International Journal of Agricultural Engineering, Vol. 3 No. 1 (April, 2010) : 121-124

Research Paper :

Impact of soil and water conservation structures on ground water recharge in Darakwadi watershed

M.D. ABUJ, A.P. MAGAR, V.T. BOMBALE, S.H. BHUTADA **AND** P.R. BHANDARI

Accepted : *March, 2010*

See end of the article for authors' affiliations

Correspondence to:
M.D. ABUJ
Department of Soil and Water Conservation Engineering, Aditya College of Agricultural Engineering and Technology, BEED (M.S.) INDIA

ABSTRACT

Land and water are the most precious heritage and physical base of biomass production of life supporting system. Efficient management and utilization of soil and water are important to increase crop production and productivity per unit area. The main factors for soil erosion in India are excessive deforestation and faulty agricultural practices. The present study was carried out at Darakwadi watershed in Aurangabad district of Maharashtra. The average increase in water level in the wells downstream side of earthen nala bund, composite cement nala bund, and cement check dam and percolation tank was found to be 2.90m, 2.77 m, 2.18m and 2.55m, respectively, in post development period.

Key words : Impact, Soil and water conservation structures, Ground water recharge, Ground water recharge in watershed

Water is most essential input to agricultural production. With the limited scope of development of irrigation potential, rain water management plays an important role to supplement the surface water for domestic, irrigation and industrial uses. Therefore, efficient conservation and scientific management of harvested water is crucial for optimum utilization for crop production. Soil and water conservation structure create temporary storage of water and help in ground water recharge. With the ever growing population, the need of water is also increasing but the chief source of water *i.e.* rainfall is almost constant or decreasing day by day. So, more scientific approach involving various factors that really govern the movement of water resources. For efficient water management, all the structures need to be evaluated for their effect on the ground water recharge in the watershed (Gore *et al.*, 2002).

METHODOLOGY

Darakwadi watershed:

Darakwadi watershed was developed by "Dilasa Janvikas Pratishthan", Aurangabad with support of United Nations Children's Development Fund (UNICEF), Mumbai and Member of Legislative Council (MLA) fund. It was implemented in year 2002-03. Total geographical area of watershed was 479 ha. It is situated at $19^0$36'15" N latitude and $75^0$48'45" E longitude and at an altitude of 524m above mean sea level with an average annual rainfall of 600mm. It is 45 km from Aurangabad and 13km from Karmad Railway Station.

Major area (75%) of Darakwadi watershed ranges from 1-3% in non cultivated area at hilly and elevated degraded land. Maximum slope 15 to 24 per cent was observed. Most of the soils in this region were medium to deep black with some part of degraded land. Topography was flat to undulating.

Soil and water conservation structures:

According to the potential available in the Darakwadi watershed, soil and water conservation structures proposed were six; earthen nala bund two cement nala bund, one composite cement nala bund, two cement nala check dams and one percolation tank. These structures were evaluated for effect on ground water recharge.

Measurement of water table depth:

In Darakwadi watershed, 12 wells were selected to determine the effect of various soil and water conservation structures on ground water recharge. Three wells in influencing area of each structure like earthen nala bund, composite cement nala bund, percolation tank and cement nala check dam were selected. The data on the water table depth was compared with the pre-development data and average increase in water table depth in the wells on the downstream side of each structure were determined /estimated.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Table 1 : Water level fluctuation in the wells on downstream side of earthen nala bund

Sr. No.	Months	Water level depths in the wells(m)						Increase in water table (2004-05)		
		Pre-development (2002-2003)			Post-development (2004-2005)					
		W_1	W_2	W_3	W_1	W_2	W_3	W_1	W_2	W_3
1.	June	1.73	0.69	1.49	2.92	1.80	2.64	1.19	1.11	1.15
2.	July	4.21	2.6	1.83	6.69	3.69	5.03	2.48	1.09	3.20
3.	Aug.	5.92	4.33	3.58	7.76	5.92	7.52	1.84	1.59	2.94
4.	Sept.	6.32	4.99	6.03	10.66	9.65	10.30	4.34	4.66	4.27
5.	Oct.	5.21	4.88	5.70	10.55	8.74	9.86	5.34	3.86	4.16
6.	Nov	4.21	4.60	5.10	9.86	7.89	9.02	5.65	3.29	3.92
7.	Dec.	3.86	3.76	4.32	8.14	7.12	7.51	4.28	3.36	3.19
8.	Jan.	2.66	2.43	3.40	6.51	5.53	6.48	3.85	3.10	3.08
9.	Feb.	2.12	1.84	2.91	5.32	4.38	5.71	3.2	2.54	2.80
10.	March	1.72	1.48	2.42	4.12	3.80	4.68	2.4	2.32	2.26
11.	April	1.03	1.11	1.83	3.16	3.13	3.97	2.13	2.02	2.14
12.	May	0.91	0.00	1.54	2.72	1.92	2.81	1.81	1.92	1.27

