International Journal of Current Research in Multidisciplinary (IJCRM) *ISSN: 2456-0979*
Vol. 5, No. 8, (August'20), pp. 01-05

IMPACT OF SOIL AND WATER CONSERVATION MEASURES ON GROUND WATER RECHARGE AT MANDAKHALI WATERSHED, MAHARASHTRA

S. R. Ullewad[1], M. R. More[2]
[1]*Assistant Prof.(Ag. Engg.) College of Agriculture, Naigaon, Dist. Nanded*
[2]*Assistant Prof.(SWCE), College of Agril. Engg. and Technology, VNMKV Parbhani*

ABSTRACT

Explosion in population, has led to increase in demand of various natural resources, including that of the most precious resource-water, especially for irrigation and agricultural purposes. Over exploitation of water resources affects the ecology of the region and affects the sustainability. Thus, a judicious use of water resources, especially in semi-arid and rural areas of India calls for good watershed management practices and implementing it in a watershed/micro-watershed. Efficient management and utilization of soil and water are important to increase in groundwater and irrigation potential per unit area. This paper highlights the impact of soil and water conservation measures on ground water recharge. The present study was carried out at Mandakhali watershed in Parbhani District, Maharashtra in the year of 2017-18. The average increase in1.295 m water table was found as compared to before construction of SWC measures in the Mandakhali watershed.

KEY WORDS: *SWC Measures, Ground Water Recharge*

INTRODUCTION

Soil and water are the two most important natural resources required for the survival of living things on the earth. The basis source of water is rainfall. In India rainfall is uneven, erratic and varies from place to place and from year to year. In Maharashtra rainfed agriculture is characterized namely by low productivity, degraded natural resources and wide spread poverty. The factors, which are responsible for the low level of productivity in the state, are obviously soil erosion and low irrigation coverage. Limited irrigation facilities, erratic behaviour of monsoon, constant threat of drought to nearly half of the gross cropped area are the basic factors inhibiting progress of agriculture in the state. 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.

In most of the developed watersheds with concerted efforts to manage rainwater, the groundwater availability is improved not only in the watershed, but the downstream areas also benefited with increased groundwater recharge (Wani et al. 2003, Sreedevi et al. 2006, Pathak et al. 2007). Along with the increased surface and groundwater availability and concomitant private investments also substantially increased in the developed watersheds, resulting in the increased incomes as well as improved livelihoods (Sreedevi et al. 2006, 2008 and Pathak et al. 2007). 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 helping 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. 2000).

METHODOLOGY

Mandakhali watershed is situated in Parbhani District of Maharashtra State. It is located 16 km towards West from District headquarters. The jurisdiction of Mandakhali encompasses watershed 19°14'N latitude and 76°38'E longitude at 400 m from mean sea level. The watershed comes under assured rainfall zone. The total geographical area of Mandakhali watershed was 2167.03 ha, out of that 1920 ha area was under cultivation. The topography was flat to undulating. The general slope of cultivable land ranges from 1 to 3 per cent while slope of non-cultivable land ranges from 3 to 15 per cent. The average annual rainfall ranges from 750-800 mm, which is uneven, erratic and varies from year to year. South-West monsoon is the major source of rainfall and about 90 per cent rainfall receives during monsoon season i.e. from the month of June to October.

Table 1: Soil and Water Conservation Measures at Mandakhali watershed

Sr. No.	Name of SWC Structures	No. of structures or Area
1.	Graded Bunds	250 ha
2.	Farm Ponds	15 No.
3.	Deep Continuous Contour Trenches	66 ha
4.	Cement Nala Bunds	9 No.

Measurement of water table level:

In the study area of five observations wells, which located in the zone of influence of the SWC measures were selected for ground water level monitoring. Water levels in the wells were monitored fortnightly from the 15th June 2017 to 15th May 2018. The information regarding the water levels in wells before village development was collected from Office of TAO, Department of Agriculture, Parbhani. The water levels of selected wells before and after development of SWC measures were compared.

RESULTS AND DISCUSSION

The data on water level in open wells W1, W2 and W3 located at downstream side of CNBs is presented in Table 2.

