

# GROUND WATER BROCHURE OF FAIZABAD DISTRICT, U.P.

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

By

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Scientist 'B'

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## DISTRICT AT A GLANCE

### 1. GENERAL INFORMATION

i. Geographical Area (Sq. Km.)	: 2341
ii. Number of Tehsil / Block	: 2/11
iii. Number of Villages / Town	: 1247 / 6
iv. Population (as on 2001 census)	: 20,89,000
iv. Average Annual Rainfall (mm)	: 1035

### 2. GEOMORPHOLOGY

Major Physiographic Units	: Flood Plain, Sand bars, Ravines, Salt Encrustation, Alluvial Plain
Major Drainages	: Ghaghra and Gomti

### 3. LAND USE (Sq. Km.)

a) Forest area	: 3038 Ham
b) Net area sown	: 134236 Ham
c) Cultivable area	: 205199 Ham

### 4. MAJOR SOIL TYPES

: (i) Balua (ii) Doras (iii) Matiyar

### 5. IRRIGATION BY DIFFERENT SOURCES

(Areas and Number of Structure)

Number of Tubewells / Borewells	: Govt. Tubewell – 10,101 Private Tubewell – 95,209
Tanks & Ponds	: Nil
Canals	: 18498 Ham
Other Sources	: 162 Ham
Net Irrigated Area	: 1,23,970 Ham
Gross Irrigated Area	: 2,20,000 Ham

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

No. of Dugwells	: 8
No. of Piezometers	: 3

### 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)	: 2.45 to 7.80

- iii Post-monsoon Depth to water level during 2006 (mbgl) : 2.08 to 5.51
- iv Long term water level trend in 10 years (1997-2006) in m/yr
  - Premonsoon (+) 0.0625–0.1630
  - Postmonsoon (-) 0.1901

**9. GROUND WATER EXPLORATION BY CGWB**

**(As on 31-3-2007)**

**Number of wells drilled (E.W., O.W., PZ)**

Type of Structure	No. of Structure Constructed	Depth Range (mbgl)	Discharge (lpm)	Storativity (S)	Transmissivity (T) m <sup>2</sup> /day
Exploratory Well	2	525.00–752.09	34 - 51	3×10 <sup>-4</sup> to 5.04×10 <sup>-4</sup>	347 – 523
Piezometer	3	32.00 – 165.00	4 – 5	-	-

**10. GROUND WATER QUALITY**

Presence of E.C. and F more than permissible limit at few locations have been recorded.

**TYPE OF GROUND WATER**

Ground water is alkaline in nature but within prescribed limit.

**11. DYNAMIC GROUND WATER RESOURCES (2006)-in MCM**

Annual Replenishable Ground Water Resources : 120040.03 Ham

Net Annual Ground Water Draft : 73301.55 Ham

Projected Demand for Domestic and Industrial Uses : 7794.57 Ham

upto 2025

Stage of Ground Water Development : 66.59% Safe

Except One Block (Haringfeenganj) : 90.45% Critical

# **GROUND WATER BROCHURE OF FAIZABAD DISTRICT, U.P.**

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## **1.0 INTRODUCTION**

The shape of the area of Faizabad district is elongated and its district headquarter is located in the northern part. The river Ghagra forms the northern boundary of the district and separates it from the districts of Gonda and Basti. It is bounded in the west by Barabanki, in the south by Sultanpur and in the east by Ambedkar Nagar districts.

Administratively, the district area is divided into 2 Tehsil and subdivided into 11 Development blocks. The detail are given below:

Tehsil	Blocks
1- FAIZABAD	(i) Sohanval (ii) Mosodha (iii) Pura Bazar (iv) Maya Bazar (v) Rudauli
2- BIKAPUR	(vi) Amaniganj (vii) Haringtonganj (ix) Bikapur (x) Tarun (xi) Maurai

## **2.0 RAINFALL AND CLIMATE**

The average annual rainfall is 1034.8 mm. The climate is sub-humid and cold season starts in November and last till February, the summer season begins in March

and continues till the onset of monsoon by middle of June. About 90% rainfall takes place from June to September During monsoon surplus surface water is available for deep percolation to ground water.