Effect of earthen nala bund:

From Table 1, it reveals that before the development of Darakwadi watershed in the year 2002-03, water level depth in the wells (W_1, W_2, and W_3) was too below. It ranged between 0.91-6.32m, 0.0-4.99m and 1.49-6.03m, respectively. After the development of watershed maximum water was harvested by earthen nala bunds and it helped to increase the water table in the year 2004-05 in all the wells (*i.e.* W_1, W_2 and W_3), water level depth ranged between 2.72-10.60m, 1.80-9.65m and 2.64-10.30m, respectively. There was increase in water table in all the wells after watershed development and increase in water level ranged between 1.19-5.65m, 1.09-4.66m and 1.15-4.27m, respectively.

Effect of composite nala bund:

From Table 2, it reveals that in pre developed stage *i.e.* in 2002-03, water level depth in all the three wells (W_4, W_5 and W_6) downstream side of composite cement nala bund was ranged between 0.50-6.10m, 0.80-7.0m and .07-6.13m, respectively from June to May.

In the post development period (2004-05), water level depth in all the three wells (W_4, W_5 and W_6) downstream side of composite nala bund ranged between 2.10-9.17m, 1.97-10.63m and 2.63-10.60m, respectively. Increase in water table in 2004-05 in all the three wells ranged between 1.43-3.07m, 1.17-4.20m and 1.63-4.47m, respectively.

Effect of percolation tank:

From the Table 3, it reveals that before the development of Darakwadi watershed water level depth in the wells W_7, W_8 and W_9 down stream side of the percolation tank, water level depth in the wells ranged between 0.42-5.40m, 1.46-6.75m and 0.74-6.52m, respectively .

Table 2 : Water level fluctuation in the wells on downstream side of composite cement nala bund

Sr. No.	Months	Water level depths in the wells(m)						Increase in water table (2004-05)		
		Pre-development (2002-2003)			Post-development (2004-2005)					
		W_4	W_5	W_6	W_4	W_5	W_6	W_4	W_5	W_6
1.	June	0.90	1.39	0.70	2.33	3.52	2.70	1.43	2.13	2.00
2.	July	2.3	2.31	1.90	4.4	5.39	5.79	2.1	3.08	3.89
3.	Aug.	4.14	5.00	4.04	6.43	8.15	7.88	2.29	3.15	3.84
4.	Sept.	6.1	7.00	6.13	9.17	10.63	10.60	3.07	3.63	4.47
5.	Oct.	5.69	6.80	6.00	8.73	10.4	10.20	3.04	3.60	4.20
6.	Nov	5.33	5.5	5.40	8.31	9.70	8.70	2.77	4.20	3.30
7.	Dec.	4.62	4.83	4.30	7.5	8.30	7.80	2.88	3.47	3.50
8.	Jan.	3.69	3.59	3.74	6.23	6.60	7.12	2.54	3.01	3.38
9.	Feb.	2.89	2.92	3.03	5.32	5.91	5.92	2.43	2.99	2.89
10.	March	1.69	2.24	1.91	4.00	4.23	4.68	2.31	1.99	2.77
11.	April	0.89	1.3	1.52	3.12	2.59	3.30	2.23	1.29	1.78
12.	May	0.50	0.80	1.00	2.10	1.97	2.63	1.60	1.17	1.63

Table 3 : Water level fluctuation in the wells on downstream side of percolation tank