Table 2: Water level in the selected wells located at downstream side of CNBs during the year 2017-18

Sr. No	Observation date	Depth of impounded water level in the well (m)						Increase in water table depth (m)		
		Pre development 2014-15			Post development 2017-18					
		W_1	W_2	W_3	W_1	W_2	W_3	W_1	W_2	W_3
1.	15th June, 2017	0.70	0.55	0.70	1.26	0.96	1.20	0.56	0.41	0.50
2.	30th June	0.82	0.72	0.83	1.44	1.05	1.29	0.62	0.33	0.46
3.	15th July	0.95	0.85	0.95	1.59	1.20	1.44	0.64	0.35	0.49
4.	30th July	1.02	0.97	1.05	1.74	1.29	1.53	0.72	0.32	0.48
5.	15th August	1.28	1.10	1.20	1.95	1.53	1.68	0.67	0.43	0.48
6.	30th August	5.50	4.50	5.35	9.00	6.30	9.30	3.50	1.80	3.95
7.	15th September	8.40	6.22	9.00	10.5	8.40	12.01	2.11	2.18	3.01
8.	30th September	7.50	5.65	7.85	9.30	8.11	10.51	1.80	2.46	2.66
9.	15th October	6.85	4.80	6.97	8.70	7.50	9.30	1.85	2.70	2.33
10.	30thOctober	6.30	4.15	6.35	7.80	6.60	7.80	1.50	2.45	1.45
11.	15th November	5.45	3.85	5.00	6.60	5.70	6.00	1.15	1.85	1.00
12.	30th November	4.30	3.48	3.20	5.10	4.20	4.50	0.80	0.72	1.30

13.	15th December	2.52	2.20	2.45	3.90	3.30	3.60	1.38	1.10	1.15
14.	30th December	1.80	1.75	1.90	2.40	2.85	2.70	0.60	1.12	0.80
15.	15th January,2018	1.50	1.45	1.48	2.22	2.55	2.41	0.72	1.10	0.93
16.	30th January	1.32	1.25	1.30	2.10	2.25	2.22	0.78	1.00	0.92
17.	15th February	1.21	1.15	1.22	1.95	1.95	2.05	0.70	0.80	0.83
18.	1st March	1.10	1.07	1.05	1.85	1.80	1.85	0.75	0.73	0.80
19.	15th March	1.04	1.00	1.01	1.68	1.70	1.68	0.64	0.70	0.67
20.	30th March	0.95	0.90	0.94	1.55	1.55	1.55	0.60	0.65	0.61
21.	15th April	0.80	0.75	0.85	1.50	1.45	1.48	0.70	0.70	0.63
22.	30th April	0.72	0.68	0.75	1.42	1.38	1.45	0.70	0.70	0.70
23.	15th May, 2018	0.70	0.65	0.72	1.35	1.30	1.40	0.65	0.65	0.68
Average increase in water table								**1.103**		

Data presented in Table 2 revealed that, before development of SWC measures in 2014-15, depth of water level in three selected wells, W_1, W_2 and W_3 was too much below from ground surface. Water level depth in W_1, W_2 and W_3 wells was found in the range 0.70-8.40 m, 0.55-6.22 m and 0.70-9.00 m respectively.

After development of SWC works, runoff water was harvested at different water harvesting structures which helped to increase the water table of the wells which were situated in the zone of influence of these structures. In the year 2017-18, depth of water level in wells W_1, W_2 and W_3 was observed in the range 1.26-10.5 m, 0.96-8.40 m and 1.20-12.01 m respectively.

It could be seen from Table 2 that there was increase in water table in all wells after construction soil and water conservation measures. Increase in water level of W_1, W_2 and W_3 wells was found in the range 0.56-3.50 m, 0.32-2.70 m and 0.46-3.95 m respectively. On an average increase in 1.103 m water table depth was found in the area influencing in the zone of CNBs at post development stage.

Effect of graded bunds and farm pond:

The data on water level fluctuation in two open wells located in influencing area of graded bunds and farm ponds is presented in Table 3.

Table 3: Water levels in two open wells located at influencing area of graded bunds and farm ponds

Sr. No	Observation date	Depth of impounded water level in the well (m)				Increase in water table (m)	
		Pre development 2014-15		Post development 2017-18			
		W_4	W_5	W_4	W_5	W_4	W_5
1.	15th June 2017	0.62	0.73	0.93	1.35	0.31	0.62
2.	30th June	0.68	0.80	1.02	1.47	0.34	0.67
3.	15th July	0.75	0.93	1.17	1.62	0.42	0.69
4.	30th July	0.83	1.02	1.26	1.74	0.43	0.72
5.	15th August	0.97	1.10	1.41	1.90	0.44	0.80
6.	30th August	2.20	4.85	5.70	9.60	3.50	4.75
7.	15th September	3.95	6.77	7.50	12.31	3.55	5.54
8.	30th September	4.17	6.90	6.60	10.81	2.43	3.91
9.	15th October	4.03	6.25	5.70	9.00	1.67	2.75
10.	30th October	3.87	5.08	5.10	7.20	1.23	2.12
11.	15th November	2.95	3.35	4.50	5.40	1.55	2.05

