

DISTRICT BROCHURE OF KUSHI NAGAR DISTRICT, U.P.

(A.A.P.: 2008-2009)

By

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Scientist 'B'

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DISTRICT AT GLANCE

1. GENERAL INFORMATION

i. Geographical Area (Sq. Km.)	: 2906
ii. Number of Tehsil / Block	: 3/14
iii. Number of Villages / Town	: 1572 / 7
iv. Population (as on 2001 census)	: 28,93,000
iv. Average Annual Rainfall (mm)	: 1202.8

2. GEOMORPHOLOGY

Major Physiographic Units	: Flood Plain, Sand bars, Alluvial Plain
Major Drainages	: Gandak and Little Gandak

3. LAND USE (Sq.Km.)

a) Forest area	: 818 Ham
b) Net area sown	: 225149 Ham
c) Cultivable area	: 291573 Ham

4. MAJOR SOIL TYPES

: (i) Bhat, (ii) Bangar

5. IRRIGATION BY DIFFERENT SOURCES

(Areas and Number of Structure)

Number of Tubewells / Borewells	: Govt. Tubewell – 1533 Private Tubewell – 83696
Tanks & Ponds	: Nil
Canals	: 57879 Ham
Other Sources	: 18316 Ham
Net Irrigated Area	: 161424 Ham
Gross Irrigated Area	: 264019 Ham

6. NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2007)

No. of Dugwells	: 11
No. of Piezometers	: Nil

7. PREDOMINANT GEOLOGICAL FORMATIONS

: Alluvial deposit of Quaternary Age

8. HYDROGEOLOGY

i Major water bearing formation	: Alluvium, sand and silt
ii Pre-monsoon Depth to water level during 2006 (mbgl)	: 2.81 to 4.53

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I. INTRODUCTION

Kushi Nagar constitutes a district of Gorakhpur division occupying the extreme north-eastern corner of Uttar Pradesh. Padrauna as its district headquarter. Its bounded by the district Maharajganj on the west as is partly the northern apex which is also flanked on the east by the Betia district of Bihar which, with Gopalganj district (Bihar) forms its eastern boundary. The dividing line being partly artificial and partly provided by the Gandak and Little Gandak rivers on the south of this district lies Deoria District.

Khushinagar district is formed in the year 2006. as a result of bifurcation of Deoria district consisting of three Tehsils namely Hata, Padrauma, and Tamkuhiraj along with its fourteen community Development Blocks namely Kaptanganj Ramkola, Motichak, Hata, Sukrauli Khadda, Nebua Naurangiya, Vishunpura, Padrauma, Kasiya Dudhahi, Fazilnagar, Tumkuhi and Sevarhi.

II. RAINFALL AND CLIMATE

The average annual rainfall is 1202.8 mm. The climate is sub-humid and is influenced to some extent by the proximity of the north and the existence of Terai swamps. About 90% of rainfall takes place from June to September. During monsoon surplus water is available for deep percolation of ground water.

There is a meteorological observatory at Gorakhpur, The records of which may be taken as representative meteorological conditions. January is the coldest month with mean daily maximum temperature at 23⁰C and mean daily minimum temperature at 9.9⁰C may is the hottest month with daily maximum temperature at 39⁰C and mean daily minimum temperature at 25.9⁰C. With the onset of monsoon day

temperature drop appreciably but night continue to be warm. The mean monthly maximum temperature is 19.8⁰C.

During the monsoon and post monsoon seasons the relative humidity is high and decreases in winter months. The mean monthly maximum relative humidity is 69% and mean monthly evening relative humidity is 53%.

Winds are generally light with slight increase in force in the late summer and southwest monsoon months .The mean wind velocity is 4.1 km/hr.

The potential evapotranspiration is 1422.7 mm.

III. GEOMORPHOLOGY & SOIL TYPES

Khushinagar district is a part of central Ganga plain and is almost a flat county with gentle plain and is almost a flat country with gentle slope from north–west to south-west. Main rivers of the district are Gandak and little Gandak having their tributaries apart form several lakes and ponds. Gandak flows in north-east part of the district and every year threats flood. Little Gandak flows from north to south in the western part of district with their tributaries Khanua, Mawan, Dhurachi submerged in it. Other tributaries of the river are Karma, Nakta Maghin, Undri, Koiler, Sonda, Jharhi and Bansi. The Important lakes found in the district are Rampur Tal lying south of Kasia. Kusher Tal near Dhara in Hata and Khaklumi Tal lying south east of Tamkuhi.

