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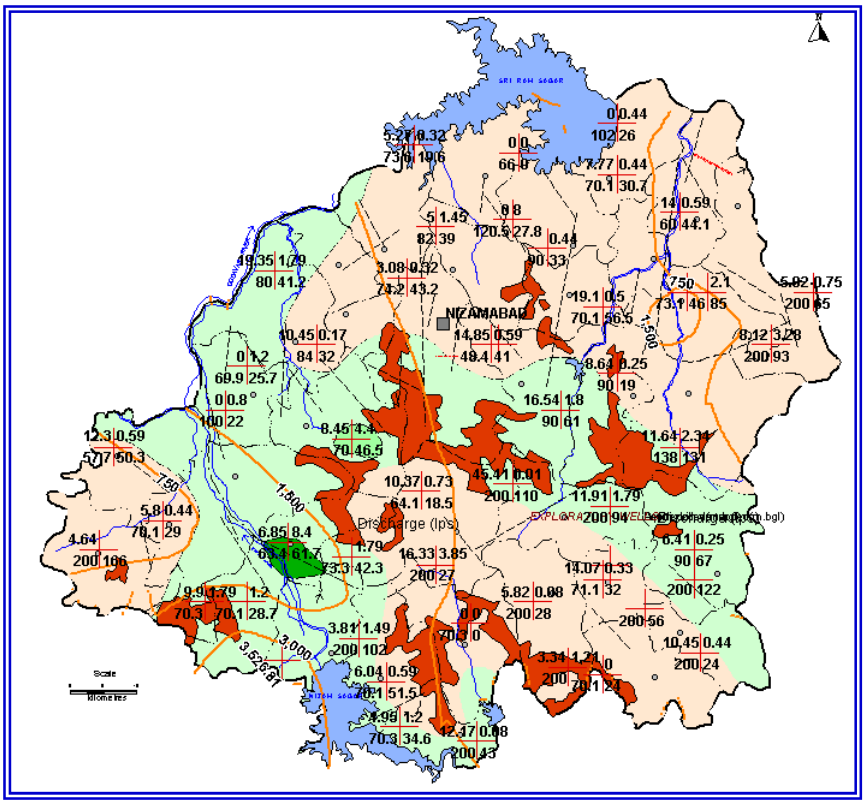
CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES
GOVERNMENT OF INDIA

GROUND WATER BROCHURE
NIZAMABAD DISTRICT, ANDHRA PRADESH



SOUTHERN REGION
HYDERABAD
September 2013

CENTRAL GROUND WATER BOARD
MINISTRY OF WATER RESOURCES
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GROUND WATER BROCHURE
NIZAMABAD DISTRICT, ANDHRA PRADESH
(AAP-2012-13)

By

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GROUND WATER BROCHURE
NIZAMABAD DISTRICT, ANDHRA PRADESH

CONTENTS

N I Z A M A B A D D I S T R I C T A T A G L A N C E

1. GENERAL

Location	North Latitude	18^0 05' 19^0 00'
	East Longitude	77^0 40' 78^0 37'
Geographical area		7956 sq.km
Headquarters		Nizamabad
No. of revenue mandals		36
No. of revenue villages		922
Population (2011)	Urban	587800
	Rural	1964273
	Total	2552073
Population density		321 per sq.km
Major rivers		Godavari, Manjira, Maneru
Soils		Black and red
Agroclimatic zone		Zone-10-Northern Telangana zone

2. RAINFALL

Actual Rainfall	845 mm

3. LAND USE (2012) (Area in ha.)

Forest	1,69,343
Barren and uncultivated	46,833
Cultivable waste	13,093
Current fallows	59,068
Net area sown	3,37,329

4. IRRIGATION (2012) (Area in ha.)

Source of irrigation	
Canals	47,182
Tanks	12,145
Dug wells	2797
Bore / Tube wells	1,45,027
Others	6,905
Net area irrigated	2,14,056
Gross area irrigated	3,98,454
Major irrigation projects	Nizamsagar and Sriramsagar
Medium irrigation projects	Pocharam, Ramadugu Koulasnala & Nallavagu

5. GEOLOGY

Major rock types	Granites, granite gneisses and basalts

6. GROUND WATER

Exploration by CGWB

No. of wells drilled			52
Major aquifer zones			8-70 m bgl
Aquifer parametres			
Transmissivity (m^2/day)		Consolidated (hard) rocks	2.6 to 117 sq.m/day
		Unconsolidated rocks	674 to 4576 sq.m/day
Storage Co-efficient		Consolidated (hard) rocks	2.8 x 10 -5 to 1.5 x 10 -4
Monitoring			
No. of observation wells			35
Dug wells			14
Piezometers	13	Manual	21
Range of water levels (May 2012)			
Min – max		2.59 and 29.32 m bgl	
Range of water levels (Nov 2012)			
Min – max		0.40 and 20 m bgl	

7. GROUND WATER RESOURCES (MCM)

Net annual ground water availability	1236.78
Net annual draft	942.25
Balance resource	282.33
Stage of ground water development	76%

8. GROUND WATER DEVELOPMENT CATEGORY

No. of mandals categorised as	
Safe (<70 % of net available resource)	24
Semi Critical (70 - 90 %)	05
Critical (90 - 100 %)	01
Over exploited (> 100 %)	06

9. CHEMICAL QUALITY

Electrical Conductivity (micro Siemens / cm at 25 deg. C)	540 to 3530
Chloride (mg/l)	28 to 546
Fluoride (mg/l)	0.18 to 1.7
Nitrate (mg/l)	Nil to 340

GROUND WATER BROCHURE
NIZAMABAD DISTRICT, ANDHRA PRADESH

1.0 INTRODUCTION

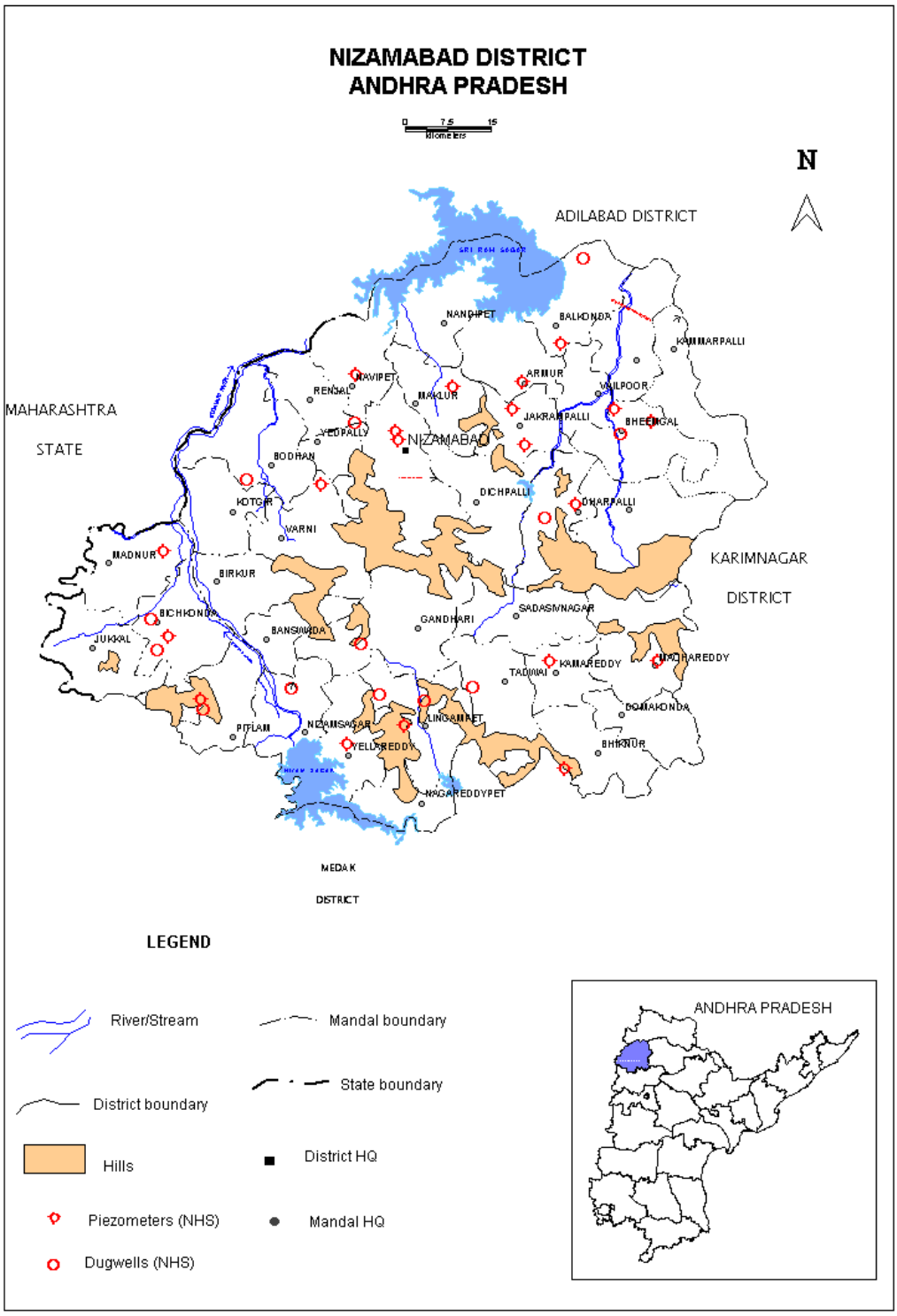
The Nizamabad district, named after the Nizam of Hyderabad Asaf Jah VI is one of the ten districts of Telangana region. The total geographical area of the district is 7956 sq.km i.e., about almost 3 percent of the total area of the State. The district is located in North Western part of the State bordering Maharashtra State. It lies between 18º 05" 00' and 19º 00" 00' North latitudes and 77º 32" 00' and 78º 40"' 00' East longitudes (**Fig.1**). Nizamabad district is primarily an agrarian district ranking first among Telangana districts of the State with almost 80% populace living in rural areas. The district has a population of 25,52,073. Density of population in the district is 321 persons/ km^2.