Sr. No.	Months	Water level depths in the wells(m)						Increase in water table (2004-05)		
		Pre-development (2002-2003)			Post-development (2004-2005)					
		W_7	W_8	W_9	W_7	W_8	W_9	W_7	W_8	W_9
1.	June	1.3	1.82	0.80	2.40	3.19	2.1	1.10	1.37	1.30
2.	July	2.33	2.90	2.60	4.27	4.80	3.68	1.94	1.90	1.08
3.	Aug.	4.21	4.02	4.56	5.89	6.79	6.5	1.68	2.77	1.94
4.	Sept.	5.40	6.75	6.52	9.42	9.92	9.60	4.02	3.17	3.08
5.	Oct.	4.92	5.09	5.89	9.09	9.69	9.50	4.17	4.60	3.61
6.	Nov	4.30	4.78	5.39	8.89	9.12	8.80	4.59	4.34	3.41
7.	Dec.	3.13	3.92	3.96	7.71	7.26	7.39	4.58	3.34	3.43
8.	Jan.	2.66	3.29	3.19	5.93	5.68	6.29	3.27	2.39	3.10
9.	Feb.	1.82	3.00	2.25	4.69	4.63	5.07	2.87	1.63	2.82
10.	March	1.36	2.43	1.59	3.59	3.57	3.98	2.23	1.14	2.40
11.	April	0.62	1.92	0.86	2.61	3.01	2.60	1.99	1.09	1.74
12.	May	0.42	1.46	0.74	2.02	2.52	2.02	1.60	1.06	1.28

Table 4 : Water level fluctuation in the wells on downstream side of cement check dam

Sr. No.	Months	Water level depths in the wells(m)						Increase in water table (2004-05)		
		Pre-development (2002-2003)			Post-development (2004-2005)					
		W_{10}	W_{11}	W_{12}	W_{10}	W_{11}	W_{12}	W_{10}	W_{11}	W_{12}
1.	June	1.5	0.9	1.6	2.9	2.1	3.3	1.4	1.20	1.70
2.	July	3.7	1.80	2.5	5.15	3.23	4.4	1.45	1.43	1.90
3.	Aug.	5.4	3.9	3.34	7.00	5.9	5.6	1.6	2.00	2.26
4.	Sept.	7.1	4.8	5.3	9.10	7.8	9.1	2.0	3.00	3.80
5.	Oct.	6.71	4.2	4.5	8.70	7.5	8.5	1.99	3.30	4.00
6.	Nov	5.39	3.5	3.8	7.36	6.39	7.75	1.97	2.89	3.95
7.	Dec.	4.61	2.12	3.33	6.49	4.66	6.12	1.88	2.54	2.79
8.	Jan.	3.08	1.3	2.59	4.9	3.16	4.45	1.82	1.86	1.86
9.	Feb.	2.36	0.8	1.79	4.4	3.10	3.70	2.04	2.30	1.91
10.	March	1.94	0.20	1.40	3.98	2.29	3.20	2.04	2.09	1.80
11.	April	1.3	0.00	0.30	3.6	1.90	2.62	2.30	1.90	2.32
12.	May	0.81	0.00	0.00	2.9	1.20	2.03	20.9	1.20	2.03

In the post development period, water level depth in all the three wells W_7,W_8 and W_9 downstream side of percolation tank ranged between 2.02-9.42m, 2.52-9.92m and 2.02-9.60m, respectively. Increase in water table for all the three wells ranged between 1.10m, 1.06-4.60m and 1.08-3.61m, respectively.

Effect of cement check dam:

From the Table 4, it reveals that before the development of Darakwadi watershed water level depth in the wells W_{10}, W_{11} and W_{12} down stream side of the cement check dam, water level depth in the wells ranged between 0.81m, 0.0-4.80m and 0.0-5.30m, respectively.

In the post development period, water level depth in all the three wells W_{10}, W_{11} and W_{12} downstream side of cement check dam water level ranged between 2.9-9.10m, 1.20-7.80m and 2.03-9.1m, respectively. Increase in water table, all the three wells ranged between 1.40-2.30m, 1.20-2.30m and 1.70-4.00m, respectively.

Conclusion:

The average increase in water table depth in wells down stream side of earthen nala bund, composite cement nala bund, cement check dam and percolation tank was found to be 2.90m, 2.77m, 2.18m and 2.55m, respectively in the post development period in Darakwadi watershed.

Authors' affiliations:
A.P. MAGAR AND S.H. BHUTADA, Department of Farm Machinery and Power, Aditya College of Agricultural Engineering and Technology, BEED (M.S.) INDIA
V.T. BOMBALE, Department of Soil and Water Conservation Engineering, Aditya College of Agricultural Engineering and Technology, BEED (M.S.) INDIA
P.R. BHANDARI, Department of Agricultural Process Engineering, Aditya College of Agricultural Engineering and Technology, BEED (M.S.) INDIA

REFERENCES

Gore, K.P., Pendke, M.S. and Jallawar, D.N. (2000). Impact assessment of soil and water conservation structure in Darakwadi watershed, Karnataka. *J. agric. Sci.*, **13**(3) : 676-681.

***