A major part of the soil is Bhat and consists of aluminum brought down by Gandak from Maharajganj district ridges run in winding course though the southern part of tehsil Hata making long abandoned channel of depression an lakes. Pebbles and boulders are also encountered in sinking well at several places. Bangar tract comprises the western part of Hata Tehsil is a very fertile level plain.

IV. GROUND WATER SCENARIO

HYDROGEOLOGY:

General Geology:

The district of Kushinagar forms part of the central Ganga plain and is covered entirely by deposit of quaternary alluvium. Alluvium consists of clay kankar and sand of different grades. Sand mixed with gravel and kankar forms the principal aquifers.

Sub-Surface-Geological Configuration:

The study of the sub-surface lithological log correlation reveal that there is a persistent clay bed occurring depth varying between 55 am 110 meters below ground level.

The alluvial material above the clay bed comprises sand of varying grain sizes with occasional gravel and kankar. Clay occurs in the granular zone in the form of irregular levee which reduce the effective thickness of the bed. Below the clay bed a moderately thick granular zone is occurring which appears it merge with the upper sand bed in the eastern part of the district. Borehole drilled through the granular zone reveal that it contain fine it medium grain sand with occasional gravel. The cumulative effective thickness of granular zone tapped in Kushinagar district varies from 60 to 80 meters.

Mode of Occurrence of Ground Water:

Precipitation is the principal source of replenishment of ground water. Ground water in kushinagar district occurs in the unconsolidated alluvial sediment. The shallow ground water is being topped by open well and hand pumps occur under water table conditions. While deeper aquifers are under confined /semi confined conditions.

DEPTH TO WATER LEVEL:

Based on premonsoon water level date of May 2006 of National Hydrograph station a depth to water level map of premonsoon period 2006 has been prepared. The depth of water level in the district varies from 2.81 to 4.53.

During monsoon season the natural ground water recharge take place by percolation of rainfall. To study the distribution of depth to water level during post

monsoon period, depth to water level map of Nov 2006 has been prepared. During this period depth to water level in district range from 1.15 mbgl to 3.27 mbgl.

WATER LEVEL FLUCTUATION:

The pre and post monsoon water level and fluctuation in shallow aquifer is based on the data of National Hydrograph Stations are as below:

Table-1

**PRE-POSTMONSOON WATER LEVEL & FLUCTUATION DATA OF
KUSHI NAGAR DISTRICT, U.P.**

Sl. No.	Name of Station	Premonsoon DTW mbgl May 2007	Postmonsoon DTW mbgl Nov 2007	Remark
1.	BELWA	2.81	3.27	-0.46
2.	BISUNPURA	3.35	2.92	+0.43
3.	CAPTANGANJ	-	1.77	-
4.	CHITTAUNI	3.43	1.87	+1.56
5.	FAZILNAGAR	3.85	1.22	+2.63
6.	KASIAL	-	1.15	-
7.	DHADDA	3.45	1.31	+2.14
8.	MANSURGANJ	3.46	2.23	+1.23
9.	MATHAULI	3.22	1.92	+1.30
10.	NAURANGIA	4.05	2.05	+2.00
11.	RAMBAR	4.53	3.08	+1.45

The magnitude of fluctuation depends upon the quantities of water being recharged & discharged. The water level fluctuation during pre–post monsoon period ranges from -0.46 m to +2.63 mbgl. The low fluctuation gives an idea that in Kushinagar district the shallow aquifer is highly permeable.

