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GROUND WATER RESOURCES OF CUDDAPAH DISTRICT, ANDHRA PRADESH

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Introduction

Cuddapah District is named after the town Cuddapah connected with Mouryans in B. C. Era and Sathavahana in 3rd Country. The district was first formed in early 19th century during the British rule. The district has a temperature climate with high temperature at summer and moderate climate with average temperature in December is 24⁰C. The district enjoys dry climate and the rainfall is low and erratic due to its peculiar geographical situation in Peninsular India. Falling in rain shadow region of Western Ghats, thus missing a major portion of the precipitation from South-West monsoon. The district is located far away from the East Coast, thus missing the most of precipitation from North-East monsoon.

The wind directions are east to South in winter and West to North-West in monsoon. A notable feature is, the winds are stronger in late winter and early summer. The moisture brought by the winds make the place neither too humid nor dry. The humidity of 40 to 75 percent is maintained in the district. The monsoon sets in by the first week of June and tapers off by the end of September. The normal rainfall of the district is 686 mm. Rainfall is expressed for the period 1987 to 1996 for this district, the trend of the rainfall during these years shows that there is an upward trend in rainfall from 1932 to 1947, 1952 to 1957, 1962 to 1967 and from 1987 to 1996 and downward trend from 1904 to 1908, 1911 to 1912, 1917 to 1919, 1931 to 1935, 1950 to 1953, 1956, 1975 to 1977 and 1984 to 1987. The minimum rainfall received in 1904 (274.59 mm) and maximum rainfall in 1996 (1386 mm). This year 1905 is classified as severe drought year.

The district is mainly drained by Pennar River and its tributaries such as Cheyyeru, Papaghni, Kundair and Sagileru. Pennar River is perennial to intermittent and the remaining rivers are intermittent to nature. Drainage is well developed in the Southern flank of Pennar River. In general, the drainage pattern is sub-dendritic to parallel. The drainage density is an index of surface run-off characteristics of the terrain and indirectly of infiltration characteristics.

Water level fluctuations:

Water levels in the water table aquifers are affected by direct recharge from precipitation, evapotranspiration, withdrawals from wells discharge to streams and sometimes changes in atmospheric pressure. Fluctuation in water level indicates both changes in the actual quantity of water stored in aquifers and movement of ground water.

One hundred and fifty eight observation wells are established by the ground water department to study the ground water fluctuations. (95 wells of departmental and 63 wells of Thungabhadra Project complex command area.) The water level data of OB wells provide record of trend of fluctuations of strata within ground water reservoirs. From the hydrographs it is seen that in general water level rise starts in the month of August and continues up to December due to precipitation. The water level starts receding from middle of December to middle of July which is due to ground water withdrawal and with no precipitation during 2nd crop period.

The following observations made from the observation well data of the premonsoon water levels of 1998-99, when compared to the normals of premonsoon water levels (1974-1993). Water levels are decreased in the range of 0.00 to 2.00 m in 21 observation wells, from 2.00 to 5.00 m in 5 OB wells, and 15 wells are fall in above 5 m. Water levels increased between 0.00 to 2.00 m in 32 OB wells and from 2.00 to 5.00 m in 22 OB wells. The decreased water levels show that the weathered zone aquifer is almost dried up and at present the first aquifer occurs between 30 and 40 m and second aquifer occurs between 70 and 80 m bgl is being tapped.

Hydrology project

For proper assessment and evaluation of ground water resource good network of purpose built observation wells called piezometers have been established in Cuddapah district under Hydrology project. So far 31 piezometers have been built under Hydrology Project in different hydrological units of Cuddapah district. The automatic water level recorders have been installed in 10 piezometers to monitor the fluctuations of water levels. The data is reentered with the help of palm-top computer.

An analysis of retrieved data shows that a definite increase in DTW in the premonsoon period, but some of the piezometers show a decline trend due to non-utilisation of groundwater in lean season and due to premonsoon showers. The decline trend is observed at Proddatur, Porumamilla, C.Kothapalli, Payasampalli piezometers as these areas received rainfall in the month of June. T.Sundupalli, Ramapuram and Puttanavaripalli received no rainfall in June and hence DTW is steadily increasing.