12.	30th November	2.70	3.20	3.60	4.80	0.90	1.60
13.	15th December	2.18	3.06	3.00	5.10	0.82	2.04
14.	30th December 2017	1.98	2.90	2.70	4.50	0.72	1.60
15.	15th January 2018	1.65	2.25	2.25	4.20	0.60	1.95
16.	30th January	1.38	2.00	2.10	3.60	0.72	1.60
17.	15th February	1.25	1.82	2.01	3.30	0.76	1.48
18.	1st March	1.17	1.63	1.95	3.00	0.78	1.37
19.	15th March	1.11	1.51	1.82	2.85	0.71	1.34
20.	30th March	1.00	1.25	1.70	2.80	0.70	1.55
21.	15th April	0.91	1.10	1.55	2.77	0.64	1.67
22.	30th April	0.78	1.02	1.42	2.70	0.64	1.68
23.	15th May 2018	0.72	0.90	1.32	2.61	0.60	1.71
Average increase in water table						**1.487**	

Data presented in Table 3 revealed that, before development of SWC works in the year 2014-15, water depth in both the open wells W_4 and W_5 located in influencing area of graded bunds and farm ponds was too much below from ground surface and was found in the range 0.62-4.17 m and 0.73-6.90 m respectively. After development of SWC works maximum runoff water was harvested in the impounding area of farm ponds which helped to build up the water table of these wells In year 2017-18, water level in both the wells W_4 and W_5 was observed in the range 0.93-7.50 m and 1.35-12.31 m respectively. Increase in water table of wells W_4 and W_5 after construction of soil and water conservation works was observed and it was found in the range 0.31-3.55 m and 0.62-5.54 m respectively. On an average increase in 1.487m water table depth at the area influencing in the zone of graded bunds and farm ponds was observed.

The average increase in1.295 m water table was found as compared to before construction of SWC measures in the Mandakhali watershed.

CONCLUSIONS

Various soil and water conservation measures such as graded bunds, cement nala bunds, farm ponds constructed through Jalyukt Shivar Abhiyan at Mandakhali watershed are helped to build ground water table under their influencing area. The average increase in1.295 m water table was found as compared to the situation before construction of SWC measures in the Mandakhali watershed.

Literature Cited:

[1] Abuj, M. D., Magar P. A., Bombale V. T., Bhutada S. H. and P. R. Bhandari (2010).Impact of soil and water conservation structures on ground water recharge in Darakwadi watershed. International J. Agriculture Engineering, 3(1): 121-124.

[2] Bombale, V. T., More M. R. and D. M. Mahale (2012). Evaluation of earthen nala bunds for the Konkan region of Maharashtra state. International Journal of Agricultural Engineering, 5(1): 25-27.

[3] Bombale, V. T., More M. R. and D. M. Mahale (2012). Evaluation of cement plugs in Konkan region of Maharashtra state. International Journal of Agricultural Engineering, 5(1): 55-57.

[4] Deshmukh, A. P. (2010). Evaluation of watershed development programme implemented in Attharwadi watershed.International J. of Agricultural Engineering, 3(2) : 205 -208

[5] 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.

[6] Pathak P, Wani SP, Sudi R, Chourasia AK, Singh SN and Kesava Rao AVR. (2007). Rural prosperity through integrated watershed management: A case study of Gokulpura-Goverdhanapura in eastern Rajasthan. Global Theme on Agroecosystems Report no. 36, Patancheru 502324, Andhra Pradesh, India: International Crops Research Institute for the Semi Arid Tropics. Pp 52

[7] Pendke, M.S., Gore, K.P. and Jallawar, D.N. (1998). Impact of watershed development on farming community. Karnatka J. agric. Sci., 12(1-4 combined):118-122.

[8] Sreedevi TK, Wani SP, Sudi R, Patel MS, Jayesh T, Singh SN and Tushaar Shah. (2006). On-site and off-site impact of watershed development: A case study of Rajsamadhiyala, Gujarat, India. Global Theme on Agroecosystems Report no. 20, Patancheru 502324, Andhra Pradesh, India: International Crops Research Institute for the Semi Arid Tropics. PP 48.

[9] Sreedevi TK, Wani SP, Sudi Raghavendra Rao, Harsha Vardhan Deshmukhi, Singh SN and Marcella D'souza. (2008). Impact of Watershed Development in Low Rainfall Region of Maharashtra: A Case Study of Shekta Watershed. Global Theme on Agroecosystems Report no. xx Patancheru 502 324, Andhra Pradesh, India; International Crops Research Institute for Semi-Arid Tropics.

[10] Wani SP, Pathak P, Sreedevi TK, Singh, HP and Singh P. (2003). Efficient Management of Rainwater for Increased Crop Productivity and Groundwater Recharge in Asia. CAB International 2003. Water Productivity in Agriculture: Limits and Opportunities for Improvement. (eds. W. Kijne, R. Barker and D. Molden) pp. 199-215.