1.1 Drainage

The district falls under Godavari river basin. The two tributaries Manjira and Maneru join the Godavari. The Manjira flows from South East to North West and then towards North, takes an easterly turn and then flows in NNE direction before joining the Godavari at Kadakurthi (Sangam). The Maneru river flows from Kamareddy towards south east in the district.

The drainage predominantly forms dendritic pattern, which is governed by lithology of the area in absence of structural control. Granitic and basaltic terrains mainly exhibit this type of pattern while the rare parallel to sub-parallel drainage pattern locally exhibited in alluvial areas.

Fig.1 : Administrative Map of Nizamabad district, A.P



1.2 Land Use

The land use particulars of the District for the year 2012 are shown in **Table-1**.

Table-1: Land Use Pattern (2011-2012).

Sl. No.	Category	Area in Ha
1	Forest	169343
2	Barren & uncultivable lands	46833
3	Land put to non-agricultural use	97053
4	Cultivable waste	13093
5	Permanent pastures	19780
6	Land under miscellaneous, tree, crops and grooves not included in net sown area	1540
7	Other fallow lands	51561
8	Current fallow lands	59068
9	Net area sown	337329
10	Area sown more than once	226460

1.3 Cropping Pattern

The district is the most developed agrarian district of the State. Paddy and Maize are the main crops grown in the district. Other crops include Bengalgram, jowar, groundnut, cotton, turmeric, chillies, greengram, black gram, soyabeen, Sugarcane etc. Mostly long duration paddy and sugarcane are grown in perennial zone (falling under canal command area). In dry lands, crops like jowar, ragi, groundnut and cotton are cultivated.

1.4 Irrigation

Total net area of 2,14,056 ha was irrigated in the district during 2012. About 5% of net area irrigated was under surface water, while the rest 95% was irrigated by ground water.

i) Surface water:

There are two major irrigation projects namely, Nizamsagar and Sriramsagar projects and 4 medium irrigation projects namely Pocharam,

3 Ramudugu, Koulasnala and Nallavagu projects. Besides this, there are several minor irrigation projects in the district. A net area of 6650 hectares was irrigated under surface water during 2009-2010. Net area of 4319 ha was irrigated under major and medium projects and 2331 hectares under minor irrigation projects.

ii) Ground water:

Net area of 1477824 ha was irrigated under ground water during the year 2012 . Area irrigated by different sources is presented in **Table-2**.

Table2: Area irrigated by different sources (2012).

Sl. No.	Source	Net Area in Ha
1	Canals	47182
2	Tanks	12145
3	Tube wells	145027
4	Dug wells	2797
5	Other sources	6905

1.5 Studies carried out by CGWB

CGWB has covered the entire district by systematic hydrogeological surveys. The hydrogeological conditions of the district are reappraised by CGWB at regular intervals. Exploratory drilling for ground water was carried out in parts of Nizamabad district during the years 1999-2011. During this period, 112 wells in 68 locations. The details are given in table No. 3.

Table No. 3 : Exploratory well details (1999-2011)

Type of well	**Number of wells drilled**
Exploratory wells	52
Observation wells	12
Piezometers	48

The analysis of the exploration data reveals that the depth of weathered zone ranges from 5 m. to 35 m.bgl. Major area in the district is covered by the weathered zone with thickness ranging from 5 to 20 m.bgl.

The depth of first fracture encountered ranges from 5.0 m. to 30.0 m.bgl. In about 83% of the wells drilled, the shallow fractures occur between 10.0 – 25.0

m.bgl. The drilling discharge of these shallow aquifers varies from 0.01 lps to 2.5 lps.

Deeper fractures were encountered upto a depth of 166 m.bgl. About 77% of the fractures are encountered in 25 to 75 m.bgl depth range. In majority of the wells, the yield is less than 2.0 lps. About 88% of the fractures yield between 0.1 to 2.0 lps.

Ground water regime in the district is monitored four times in a year on regular basis through a network of 19 dug wells and 13 purpose built piezometers.

2.0 RAINFALL

The annual rainfall of the district is 845 mm during 2012. The mean monthly rainfall distribution is given in **Figure 2.**

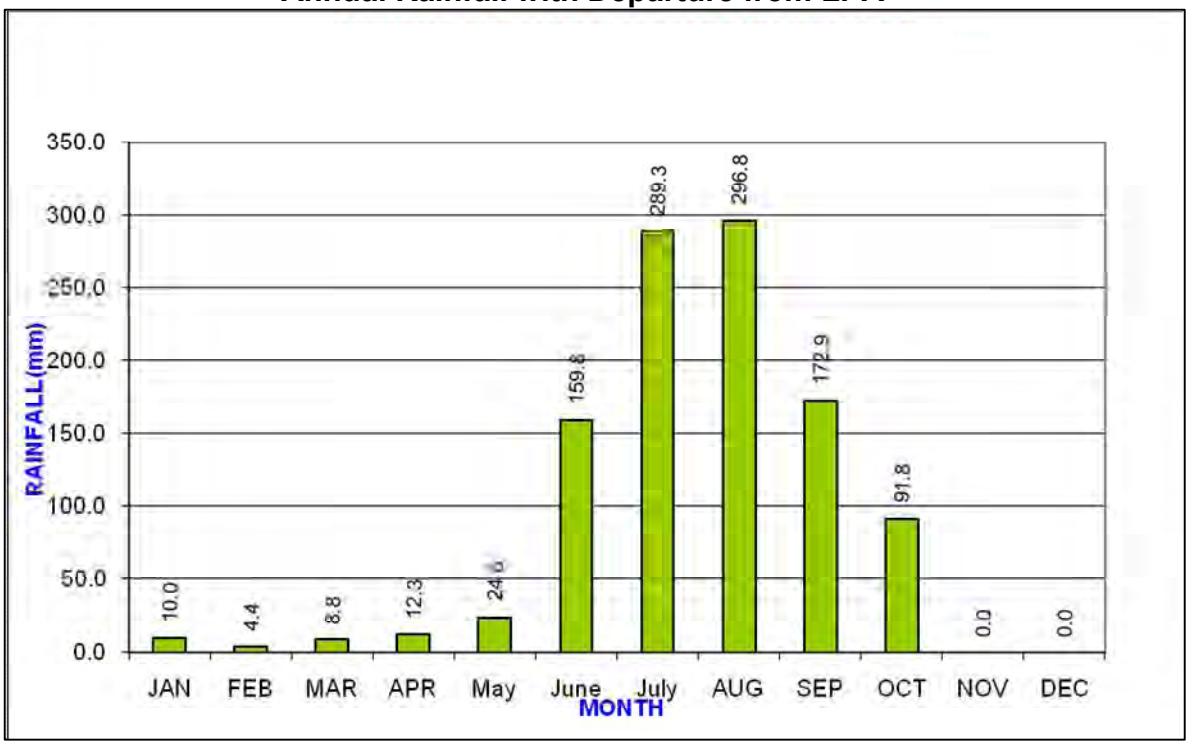
The annual and seasonal rainfall distribution with its departure from mean along with percentage distribution year-wise is given in **Table 4**. The data is presented in **Figure 2**. The annual rainfall ranges from 685 mm in 2002 to 1198 mm in 2005. The annual rainfall departure ranges from -36 % in 2002 and 2009 to 12 % in 2005. The southwest monsoon rainfall contributes about 86 % of annual rainfall. It ranges from 565 mm in 2002 to 993 mm in 2000. The year 2002, 2004 and 2009 experienced drought conditions in the district as the annual rainfall recorded in these three years is less than 75% of normal. The distribution of annual rainfall and its departure from normal is presented in **Figure 2**. It indicates that, the cumulative rainfall departure as on 2011 is negative i.e. -169%, showing rainfall deficit.