Ground water quality

The chemical quality of water is dependent upon the soluble salts and gases present in rocks, weathered mantle, soil, atmosphere and the duration of contact with water with formations that contribute dissolved salts. Surface water generally contains dissolved salts due to their contact with the formations for a less time, when compared with the ground water.

Among the rock types which contribute dissolved salts to ground water in the district, granites, shales, limestones, quartzites contribute in small quantities as salts of calcium and magnesium. Some isolated pockets carry high concentration of un-dissolved constituents owing to semi-arid conditions coupled with poor drainage and urban pollution around Cuddapah Town.

One hundred and eighty seven water samples spread all over district were analysed (Premonsoon 1998). The SAR values of water samples are plotted against specific conductance in U.S. Salinity diagram. Based on the conductivity values 2 samples fall in CISI group 16 samples in C2SI group 79 samples in

C3SI group, 26 samples in C3S3 group, 4 samples in C3S4 group, 2 samples in C4SI group, 12 samples in C4S2, 6 samples in C4S3 group, 17 samples in C4S4 group and 21 samples in high saline group.

The water with low values of salinity and low sodium can be used for irrigation with little danger of development of harmful levels of exchangeable sodium in soils. The water with high values of salinity and sodium may be used for growing crops having good salt tolerance provided they are used in well drained salts. Ranges of values determined for the constituents and properties of water samples analysed during premonsoon 1998 are depicted hereunder.

S.No.	C onstituent / Property	Premonsoon 1998	
		Min.	Max.
1	Calcium (Ca)	24	200
2	Magnesium (Mg)	10	131
3	Sodium (Na)	25	700
4	Potassium (K)	3	300
5	Total hardness as CaCO ₃	80	1140
6	Chloride (Cl)	20	940
7	TDS	160	10624
8	Specific Conductance	250	16600
9	Hydrogen Ion Concentration	7.15	8.60
10	Sodium Absorption Ratio (SAR)	0.65	17.25

Ground water resource evaluation studies

The ground water resource evaluation studies are carried out (based on the norms recommended by ground water estimation committee 1984 to delineate white / grey / dark zones in Vempali, Muddanur, Chapadu and Pendlimarri Mandals. On the basis of the projected stage of ground water development areas have been classified as follows: (ARDC – 1979)

White area up to 60%

Grey area between 60% and 80%

Dark area over 50%

The valley fill deposited along the river courses are important ground water reservoirs. The proximity of potential sources of recharge which are the streams giving rise to these deposits. The potential areas are along Penna, Chitravathi, Papaghni and Cheyyair river courses.

In respect of Cumbum phyllites, Badvel, Porumamilla, Kalasapadu, Gopavaram, B, Matam, B. Kodur and Atloor mandals are feasible for development of ground water through dugwells / borewells. In limestone terrain, appears to be the most potential especially where they are cavernous comparatively less potential in favour of crystallines and shales.

Based on the studies the following villages of different category fall in a dark category.

Dark areas

Mandal	Village	Formation
1.Vempalli	1.Muthukuru	Alluvium
	2. Rmireddypalli	'''
	3. Naguru	'''
	4. Vempalli	'''
2.Veerapunayunpall	5. Moilla Cheruvapalli	'''
	6. Palagiri	'''
	7. Thangedupalli	'''
3.Kamalapuram	8. Kogatam	'''
	9.Sambathur	'''
	10. Gangavaram	'''
	11. Vibhuru Rampuram	'''
	12. Kamalapuram	'''
	13. Ramachandrapuram	'''
	14. Peddacheppali	'''
	15.Chinna Cheppali	'''
	16.Yellareddypalli	'''
	17. Letapalli	'''
	18. Dadireddypalli	'''
4. Yerraguntla	19. Gopalapuram	Hard rocks
	20. Central part of Chinnadandlur	
	21. Iluru	'''
5.Muddanur	22. Uppaluru	'''
	23. Konapuram	'''
	24. Madannagaripalli	'''
	25. Ventigaripalli	'''
	26. North of Kolavali	'''
	27. Ankireddypalli	'''
	28. Veldurthi	'''
6. Chapadu	29. Vedururu	Alluvium
7. Pendlimarri	30. S of Nandimandalam	Sales,Limestnes
	31. A.Viswanthuni Kalva	Alluvium