LONG TERM WATER LEVEL TREND:

Based an water level data of 10 years a long term water land trend for pre and post monsoon period has been worked out as summerised below:

Table-2

**WATER LEVEL TREND OF HYDROGRAPH STATIONS OF
KUSHINAGAR DISTRICT, U.P.**

Sl. No.	Location	Pre Monsoon			Post Monsoon			Annual		
		<i>Data Points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>	<i>Data (Points)</i>	<i>Rise (m/year)</i>	<i>Fall (m/yea)</i>	<i>Data Points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>
1.	Naurangia	9		0.0924	10	0.0491		37	0.0276	
2	Khadda	10		0.0802	10		0.0083	46		0.192
3	Bisunpura	10		0.0288	10	0.0234		36	0.0400	
4	Belwa	10	0.1068		10	0.0832		38	0.0903	
5	Padrauna	3			4			13		
6	Chittauni	10		0.0914	10	0.0429		37	0.0363	
7	Captanganj	8		0.0654	9	0.0332		33	0.0516	
8	Kasia - 1	8		0.0820	9		0.1667			0.0652
9	Rambar	10		0.1358	9	0.1074		34	0.0362	
10	Fazil nagar	10		0.2004	10	0.0059		38		0.0287

On personal of table it is observed that in general there is a fall in water level in premonsoon period an its ranges between 0.0288to 0.1358m/year however at Belwa it shows rising trend and is 0.1068m/year.

Fall in water level in post-monsoon period is observed at Khadda, Kasia-1 and Mathauli and it ranges between 0.0083 to 0.1667 in/year where as in remaining part trend shows positive and it varies from 0.0234 to 0.1074 m/year.

GROUND WATER MOVEMENT:

Water table contour map prepared in ground water management survey reveal that ground water movement direction is from North to south and the hydraulic gradient of water table is around 0.3 m/km.

GROUND WATER EXPLORATION:

Two exploratory wells have been drilled in past by Central Ground Water Board. The depth drilled of these wells various from 301.75 m to 317.5 mbgl. The storativity is 1.38×10^{-4} and Transmissivity ranges from 2650 m^2/day to 3918 m^2/day .

In addition to these wells number of tubewells have been drilled by State Irrigation Department and U.P. Jal Nigam. The depth of these tubewells varies from 70.0 mbgl to 120.0 mbgl. These wells were constructed to meat the irrigation requirement and drinking water purposes.

Table-3

DETAILS OF EXPLORATORY TUBEWELLS, DISTRICT KUSHINAGAR, U.P.

Sl. No.	Location/ Latitude/ Longitude/ Toposheet	Type of well	Year of Const.	Drilled Depth/ Bedrock (mbgl)	Zones Tapped (mbgl)	Water Level (mbgl)	Yield (lpm)	Draw Down (m)	Transmissivity T (m^2/day)	Storativity S	Geology
1.	Udit Nagar Degree College	EW	2003-04	317.5	57-69 119-131 155-161 185-197	4.54	2846	7.44			Alluvium
2.	Shairi Durga Mandir	EW	2003-04	301.75	59.00 65.00 74.00 80.00 11500 121.00 127.00 133.00 164.00 18200	1.54	3000	4.8			Alluvium

V. GROUND WATER RESOURCE AND ESTIMATION

The estimation of ground water resources is a basic pre requisite for sustainable development with out causing adverse effect on the ground water requirement. The ground water resources of Kushinagar district is a follows:

The evaluation of ground water resource potential of Kushinagar district has been worked out on the norms suggested by ground water estimate committee and shown in the Table-IV.

Table-4

DYNAMIC GROUND WATE RESOURCES OF KUSHINAGAR DISTRICT, UTTAR PREDESH (AS ON 31.03.2004)

Sl. No.	Assessment Units Blocks	Annual Ground Water Recharge (ham)	Net Annual Ground Water Availability (ham)	Existing Gross Ground Water Draft for All Uses (ham)	Net Ground Water Availability for Future Irrigation Development (ham)	Stage of Ground Water Development (%)	Category of Block
1	Dudhi	9828.31	9336.90	3094.34	5748.80	33.14	Safe
2	Fazil Nagar	7509.37	7133.90	4316.56	2496.98	60.51	Safe
3	Hata	8162.58	7346.32	4556.58	2432.46	62.03	Safe
4	Kaptanganj	8623.63	7761.27	3761.85	3706.89	48.47	Safe
5	Kasaya	8137.68	7323.91	5159.47	1897.88	70.45	Semi Critical
6	Khadda	15582.24	14803.13	3004.87	11568.84	20.30	Safe
7	Moti Chak	8163.35	7347.02	5008.54	2083.56	68.17	Safe
8	Nebuanaurangia	10784.68	10245.44	2558.33	7346.77	24.97	Safe
9	Padrauna	13206.67	11886.00	5537.12	5650.23	46.59	Safe
10	Ramkola	9931.92	9435.32	3472.73	5537.71	36.81	Safe
11	Sewarhi	7738.14	7351.23	2504.26	4441.60	34.07	Safe
12	Sukrauli	7055.47	6702.69	5464.55	1023.15	81.53	Semi Critical
13	Tamkuhi	9314.01	8382.61	3710.32	4251.43	44.26	Safe
14	Vishunpura	9802.24	9312.13	3149.04	5924.10	33.82	Safe
	Total	133840.29	124367.88	55298.55	64110.41	44.46	