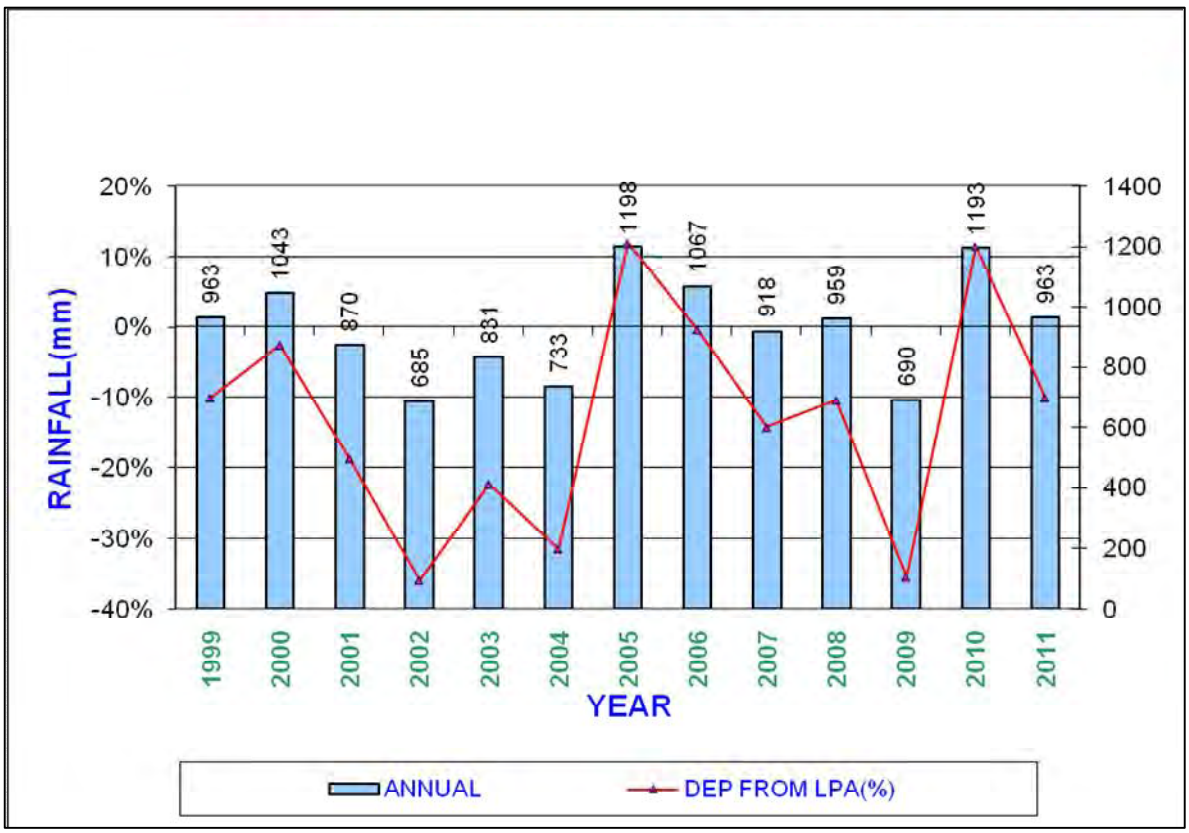
TABLE : 4 MONTHLY RAINFALL DISTRIBUTION (1999-2011)

Sl No	YEAR	ANNUAL	SWM	NEM	WINTER	SUMMER	SWM(%)	NEM(%)	WINTER (%)	SUMMER (%)	DEP FROM LPA (%)
1	1999	963.0	866.0	59.0	0.0	38.0	89.93%	6.13%	0.00%	3.95%	-10%
2	2000	1043.0	993.0	6.0	4.0	40.0	95.21%	0.58%	0.38%	3.84%	-3%
3	2001	869.9	693.0	116.9	1.0	59.0	79.66%	13.44%	0.11%	6.78%	-19%
4	2002	684.8	564.8	52.0	35.0	33.0	82.48%	7.59%	5.11%	4.82%	-36%
5	2003	831.4	750.0	44.0	6.0	31.4	90.21%	5.29%	0.72%	3.78%	-22%
6	2004	733.1	598.7	54.0	8.4	72.0	81.67%	7.37%	1.15%	9.82%	-32%
7	2005	1197.8	984.5	102.3	74.8	36.2	82.19%	8.54%	6.24%	3.02%	12%
8	2006	1066.6	881.0	59.7	0.0	125.9	82.60%	5.60%	0.00%	11.80%	0%
9	2007	917.6	872.2	37.2	0.0	8.2	95.05%	4.05%	0.00%	0.89%	-14%
10	2008	959.3	845.1	13.2	12.1	88.9	88.10%	1.38%	1.26%	9.27%	-10%
11	2009	689.7	596.4	67.6	0.0	25.7	86.47%	9.80%	0.00%	3.73%	-36%
12	2010	1192.7	952.5	192.8	38.7	8.7	79.86%	16.17%	3.24%	0.73%	11%
13	2011	962.9	908.2	15.6	4.2	34.9	94.32%	1.62%	0.44%	3.62%	-10%
		1070.7	**918.8**	**91.8**	**14.4**	**45.7**	**85.82%**	**8.57%**	**1.35%**	**4.26%**	

Note : SWM= South west monsoon, NEM = North east monsoon

Fig.2: Monthly Rainfall Distribution of LPA and Annual Rainfall with Departure from LPA





3.0 GROUND WATER SCENARIO

3.1 Hydrogeology

From ground water point of view, the geological formations of the district can be grouped into two categories 1) consolidated (hard rocks) and 2) Unconsolidated (soft rocks). Though ground water is known to occur in both the units, a greater part of the district is underlain by hard rocks comprising granites, gneisses, basalt etc. These hard rocks are devoid of any primary porosity and the occurrence of ground water largely depends on a) secondary porosity b) degree and extent of weathering c) degree and extent of fissuring/fracturing of the rocks d) degree of inter-connection of fractures, fissures and voids e) the intensity and distribution of rainfall.

Ground water in the hard rocks occurs in the weathered mantle under phreatic conditions down to a depth of 15 to 20 m bgl and in fractured zones, under semi-confined conditions down to a depth of 70 to 85 m bgl. However, in basalts, ground water is reported to occur mostly under unconfined conditions. Laterites occur as capping on basalts/Deccan traps. Ground water occurs in these rocks under unconfined conditions in weathered zones. The hydrogeology with yield prospects are presented in **Fig.3**.

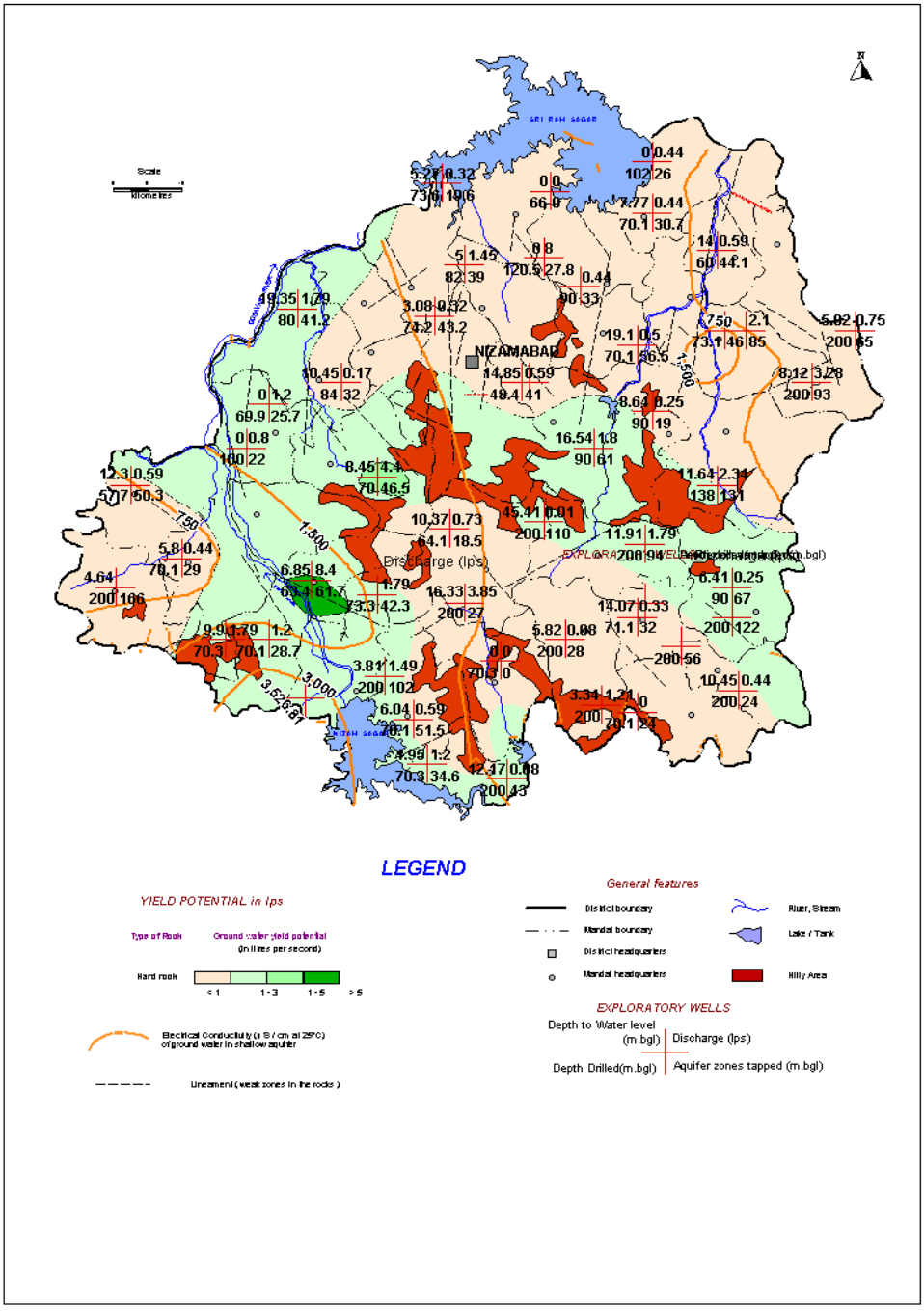
Depths of dug wells in hard rocks vary between 15 and 20 m with yields varying between 25 and 170 cu.m/day, generally, around 50 to 80 cu.m/day. The depths of bore wells mostly of 16.5 cm diameter generally vary between 50 and

70 m. They yield 3 to 10 cu.m/hr in general and occasionally upto 20 cu.m/hr. The potential zone generally occurs between 18 and 40m and occasionally down to 70 m. Transmissivity values vary between 2.6 and 117 sq.m/day and storage coefficient values vary between 2.8 x 10^{-5} and 1.9x10^{-4}.

