graph 8 : Post-Monsoon RWL Variation at Bhanpur (After Check Dam)



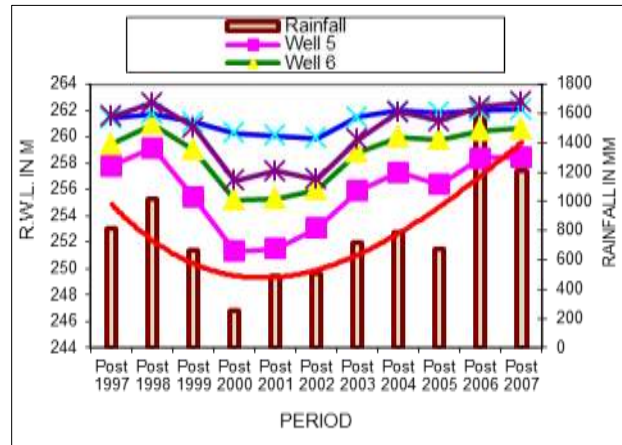
Graph 9 : Pre-Monsoon RWL Variation at Dhavadia (Before Check Dam)



Graph 10 : Pre-Monsoon RWL Variation at Dhavadia (After Check Dam)



Graph 11 : Post-Monsoon RWL Variation at Dhavadia (Before Check Dam)



Graph 12 : Post-Monsoon RWL Variation at Dhavadia (After Check Dam)

III. DISCUSSION ON ANALYSIS

Ground water flow pattern in the Machhan basin broadly follows the topography and drainage pattern of the basin. After construction of check dams significant rise is observed in overall water table. Post-monsoon water table appears to vary at much steeper rate showing more rise in response of small increase in rainfall. Also there observed general decline in the water table from post-monsoon of one year to pre-monsoon of next year which is an indicative of good internal drainage.

Rainfall in year 2000 was 257 mm, lowest amongst all the year studied. Due to this entire area had water levels below 5 m. during pre-monsoon 2001. The rainfall in year 2001 was 488 mm. more than previous year however still it was very less to

normal annual rainfall of the region. 68 % of wells were observed dry during this year. There was no considerable change in water levels during pre-monsoon 2002. In 2003 rainfall was 718 mm, less than normal average rainfall of the region, still water table raised during post-monsoon 2003. Water levels again raised during pre-monsoon 2004 compared to pre-monsoon 2003 whereas the rainfall in year 2004 was 785.1 mm, still less than the normal annual rainfall of the region. Post-monsoon water table shows reasonably stable behavior even during less rainfall for many consecutive days.

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