A review of the table of ground water balance shows that availability of ground water in the district is 124367.88 ham. Various factors which are involved in ground water recharge such as rainfall, seepage from canal, seepage from applied irrigation, recharge from surface bodies like ponds, lakes and flood plain have been taken into account. The highest ground water recharge has been estimated in Khadda block, which is 15582.24 ham, where as lowest recharge is 7055.47 ham in Sukrauli block.

Similarly the ground water draft from different ground water structures such as dugwell, shallow and deep tubewell of entire district is 55298.55 ham. Maximum ground water draft has been calculated for Padrauna block, which is 5537.12 ham. Where as minimum ground water draft has been worked out for Sewarhi block, which is 2504.26 ham. The ground water balance for future exploitation of the district is 64110.41 ham. The maximum ground water balance is found in Khadda block which is 11568.84 ham where as Sukrauli block has a balance of 1023.15 ham which is lowest.

All the blocks of Kushinagar district are under safe category except Kasya and Sukrauli block, where the stage of development has attend 70.45% and 81.53% respectively. The availability of ground water resource potential for irrigation for entire district remains 64110.41 ham for further ground water development. Blockwise maximum resource of 14803.13 ham is available in Khadda block, where the level of development is about 20.30%. The minimum ground water resource is available in Sukrauli block where the level of development is highest i.e. 81.53%.

VI. GROUND WATER QUALITY

In general the quality of ground water is suitable for drinking and irrigation purpose. The quality of ground water is described as follows:

GROUND WATER SUITABILITY FOR DRINKING PURPOSES:

Ground water samples were collected during National Hydrograph Stations monitoring. These sample were analysed in the chemical laboratory of CGWB, Northern region.

The summarized results falling in permissible limit and undesirable effect and undesirable effect out side permissible limit are shown below in table and the analytical results are shown in Table-V.

Table-V

**CONSTITUENT, DESIRABLE LIMIT, PERMISSIBLE LIMIT, NO. OF
SAMPLES BEYOND PERMISSIBLE LIMIT AND UNDESIRABLE EFFECT
BEYOND PERMISSIBLE LIMIT**

Sl. No.	Constituent	Desirable Limit (ppm)	Permissible Limit (ppm)	No. of samples Beyond permissible Limit	Undesirable effect beyond Permissible Limit
Essential Characteristic					
1.	pH	6.5-8.5	No. relaxation	Nil	Beyond this range water will effect mucus membrane and water supply system
2.	Total Hardness as CaCO ₃	300	600	Nil	Encrustation in water supply structure and adverse effect on domestic use
3.	Iron	0.3	1.00	Nil	Precipitate after exposure in air, causes turbidity stains plumbing fixture laundry and cooking utensil.
4.	Chloride	250	1000	Nil	May cause physiology damage.
5.	Fluoride	1.00	1.5	Nil	High fluoride leads to flourises, pronounced mottling and disfiguration of teeth
Desirable Characteristic					
6.	Total Dissolved solid	500	2000	Nil	May cause Gastro-intestinal irritation
7.	Calcium	75	200	Nil	Encrustation in water supply structure and adverse effect on domestic use.
8.	Magnesium	30	100	Nil	-----Do-----
9.	Sulphate	200	400	Nil	Causes Gastro-intestinal irritation when Mg & Na are present.
10.	Nitrate	45	No Relaxation	Nil	May cause methamoglobo-inemia

Table-6

CHEMICAL ANALYSES OF GROUND WATER SAMPLES COLLECTS FROM KUSHINAGAR DISTRICT (U.P)
SAMPLES COLLECTED DURING 2007 (MAY)