Alluvial deposits generally occur as flood plains in the valley areas of the Godavari, Manjira and Phulung vagu. The alluvial deposits have primary porosity. The groundwater in these formations occurs under unconfined to confined conditions (with occurrence of intermittent clays). The thickness of these alluvial deposits is upto 10-12 meters.

The depths of filter points in alluvium vary between 9.75 and 15.77 m. the water levels vary between 5.04 and 5.08 m and the discharges vary between 8.7 and 9.3 liters/second and the transmissivity values vary between 674 and 4576 m^2/day.

Fig. 3: Hydrogeology – Nizamabad district, A.P

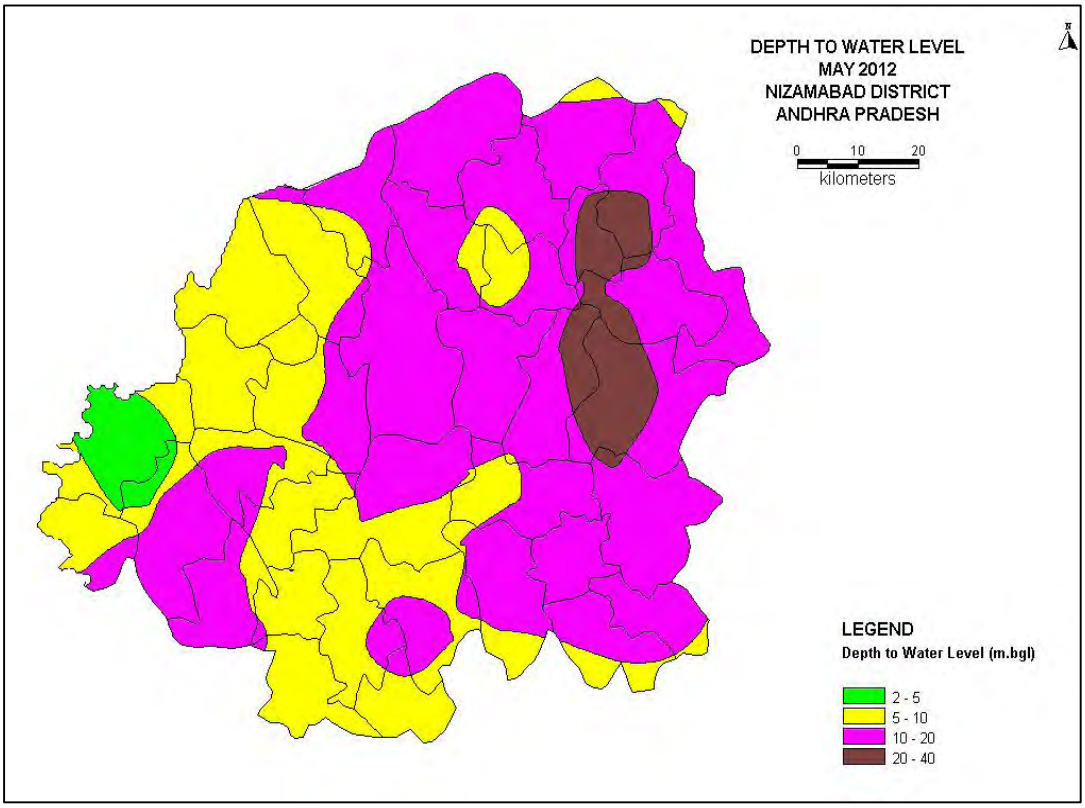


3.2 Depth to water level

3.2.1 Pre-monsoon

A perusal of the maps prepared from pre monsoon water level data (May, 2012) collected from observation wells of C.G.W.B shows that the depth of water level in the district vary between 2.59 and 29.32 m bgl. The depth to water levels in major part of the district varies between 5 and 20 m bgl **(Fig.4**). Shallow water levels are noticed in small areas on western side of the district, while deeper water levels of more than 20 m bgl are noticed in eastern side of the district.

Fig.4: Depth to Water Level – Pre monsoon (May 2012)

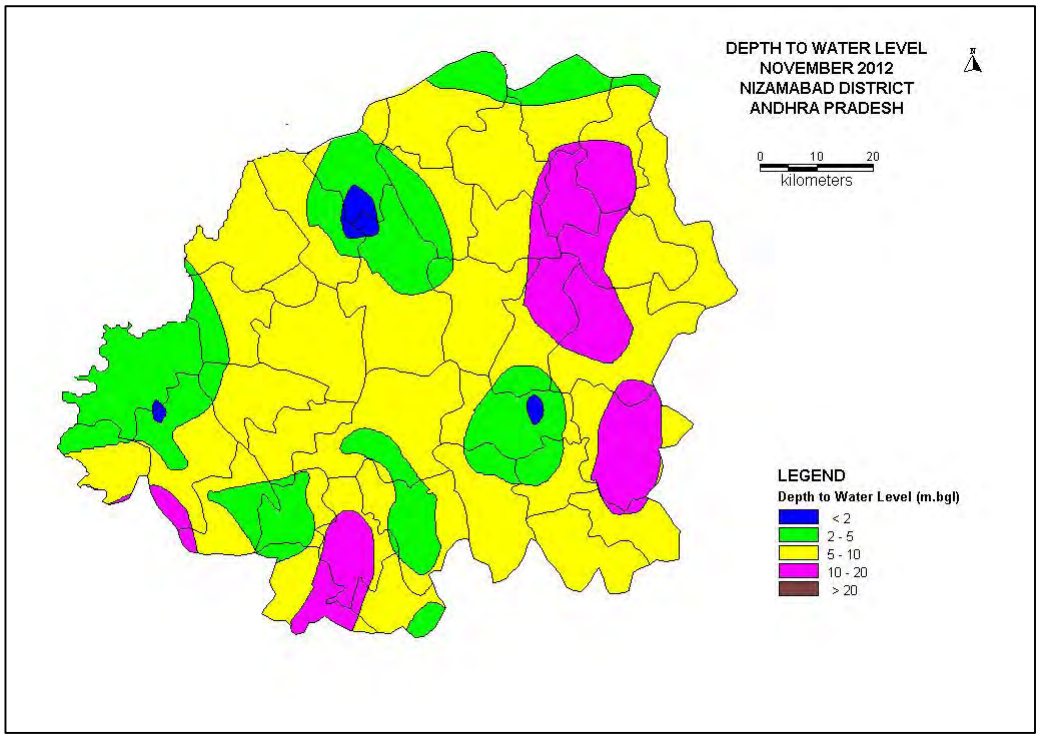


3.2.2. Post-monsoon

A perusal of the depth to water level map of November, 2012 shows that the water levels vary between 0.40 and 20 m. In major part of the district, depth to water level of 2-10 meters is noticed (**Fig.5**). Deeper water levels of more than

10 m are noticed in eastern and south eastern side of the district, while shallow/water logged condition with less than 2 m depth to water level is noticed in small patches in northern, western and south eastern part of the district.

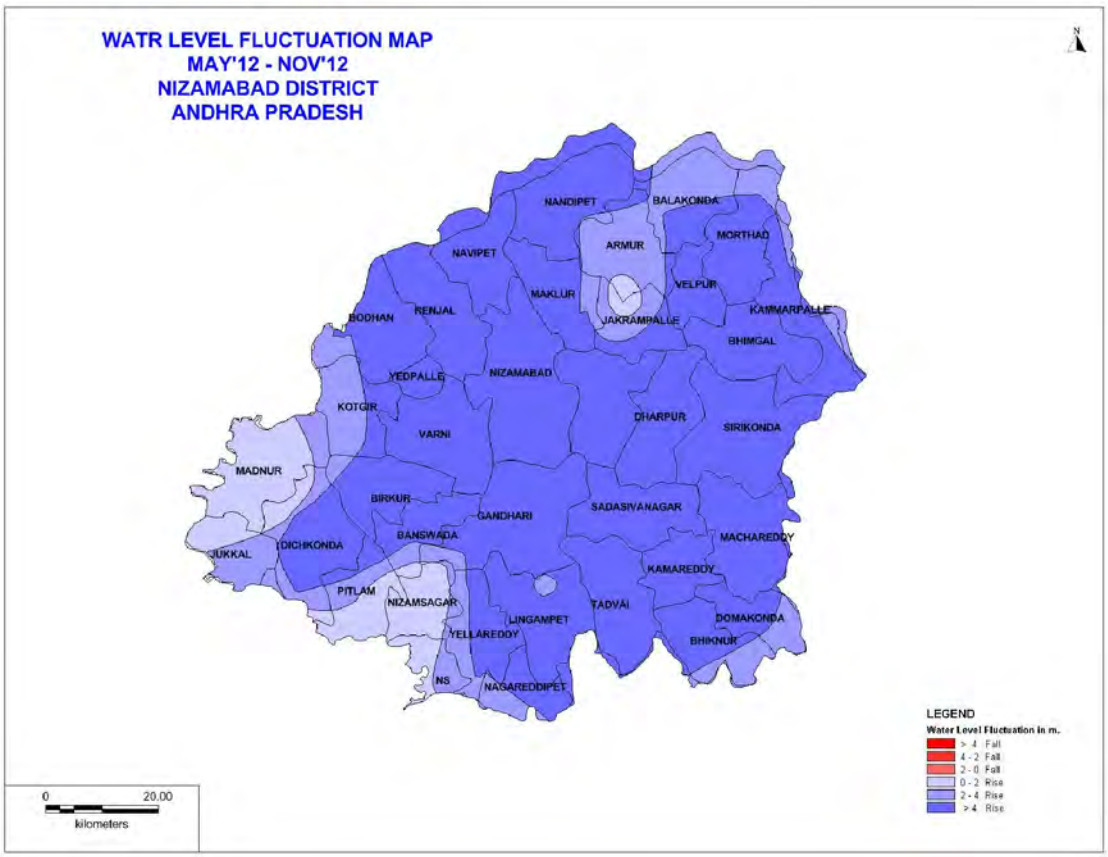
Fig.5: Depth to Water Level – Post monsoon (Nov-2012)



