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RAIN WATER HARVESTING FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

Water is an important resource for the development of any community. Rainfall is the major means by which freshwater is made available. As the utility increases to many fold, availability of water has become a scarce commodity. Hence, utilization of rain water is gaining significance, which otherwise wastes into oceans. To meet the growing population demands rainwater harvesting is need of the hour. The study area is a site near Chowdavaram village, Guntur District. Past rainfall records were collected and annual rainfall was computed. Water levels in the wells and bore wells near the site were measured at suitable intervals during pre and post monsoon seasons. A rainfall harvesting structure i.e., check dam was designed and constructed. Water levels were increased by and large due to construction of check dam as visualized from the depth of water level records. It was observed that the influence of check dam was more on bore wells near to which gradually decreases with distance. It is also observed that for every 5 m rise of water level, power required is reduced to half. If energy conserved is appreciated as energy produced in a society starving of resources, a lot more can be done to future generations in the form of economic savings. Hence, rainwater harvesting is the need of the hour for achieving sustainable development.

INTRODUCTION

Water is an important resource for the development of any community. India is receiving rainfall through monsoons. Hence, most of the rainfall is confined to a limited period in the year and creating a necessity of storing water for later use as surface storage or ground water storage (Garg 1996). Now-a-days, surface storage has become a big problem in terms of resources, environmental activists agitations, structural problems and large land displaced people problems. The issues related to sharing of water are also in the limelight. The disputes related to Krishna and Cauvery water sharing, Tehri dam, Narmada dam, etc. can be averted if a proper watershed management is taken up at micro level. Underground water storage is cheaper and also no land is required. The water can be tapped during non-rainy seasons for various uses. Out of the 370 M ha-m rainfall in India, 10% is contributed to ground water reserves in normal course (Subramanian 1995). One can say beyond doubt that the prosperity and progress of society has a clear relationship to this resource.

Rainfall is the major means by which freshwater is made available. As the utility increases to many folds, availability of water has become a scarce commodity. Utilization of rain water, where it is available, is called rain water harvesting. To meet the needs of present generation without compromising the abilities of future generation is termed as sustainable development. To meet the growing population demands, rain water harvesting is an important option (Murthy 1998).

OBJECTIVES OF THE STUDY

1. To design infiltration structure, i.e., check dam to infiltrate rain water.

2. Rate of infiltration at the structure, quality and quantity variation of water are to be studied.
3. To estimate change in recharge after construction of infiltration structure.

Existing Methods to Improve the Ground Water

Punmia & Pandey(1992) describes various methods to improve the Ground Water.The existing methods to improve the ground waters include: 1. Conventional type (flooding, spreading in basin, ditch and furrow method, irrigation); 2. Emergency methods (injection or by pumping); 3. Modified methods (percolation tanks, check dams, roof top collection percolation pits).

Infiltration Structures - Check Dam

By constructing the check structures, one can increase recharge of rainwater in a short duration. Rain water can be admitted into the aquifer through such structures as there will be retardation in velocity and thereby increase in flow time and finally the increased infiltration. Retention of water at such structures also increases infiltration with time and in turn water recharge. In plain areas which have gentle slope, with the construction of check dam, large amount of water can be stored and percolation of water can be increased further (Barah 1996).

In this study, check dam has been designed and constructed. In the design, non-overflow section is designed treating as a low gravity dam and overflow section is designed as surplus weir (Modi 1995). The height of check dam is 1.74 m, and length 14.295 m.

MATERIALS AND METHODS

Study area was proposed where ground water is in use and past rainfall data are available. Site identified was near to Chowdavaram village, Guntur district. Past rainfall records were collected from Regional Agricultural Research Station, Acharya, N.G. Ranga Agriculture University (ANGRAU) of A.P. Run-off from catchment was computed by using strange tables. Rainfall date are shown in Table 1.

Benchmark was setup near the check dam. Reduced levels of Open Well (OW) and Bore Wells (BW), identified as observation wells, were measured by using dumpy level. Water levels in the wells and bore wells near the check dam were measured at suitable intervals during pre and post monsoon seasons by water level recorder. Fluctuations of water levels in observation wells measured are shown in Table 2.

DISCUSSION

Table 1: Rainfall particulars of Chowdavaram village.

Year	No. of rainy days	No. of days with < 10 mm	< 2.5 mm	Total rain-fall in mm	No. of monsoon rainy days	Rainfall in monsoon, mm	% monsoon rain
1995	68	38	28	874.5	29	610.0	69.75
1996	71	55	16	1089.8	31	800.8	73.48
1997	59	25	07	1022.8	26	882.0	86.23
1998	60	34	12	671.0	27	480.0	71.53
1999	74	49	25	785.3	30	552.2	70.31
2000	88	57	34	1305.3	33	949.5	86.69
2001	83	55	26	1095.2	40	753.8	68.82
2002	82	54	30	1088.6	31	813.0	74.68
2003	54	11	14	816.3	30	590.2	72.30
2004	88	52	36	1220.8	42	912.1	74.71
2005	27	07	05	361.0	23	320.0	88.64

Table 2: Water levels and fluctuations in observation wells.

Location	Before Construction of Check Dam			After Construction of Check Dam		
	Pre Monsoon Water Level (m)	Post Monsoon Water Level (m)	Fluctuation in Water Level (m)	Pre Monsoon Water Level (m)	Post Monsoon Water Level (m)	Fluctuation in Water Level (m)
BW1	3.0	3.7	0.7	3.1	4.6	1.5
BW2	4.1	4.8	0.7	4.0	5.5	1.5
OW1	4.2	4.9	0.7	4.2	5.8	1.6
BW3	4.9	5.7	0.8	4.5	5.8	1.3
BW4	5.3	5.8	0.5	5.2	6.2	1.0
	Average fluctuations		0.62 (m)			1.38 (m)

Water levels are increased by and large due to construction of check dam as visualized from the Table 2. The average recharge in the area is estimated as 10% of rainfall and recharge is improved significantly from 10% to 22% for the given rainfall. It is observed that the influence of check dam is more on bore wells nearer to it and its influence gradually decreases with distance. It is also observed that for every 5 m rise of water level, power required is reduce to half. An average increase in storage coefficient of 0.0058 is observed after construction of check dam.

CONCLUSIONS

Increase in water table reduces energy bills and makes the cultivation economically competitive. In sustainable development conservation of fuels by reducing energy demand and also making water as a replenishable resource are the targets. If energy conservation is appreciated as energy produced in a society starving of resources, a lot can be done to future generation in the form of economic savings. Water is one among the important resources that needs proper management. Now-a-days, to arrest ground water depletion, rain water harvesting structures like check dams are extensively in use. So, it is necessary to take up measures to conserve and augment the renewable natural ground water resources. Hence, rainfall harvesting has to be taken up in a big way to reap the benefits.

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