Location	E.C. Micro Siemen /cm. at 25 ⁰ C	pH	Concentration in mg/l													
			CO ₃	HCO ₃	Cl	NO ₃	SO ₄	F	Ca	Mg	TH CaCO ₃	Na	K	SIO ₂	PO ₄	B
Kohule	360	8.0	-	195	21	0.60	ND	0.38	8	32	158	17	4.4			
Kaptanganj	250	8.6	-	122	11	1.0	10	0.46	16	15	100	13	3.8			
Kasia	410	8.05	-	110	18	0.75	120	0.15	48	19	200	13	3.9			
Rambar	280	7.5	-	122	7	0.71	15	0.30	16	16	105	7.3	3.6			
Vausanjia	330	8.05	-	153	28	0.60	10	0.30	24	22	150	10	4.2			
Clicttaumi	250	8.00	-	153	7	0.30	Nd	0.08	16	21	125	5.5	8.5			
Bishunpur	450	7.95	-	268	14	2.90	Nd	0.15	34	34	225	6.00	4.2			
Belwa	270	7.90	-	159	7	0.60	5	0.22	22	18	130	8.4	2.5			
Mausurganj	260	7.75	-	153	11	0.9	5	0.34	10	21	110	12	3.7			
Mathani	320	7.80	-	171	7	32	2	0.19	22	21	140	14	2.0			

SUITABILITY OF GROUND WATER FOR IRRIGATION USE:

As per Wilcox classification based on EC of ground water, the water can be grouped into five categories as detailed below:

Sl. No.	Water Class	Ec. in micro mhos/cm at 25⁰C	No. of Samples
1.	Excellent	<250	2
2.	Good	250-750	9
3.	Permissible	750-2000	–
4.	Doubtful	2000-3000	–
5.	Undesirable	>3000	–

The ground water of the district is of good quality from irrigation point of view.

VII. GROUND WATER MANAGEMENT STRATEGY

Kushinagar district comprises alluvial areas .The cultivators of the area are having small land holding & are poor. The fragmented nature of land holding is creating an hardship to an individual farmers to develop the ground water resource economically following strategy may be taken up to enhance the irrigation for future development.

- (i) Awareness programme should be taken up to educate the user regarding rising trend of water level and use of ground water in conjunction with surface water to save land from becoming water logging areas in future.
- (ii) The potential of certain forest species to draw water more than the agriculture crops because of their deeper root system, higher transpiration rates through out the year and ability to minimise rain provides a technique for keeping water table under control and increase forest produce be adopted in the areas having both shallow water levels and rising trends.
- (iii) Marginal farmers may be given financial aid for developing the ground water abstraction structure.

- (iv) Most of the bore wells are fitted in the diesel pump sets. The pumping costs is higher to poor farmers. Power availability may be enhanced by taking up power projects in future.
- (v) The canals main branch / distribution and minors should be lined to minimise the seepage in canal command areas. Hence making availability of more water at the tail end of canals.

VIII. AWARENESS & TRAINING ACTIVITY

Mass awareness programme and water management training programme by CGWB has not taken place in the district so far.

AREAS NOTIFIED BY CGWA/SGWA:

Kushi Nagar district has not been notified as yet.

IX. RECOMMENDATIONS

Kushi Nagar district has 64110.41 ham of ground water availability for future irrigation. To increase the agricultural productivity the main requirement is that the ground water should be developed in a planned and scientific manner. The recommendations are as follows:

- (i) The actual utilization of ground water available for irrigation is much less than the potential available. All the blocks except Sukrauli and Kasaya falls under safe category. Multiple cropping pattern should be adopted to utilise the potential available.
- (ii) Marginal and poor farmers should be given financial help for constructing ground water abstraction structure with a view to draw water for irrigation.
- (iii) The district is backward industrially. The water-based industry may be promoted for utilizing the resources in a planned manner.