3.2.3 Water level fluctuation

Water level fluctuation between pre-monsoon (May, 2012) and post-monsoon period (November, 2012) is presented in **Fig.6**. The perusal of the map shows that rise in water level varies between less than 2m (0.03) and more than 4m (16.48) is observed. In majority of the area is covered with water level rise of more than 4 m. Water level fall is not noticed in the district.

Fig.6: Water Level Fluctuation (Pre – Post, 2012)



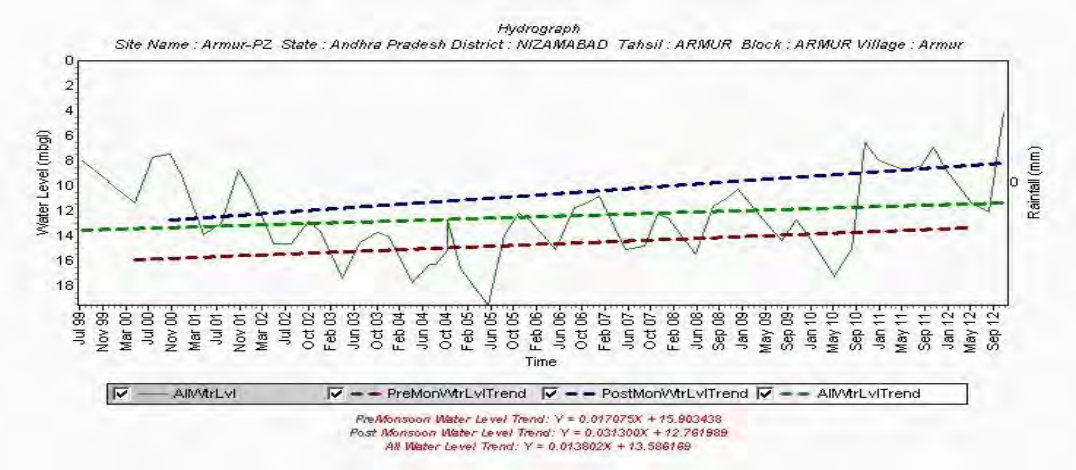
3.2.4 Long term water level trend

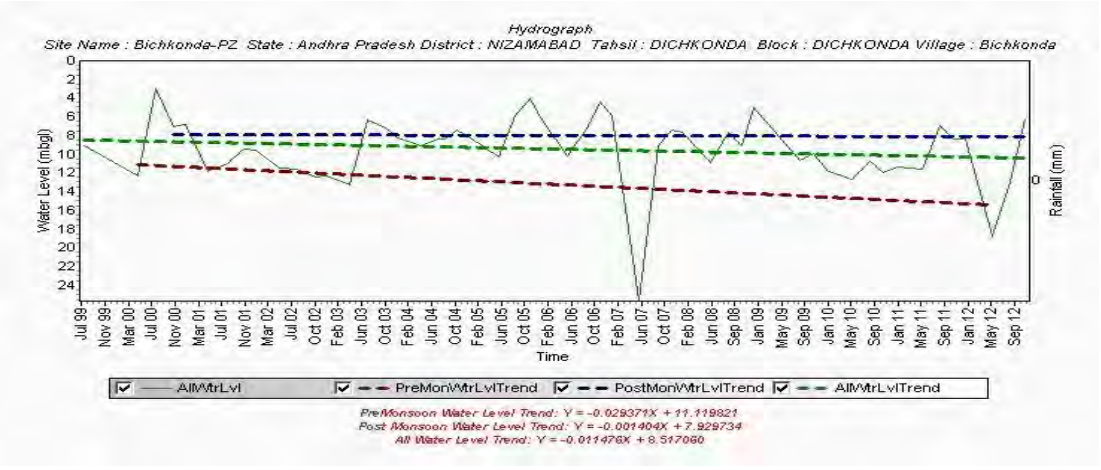
i) Pre-monsoon

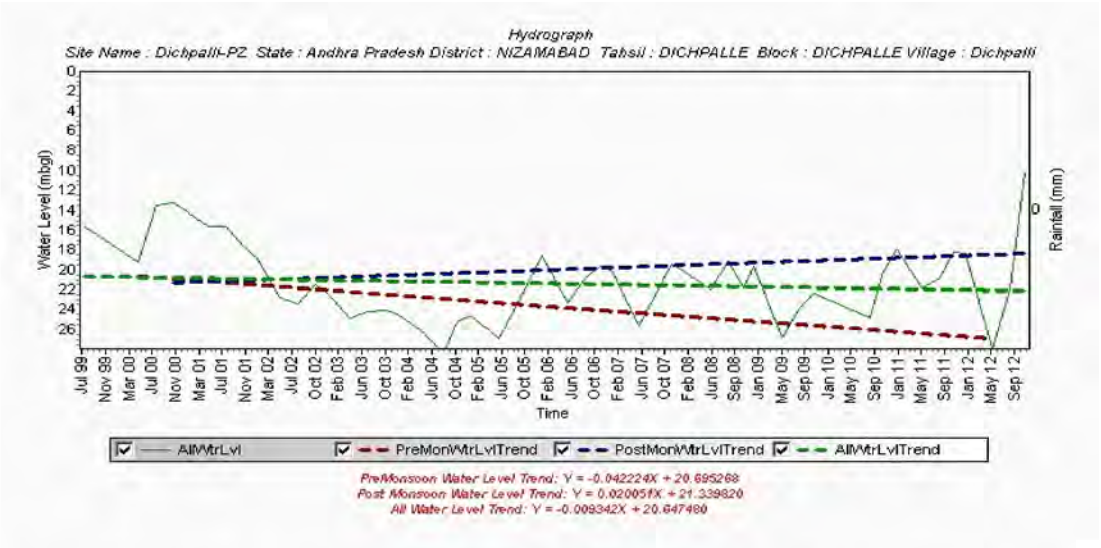
Water level trend data analysis during last decade (2001-2011) shows that the water level fall ranges from 0.018 to 0.54 m/year and Rise ranges from 0.04 to 0.53 m/year. The wells in the Western part of the district show falling trend where as the wells in the eastern and central part of the district shows rising trend.with the water level of pre-monsoon period of year 2011 shows that in about 50% of wells, decline in water levels is noticed. The water level decline varies between 0.07 and 1.71 meters during the last decade. A major part of the

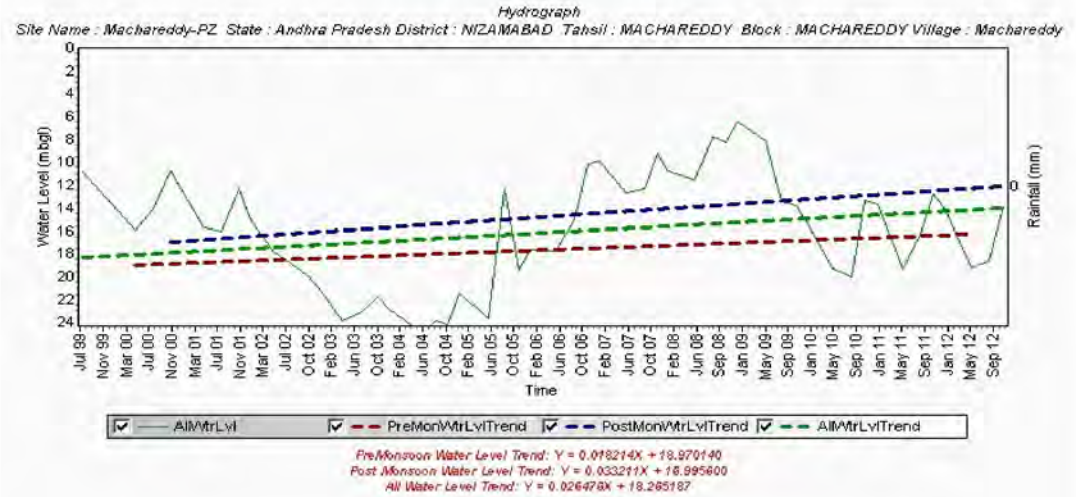
district shows water level decline of 2-4 meters (83% wells). The hydrographs of ground water monitoring wells are presented in **Fig.7**.

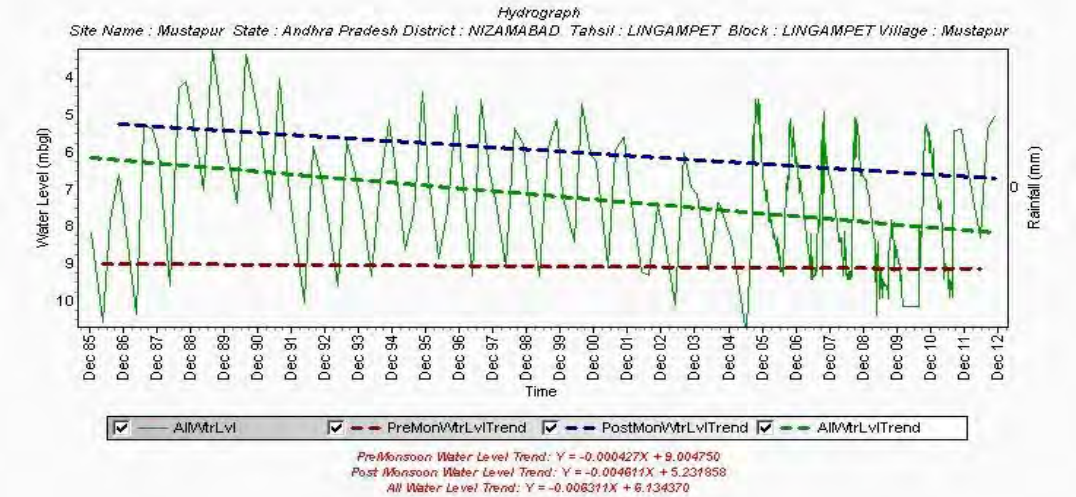
Fig.7: Hydrographs






Hydrograph
Site Name : Dichpalli-PZ State : Andhra Pradesh District : NIZAMABAD Tahsil : DICHPALLE Block : DICHPALLE Village : Dichpalli
Water Level (mbgl)
Rainfall (mm)
Time
AllWtrLvl
PreMonWtrLvlTrend
PostMonWtrLvlTrend
AllWtrLvlTrend
PreMonsoon Water Level Trend: Y = -0.042224X + 20.695268
Post Monsoon Water Level Trend: Y = 0.020051X + 21.339820
All Water Level Trend: Y = -0.009342X + 20.647480


Hydrograph
Site Name : Machareddy-PZ State : Andhra Pradesh District : NIZAMABAD Tahsil : MACHAREDDY Block : MACHAREDDY Village : Machareddy
Water Level (mbgl)
Rainfall (mm)
Time
AllWtrLvl
PreMonWtrLvlTrend
PostMonWtrLvlTrend
AllWtrLvlTrend
PreMonsoon Water Level Trend: Y = 0.018214X + 18.970140
Post Monsoon Water Level Trend: Y = 0.033211X + 16.995600
All Water Level Trend: Y = 0.026478X + 18.265187


Hydrograph
Site Name : Mustapur State : Andhra Pradesh District : NIZAMABAD Tahsil : LINGAMPET Block : LINGAMPET Village : Mustapur
Water Level (mbgl)
Rainfall (mm)
Time
AllWtrLvl
PreMonWtrLvlTrend
PostMonWtrLvlTrend
AllWtrLvlTrend
PreMonsoon Water Level Trend: Y = -0.000427X + 9.004750
Post Monsoon Water Level Trend: Y = -0.004611X + 5.231858
All Water Level Trend: Y = -0.006311X + 6.134370

3.3 Ground Water Resources:

Based on the Ground Water Estimation Committee (GEC-1997) recommendations, ground water assessment was done in 2011. The mandal wise details of ground water resources for all the 36 mandals of the district is presented in **Table-5 & 6**. The total groundwater resources available in the district are 1236.78 MCM viz., 514.61 MCM in command area and 722.17 MCM in non-command area. The total ground water utilization is 942.25 MCM viz., 356.93 MCM in command area and 585.32 MCM in non-command area. Thus, the total ground water balance left is of the order of 282.33 MCM, 145.72 MCM in the command area and the rest 136.61 MCM in non-command area.

Based on the stage of ground water development, over all, the district falls under semi-critical category with stage of development of 76 per cent. The stage of development in command area of the district is 69 per cent while in non-command area, it is 81 per cent. Out of 36 mandals of the district, 24 mandals fall in 'safe' category, 5 mandals fall in 'semi-critical' category, 1 mandal falls in 'critical' category and the remaining 6 mandals fall in 'over-exploited' category. The minimum stage of ground water development of 36 per cent is in Navipet mandal, while the maximum stage of ground development with 135 per cent is in Kamareddy mandal. The mandal-wise categorization of the district is depicted in **Fig.8**.

Fig. 8: Mandal-wise Categorisation in Nizamabad district, A.P (GEC- 2008-09)

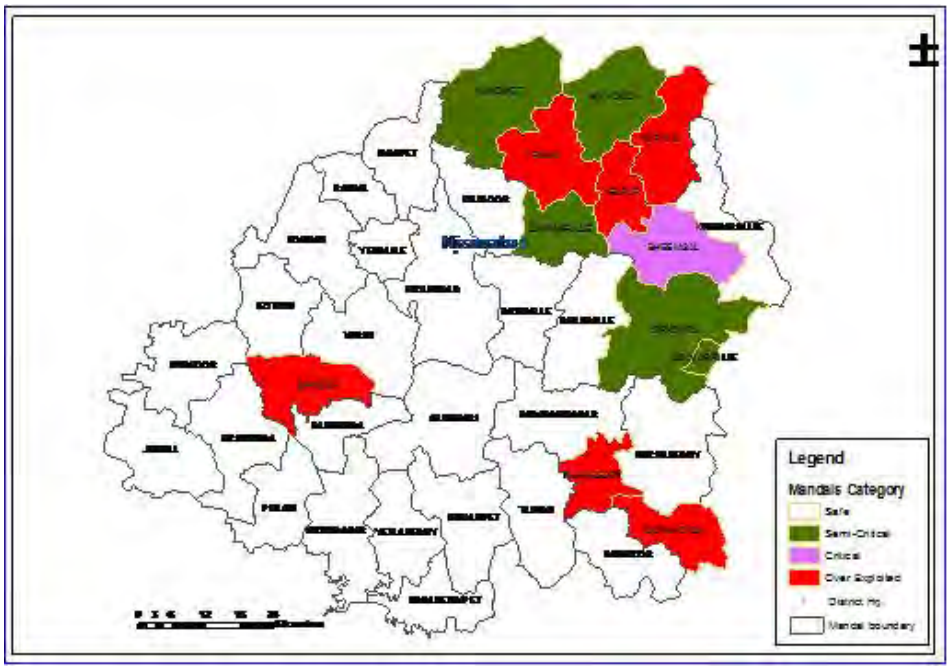


Table-5: Assessment Of Mandal-wise Dynamic Ground Water Resources of Nizamabad District, Andhra Pradesh [2008-2009] [in ha.m.]

Sl. No	Mandal	C/ NC/ T	Net annual ground water availability	Existing gross ground water draft for irrigation	Existing gross GW draft for domestic and industrial water supply	Existing gross ground water draft for all uses [11+12]	Provision for domestic and industrial require-ment supply to 2025	Net GW availability for future irrigation develop- ment [10-11-14]	Stage of ground water development {(13/10*100)} [%]
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	Armoor	C	3260	3752	30	3782	30	0	116
		NC	718	781	10	791	10	0	110
		T	3978	4533	40	4573	40	0	115
2	Balkonda	C	4795	3783	32	3815	224	788	80
		NC	141	211	5	216	5	0	153
		T	4936	3994	37	4031	229	788	82
3	Banswada	C	2748	1029	39	1068	148	1571	39
		NC	466	462	8	470	8	0	101
		T	3214	1491	47	1538	156	1571	48
4	Bheemgal	C	0	0	0	0	0	0	0
		NC	3359	3141	16	3157	155	63	94
		T	3359	3141	16	3157	155	63	94
5	Bichkunda	C	0	0	0	0	0	0	0
		NC	2738	1943	32	1975	154	641	72
		T	2738	1943	32	1975	154	641	72
6	Biknoor	C	0	0	0	0	0	0	0
		NC	2523	2765	46	2811	46	0	111
		T	2523	2765	46	2811	46	0	111
7	Birkur	C	5969	3730	46	3776	199	2040	63
		NC	369	161	7	168	9	199	46
		T	6338	3891	53	3944	208	2239	62
8	Bodhan	C	5362	3581	45	3626	264	1517	68
		NC	1053	696	16	712	44	313	68
		T	6415	4277	61	4338	308	1830	68
9	Dharpally	C	0	0	0	0	0	0	0
		NC	3289	2608	29	2637	178	503	80
		T	3289	2608	29	2637	178	503	80
10	Dichpally	C	857	426	32	458	40	391	53
		NC	2721	2663	54	2717	58	0	100
		T	3578	3089	86	3175	98	391	89
11	Domakonda	C	0	0	0	0	0	0	0
		NC	2316	2719	47	2766	47	0	119
		T	2316	2719	47	2766	47	0	119
12	Gandhari	C	0	0	0	0	0	0	0
		NC	3327	2257	26	2283	158	912	69
		T	3327	2257	26	2283	158	912	69
13	Jakranpally	C	337	209	16	225	28	100	67
		NC	1933	1892	43	1935	43	0	100
		T	2270	2101	59	2160	71	100	95