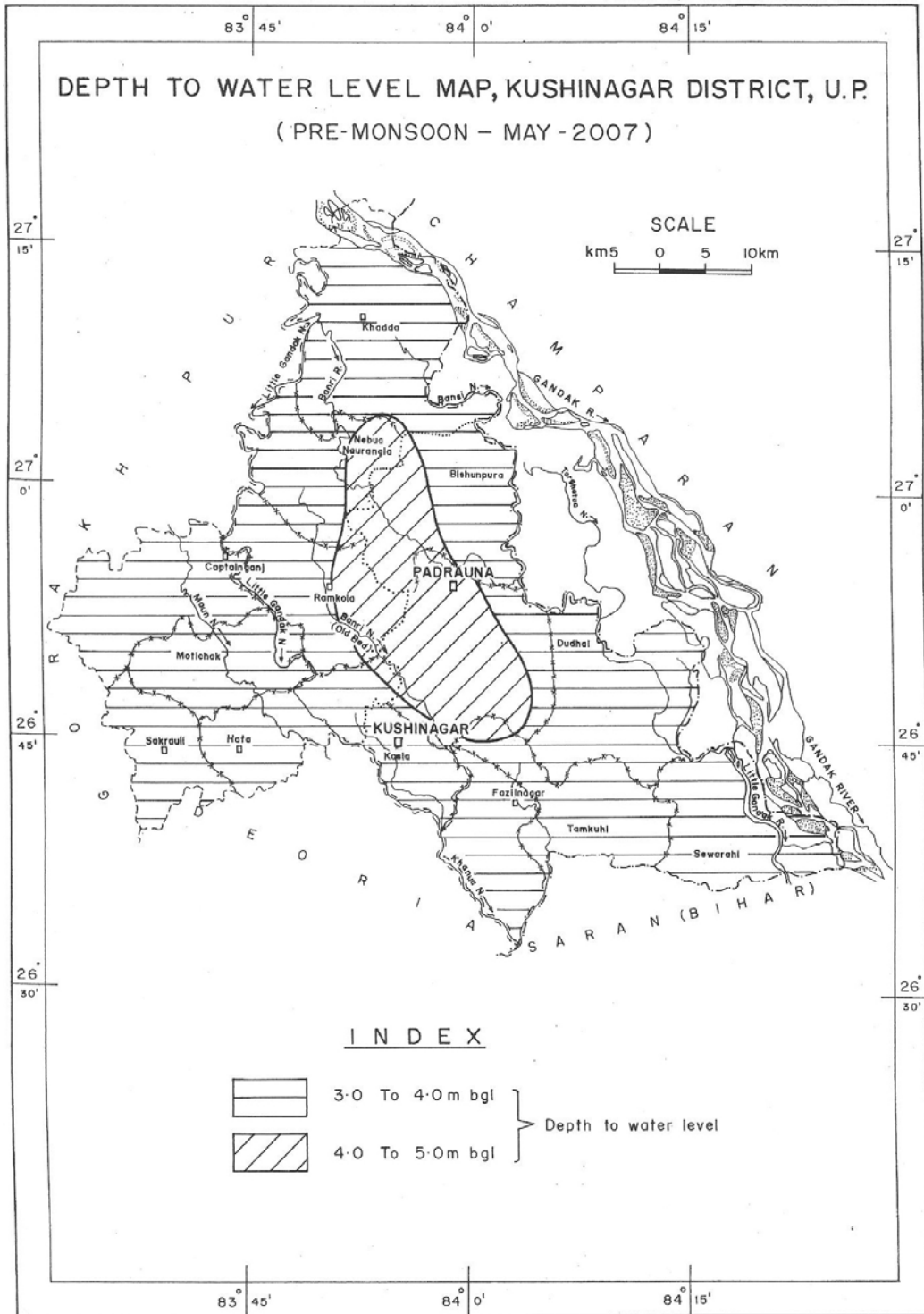
- (iv) High yielding varieties and use of improved technology be adopted to get maximum production per unit of water.
- (v) The concept of conjunctive use of surface water and ground water in canal command area be adopted. Conjunctive use of ground water can be planned as detailed below.
 - Ground water can be used in the Kharif season to supplement irrigation requirement to the necessary extent.
 - It can be used during Rabi season when rainfall contribution is much less compared to the irrigation requirement
 - Ground water can also be used for meeting its requirement of summer crops.

INDEX MAP OF KUSHINAGAR DISTRICT, U. P.



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- CGWB Hydrograph Station
- ⊕ Tubewell Constructed by CGWB



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