1	2	3	4	5	6	7	8	9	10
14	Jukkal	C	0	0	0	0	0	0	0
		NC	2139	935	32	967	121	1083	45
		T	2139	935	32	967	121	1083	45
15	Kamareddy	C	0	0	0	0	0	0	0
		NC	2077	2738	58	2796	58	0	135
		T	2077	2738	58	2796	58	0	135
16	Kammarpally	C	489	463	6	469	15	11	96
		NC	3175	2395	21	2416	139	641	76
		T	3664	2858	27	2885	154	652	79
17	Kotagiri	C	3904	2507	40	2547	234	1163	65
		NC	418	164	44	208	44	210	50
		T	4322	2671	84	2755	278	1373	64
18	Lingampet	C	0	0	0	0	0	0	0
		NC	3541	2048	35	2083	131	1362	59
		T	3541	2048	35	2083	131	1362	59
19	Machareddy	C	0	0	0	0	0	0	0
		NC	4897	3364	33	3397	332	1201	69
		T	4897	3364	33	3397	332	1201	69
20	Madnoor	C	0	0	0	0	0	0	0
		NC	2248	1674	35	1709	140	434	76
		T	2248	1674	35	1709	140	434	76
21	Makloor	C	2700	1756	23	1779	160	784	66
		NC	400	276	32	308	32	93	77
		T	3100	2032	55	2087	192	877	67
22	Morthad	C	1995	2130	74	2204	74	0	110
		NC	1781	1971	32	2003	32	0	112
		T	3776	4101	106	4207	106	0	111
23	Nagireddypet	C	0	0	0	0	0	0	0
		NC	1900	1595	63	1658	143	162	87
		T	1900	1595	63	1658	143	162	87
24	Nandipet	C	3245	2280	12	2292	206	759	71
		NC	1480	1089	45	1134	71	320	77
		T	4725	3369	57	3426	277	1079	73
25	Navipet	C	3421	1389	11	1400	123	1909	41
		NC	1253	233	27	260	27	993	21
		T	4674	1622	38	1660	150	2902	36
26	Nizamabad	C	2244	1854	9	1863	167	223	83
		NC	2554	1979	23	2002	134	441	78
		T	4798	3833	32	3865	301	664	81
27	Nizamsagar	C	1087	288	12	300	55	744	28
		NC	1694	1096	47	1143	82	516	67
		T	2781	1384	59	1443	137	1260	52
28	Pitlam	C	0	0	0	0	0	0	0
		NC	2252	1800	76	1876	125	327	83
		T	2252	1800	76	1876	125	327	83
29	Renjal	C	1704	927	8	935	102	675	55
		NC	203	55	46	101	46	102	50
		T	1907	982	54	1036	148	777	54
30	Sadashivanagar	C	0	0	0	0	0	0	0
		NC	2937	2500	42	2542	121	316	87
		T	2937	2500	42	2542	121	316	87
1	2	3	4	5	6	7	8	9	10

31	Sirikonda	C	0	0	0	0	0	0	0
		NC	4923	3957	49	4006	95	871	81
		T	4923	3957	49	4006	95	871	81
32	Tadwai	C	0	0	0	0	0	0	0
		NC	2367	1685	54	1739	175	507	73
		T	2367	1685	54	1739	175	507	73
33	Velpoor	C	694	690	10	700	10	0	101
		NC	1267	1305	72	1377	72	0	109
		T	1961	1995	82	2077	82	0	106
34	Varni	C	4488	3119	15	3134	227	1142	70
		NC	1094	199	52	251	52	843	23
		T	5582	3318	67	3385	279	1985	61
35	Yedapally	C	1897	1081	11	1092	99	717	58
		NC	0	0	0	0	0	0	0
		T	1897	1081	11	1092	99	717	58
36	Yellareddy	C	265	216	12	228	12	38	86
		NC	2664	1882	36	1918	174	608	72
		T	2929	2098	48	2146	186	646	70
District		C	51461	35210	483	35693	2417	14572	69
		NC	72217	57239	1293	58532	3261	13661	81
		T	123678	92449	1776	94225	5678	28233	76

Table-6: Mandal-wise Categorisation [2008-2009] of Nizamabad District

Sl. No	Mandal	C/ NC/ T	Stage of ground water develop ment [%]	Pre-monsoon		Post monsoon		Category [safe/ semicritical/ Critical/ Over exploited] Is there a significant decline [YES/NO]
				Water level trend cm/yr	Is there a significant decline [YES/NO]	Water level trend cm/yr	Water level trend cm/yr	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	Armoor	C	116	24	Yes	42	Yes	Over Exploited
		NC	110	24	Yes	42	Yes	Over Exploited
		T	115	24	Yes	42	Yes	Over Exploited
2	Balkonda	C	80	11	Yes	-10	No	Semi-Critical
		NC	153	11	Yes	-10	No	Over Exploited
		T	82	11	Yes	-10	No	Semi-Critical
3	Banswada	C	39	-63	No	-22	No	Safe
		NC	101	13	Yes	-22	No	Over Exploited
		T	48	-63	No	-22	No	Safe
4	Bheemgal	C	0					
		NC	94	12	Yes	11	Yes	Critical
		T	94	12	Yes	11	Yes	Critical
5	Bichkunda	C	0					
		NC	72	-108	No	-76	No	Safe
		T	72	-108	No	-76	No	Safe
6	Biknoor	C	0					
		NC	111	13	Yes	16	Yes	Over Exploited
		T	111	13	Yes	16	Yes	Over Exploited
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
7	Birkur	C	63	-48	No	-36	No	Safe

		NC	46	-48	No	-36	No	Safe
		T	62	-48	No	-36	No	Safe
8	Bodhan	C	68	-38	No	-88	No	Safe
		NC	68	-38	No	-88	No	Safe
		T	68	-38	No	-88	No	Safe
9	Dharpally	C	0					
		NC	80	-17	No	-11	No	Safe
		T	80	-17	No	-11	No	Safe
10	Dichpally	C	53	-63	No	-22	No	Safe
		NC	100	10	Yes	-10	No	Semi-Critical
		T	89	10	No	-10	No	Safe
11	Domakonda	C	0					
		NC	119	102	Yes	123	Yes	Over Exploited
		T	119	102	Yes	123	Yes	Over Exploited
12	Gandhari	C	0					
		NC	69	-5	No	-51	No	Safe
		T	69	-5	No	-51	No	Safe
13	Jakranpally	C	67	10	No	-10	No	Safe
		NC	99.9	11	Yes	-10	No	Semi-Critical
		T	95	11	Yes	-10	No	Semi-Critical
14	Jukkal	C	0					
		NC	45	-19	No	-9	No	Safe
		T	45	-19	No	-9	No	Safe
15	Kamareddy	C	0					
		NC	135	13	Yes	16	Yes	Over Exploited
		T	135	13	Yes	16	Yes	Over Exploited
16	Kammarpally	C	96	-17	No	11	Yes	Semi-Critical
		NC	76	-17	No	11	Yes	Semi-Critical
		T	79	-17	No	11	Yes	Semi-Critical
17	Kotagiri	C	65	-176	No	-128	No	Safe
		NC	50	-176	No	-128	No	Safe
		T	64	-176	No	-128	No	Safe
18	Lingampet	C	0					
		NC	59	-17	No	1	No	Safe
		T	59	-17	No	1	No	Safe
19	Machareddy	C	0					
		NC	69	-34	No	-11	No	Safe
		T	69	-34	No	-11	No	Safe
20	Madnoor	C	0					
		NC	76	-27	No	7	No	Safe
		T	76	-27	No	7	No	Safe
21	Makloor	C	66	-165	No	-252	No	Safe
		NC	77	-165	No	-252	No	Safe
		T	67	-165	No	-252	No	Safe
22	Morthad	C	110	37	Yes	50	Yes	Over Exploited
		NC	112	37	Yes	50	Yes	Over Exploited
		T	111	37	Yes	50	Yes	Over Exploited
23	Nagireddypet	C	0					
		NC	87	-108	No	-76	No	Safe
		T	87	-108	No	-76	No	Safe
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
24	Nandipet	C	71	-153	No	72	Yes	Semi-Critical
		NC	77	-153	No	72	Yes	Semi-Critical

		T	73	-153	No	72	Yes	Semi-Critical
25	Navipet	C	41	-141	No	-98	No	Safe
		NC	21	-141	No	-98	No	Safe
		T	36	-141	No	-98	No	Safe
26	Nizamabad	C	83	-128	No	-114	No	Safe
		NC	78	-128	No	-114	No	Safe
		T	81	-128	No	-114	No	Safe
27	Nizamsagar	C	28	-63	No	-23	No	Safe
		NC	67	-63	No	-23	No	Safe
		T	52	-63	No	-23	No	Safe
28	Pitlam	C	0					
		NC	83	-108	No	-76	No	Safe
		T	83	-108	No	-76	No	Safe
29	Renjal	C	55	-141	No	-98	No	Safe
		NC	50	-141	No	-98	No	Safe
		T	54	-141	No	-98	No	Safe
30	Sadashivanagar	C	0					
		NC	87	-57	No	-90	No	Safe
		T	87	-57	No	-90	No	Safe
31	Sirikonda	C	0					
		NC	81	-17	No	11	Yes	Semi-Critical
		T	81	-17	No	11	Yes	Semi-Critical
32	Tadwai	C	0					
		NC	73	-20	No	3	No	Safe
		T	73	-20	No	3	No	Safe
33	Velpoor	C	101	24	Yes	42	Yes	Over Exploited
		NC	109	24	Yes	43	Yes	Over Exploited
		T	106	24	Yes	42	Yes	Over Exploited
34	Varni	C	70	-82	No	-99	No	Safe
		NC	23	-82	No	-99	No	Safe
		T	61	-82	No	-99	No	Safe
35	Yedapally	C	58	-38	No	-88	No	Safe
		NC	0					
		T	58	-38	No	-88	No	Safe
36	Yellareddy	C	86	-38	No	-21	No	Safe
		NC	72	-38	No	-21	No	Safe
		T	70	-38	No	-21	No	Safe

3.4 Ground Water Quality

The ground water is in general alkaline in nature with pH values varying between 6.3 and 7.6. The Electrical Conductivity (EC) values are mostly below 2000 micro Siemens/cm at 25º C. Chloride content is mostly below 250 ppm, Nitrate values are above 45 ppm in 50% of the samples, at three locations it ranges from 160 to 340 ppm). Carbonate is absent in all the water samples collected. Fluoride is within the permissible limit of 1.5 mg/l except at one location (Ansanpally) it is 1.70 mg/l. Magnesium is also within the permissible limit of 100 ppm.

Thus, the ground water of the district in general is suitable for drinking purposes. Since, water is moderate hard to hard, needs to be softened before using for domestic purposes.

From Agriculture point of view, ground water of the district from shallow aquifers mostly falls under C2 S1 and C3S1 classes with medium to high EC and low Sodium alkaline hazards as per U.S. Salinity classification for waters used for Irrigation purposes.

Thus, the ground water of the district is in general suitable for irrigation purposes.

4.0 STATUS OF GROUND WATER DEVELOPMENT

The district is dependent on ground water both for domestic and irrigation needs. During the year 2009-2010 about 95% of the net area was irrigated by ground water. At present, there are several dug wells and bore wells/tube wells which cater to the needs of domestic purposes while energized dug wells and bore wells/tube wells support Irrigation needs.

Small diameter dug wells of 1 to 3 m and of total depth of 4.5 to 16.2 meters is in vogue for domestic purposes. The water is lifted from these wells by bucket and rope also by 1 to 2 HP electric motor. Shallow bore wells fitted mostly with hand pumps and also submersible pumps of 3 to 5 HP serve the purpose of domestic needs.

The irrigation-dug wells in hard rocks are mostly rectangular in shape with length of 6-15 m and breadths of 2 to 10 m. The total depth of irrigation dug wells range from 6 to 20.2 meters with general depths of 6 to 11 meters. Extension bores of diameter ranging between 25 and 100 mm are drilled down to 10 to 25 m in many of the irrigation dug wells.

In alluvial aquifers, the development of ground water is through shallow dug wells and filter point wells. The dug wells vary in diameter between 3 and 4.6 meters and total depths vary between 5.6 and 1.5 meters. The irrigation well density is 14 wells per sq.km in the district.

The dug wells/dug-cum-bore wells in hard rock areas are operated mostly by 3 to 5 HP electric motors and yield 25 to 170 cu.m/day, generally around 50 to 80 cu.m/day, depending on the season wet or dry and the water column.

Bore wells mostly of 16.5 cm dia are drilled generally down to 50 to 70 meters. The potential zones are reported to occur generally between the

depths of 18 and 40 meters. The discharges of these bore wells drilled for irrigation purposes varies between 3 and 10 cu.m/hr in general occasionally upto 20cu.m/hr. The water is lifted generally by 5 to 7.5 HP submersible pumps. The transmissivity values of State Ground Water Department bore wells drilled under Hydrology Project vary between 6.34 and 34.82 cu.m/day.

The depth of filter points varies between 9.75 and 15.77 m. The filter points yield 30 cu.m/hr to 50 cu.m/hr, in favourable places, where the thickness of alluvium is more. The transmissivity values for the wells of APSIDC in alluvium range between from 674 to 4576 sq.m/day.

Central Ground Water Board has drilled 112 wells in 68 locations, out of which 52 are Exploratory wells, 12 are Observation wells, 48 are Piezometers which include 11 well field sites for specific yield studies . The weathered zone depth ranges from 5 m. to 35 m.bgl Major area in the district is covered by the weathered zone with thickness ranging from 5 to 20 m.bgl.

The first fracture encountered depth ranges from 5.0 m. to 30.0 m.bgl. In about 83% of the wells drilled, the shallow fractures occur between 10.0 – 25.0 m.bgl. The drilling discharge of these shallow aquifers varies from 0.01 lps to 2.5 lps.

The deeper fractures were encountered upto depth of 166 m.bgl. About 77% of the fractures fall in 25 to 75 m.bgl depth range. In majority of the wells the yield is less than 2.0 lps. About 88% of the fractures yield between 0.1 to 2.0 lps.

Exploratory bore wells drilled by State Ground Water Department and Irrigation Development Corporation of AP State down to maximum depths of 64.6 m gave discharges of 1 to 12 lps, generally upto 5 lps. Water levels varied between 2.1 and 18.7 m bgl. Transmissivity values vary between 2.5 and 142 sq.m/day. Wells drilled in alluvial formations by Ground Water Department down to 15.77 m gave discharges of 8.7 to 9.3 lps and transmissivity values of 674 to 4576 sq.m/day. Water levels varied between 5.04 and 5.08 m.

5.0 GROUND WATER MANAGEMENT STRATEGY

Ground water resource, is a vital element for human existence, has to be manage carefully, keeping in view of its sensitive nature to many stresses that act on its quantity and quality. The resource has to be continuously and carefully monitored and then utilized, wherever it is in great demand.

It is estimated that there is a total ground water balance of 282.33 MCM. Over all, the district falls under semi-critical category with stage of ground water development at 76%. Of the 36 mandals of the district, only 24 mandals fall in 'safe category',5 in Semi Critical,1 in Critical and 6 mandals fall in over-exploited category, hence much attention has to be given to management strategies to avoid over-exploitation of the ground water resources of the district.

Ground water management practices have to be initiated specially in semi-critical to over-exploited mandals (12 nos.). Proper scientific techniques have to be employed in selection of sites for dug wells and bore wells to avoid failures. Strict implementation of WALTA Act is to be adhered to.

5.1 Water Conservation and Artificial Recharge

Ground water conservation and artificial recharge works have been taken up on a large scale in the district since 2002 under Neru-Meeru, watersheds, RIDF and other programmes. District Watershed Management Agency under IWDP-III project (Phase I & II) constructed 21 check dams, 80 percolation tanks, 4 mini percolation tanks, 8585 contour trenches and 10305 farm ponds as on 20.3.2006. Apart from these, another 19473 farm ponds are under construction in the District. These artificial recharge structures are constructed to improve the ground water storage and to improve yields of wells.

Construction of artificial recharge structures in non-command areas of the District, especially in critical and over-exploited mandals should be continued. The most ideally suited artificial recharge structures are check dams and percolation tanks. The works should be taken up on watershed basis after careful assessment of the available surface run off and after meeting the needs of the existing structures. The site conditions like availability of unsaturated zone to accept recharge, permeability of soils, etc. have to be carefully studied before venturing for construction of artificial recharge structures. Central Ground Water Board has conducted mass awareness and training programmes in the district to bring awareness among public about the importance of ground water management and teach the basic skills in selection of sites and designs of artificial recharge structures.

Roof top harvesting both in urban and rural areas should be made mandatory to enhance the ground water recharge.

6.0 RECOMMENDATIONS

1. Roof top rain water harvesting in both urban and rural areas are to be made mandatory to enhance recharge to ground water system.
3. Large scale artificial recharge structures like, gully plugs, check dams, percolation tanks, recharge ponds, etc. are to be launched on war footing basis, based on topography, soil characteristics, slope, run off factors and hydrological conditions, especially in critical and over-exploited mandals, where ground water is in good demand.
4. Conjunctive utilisation of ground water and surface water to be adopted to avoid water-logging conditions, which will lead to ground water salinity problems, thereby lands becoming unsuitable for irrigation, in the long run.
5. Mass awareness programmes to be taken up at village levels, especially in non-command areas to educate farmers regarding water conservation and management techniques, regarding cropping pattern and modern irrigation methods to be adopted.
6. Ground water development to be taken first in virgin areas and exploited in phased manner, keeping an eye on the ground water regime and thereby enhance irrigation potential.
7. Farmers should be educated regarding the extent of land to be irrigated and the type of crop to be raised in a particular area, depending upon availability of water resource and financial position.
8. Old and silted tanks are to be revitalized to restore their original storage capacities.