January is generally the coldest month with the average minimum temperature of 7<sup>0</sup>C and mean monthly maximum temperature is 22.3<sup>0</sup>C. From March temperature rises rapidly and May and early June day temperature sometimes reaches 47<sup>0</sup>C. After onset of monsoon in June, there is appreciable drop in temperature. The mean monthly maximum temperature is 32<sup>0</sup>C and mean monthly minimum temperature is 16.5<sup>0</sup>C.

Except during the monsoon and early part of monsoon period the air is dry .The mean monthly morning related humidity is 72% and mean monthly evening relative humidity 50%.

The winds are generally light except in summer and monsoon when they strengthen slightly. The mean wind velocity is 3.2 km/hr.

The Potential evapotranspiration is 1660.9 mm.

### **3.0 GEOMORPHOLOGY & SOIL TYPES**

Faizabad district being part of the flood plain of Ghaghra river, features like oxbow lakes river cut off, natural depression filled into impounded water are the common surfacial manifestations. The different geomorphological unit identified in area by remote sensing are sand bar, flood plain, salt encrustation and ravines.

On the basic of physical characteristics of the soil, The upland can be divided into

- Balua
- Doras
- Matiyars

Balua tract is sandy region and located all along high banks of river Ghaghra in the north and of the Gomti river in the south west area. The predominating soil of the district is brownish sandy loam containing fair percentage of sand.

The Doras plain consist of clay and sand. The Matiyars type of soil consist of blackish stiff clay.

## **4.0 GROUND WATER SCENARIO**

### **4.1 HYDROGEOLOGY:**

#### **General Geology:**

Faizabad district forms a part of central Ganga plain and is underlain by a thick pile of alluvium deposits of quaternary age. This alluvium is a pile of unconsolidated sediments made up of sequence of clay, silt, kankar and different grades of sand. The sands are of varying grade from very coarse to fine occasionally becoming gravelly in nature. Sand mixed with gravel and kankar form the principal aquifers.

#### **Sub-Surface-Geological Configuration:**

In order to understand the subsurface aquifer system exploratory borehole data drilled by C.G.W.B. at four location and data from state irrigation, tubewell construction division were utilized and following inferences have been made.

- (i) On regional scale, a multiple aquifer group extending down to depth of 745mbgl is existing as observed from exploratory well data drilled by C.G.W.B. The thickness of the aquifer reduces to 60 m and prominent clay having thickness of 30 to 40m is encountered at bottom. In eastern part, this aquifer has got many clay lenses. In general the thickness of sandy layer increase in the western direction. This may be due to existing drainage system of the river Tons, Which flows in the south eastern direction through the central part of the district.
- (ii) Aquifers systems behave as unconfirmed, semi confirmed to confined depending upon the presence of clay beds Aquifer material are fine to medium grained.
- (iii) The presence of clay beds of variable thickness are dominantly confirmed to area close to major drainage system namely Tons. The clay beds may correspond to periodical back swamp of earlier depositional environment.

#### **Occurrence of Ground Water:**

Ground water occurs in pore spaces of the unconsolidated alluvial sediment in the zone of saturation. Sediment from ground level to up to depth / 15 to 20.0 m.,

comprise fine to medium grained sand with thin clay at top. In this zone ground water occurs under unconfined condition. The depth of dug wells varies from 3.60 mbgl to 12.50 mgl.

**DEPTH TO WATER LEVEL:**

A perusal of premonsoon water level map for the year 2007, reveal that the water level varies from 2.45 mbgl at Bakarganj to 7.80 mgl at Bikapur.

Table-1

**WATER LEVEL FLUCTUATION (PRE AND POST) FOR THE  
SELECTED YEAR 2007**

State : Uttar Pradesh  
District: Faizabad  
Tehsil : Bikapur  
Block : Bikapur

Sl. No.	Well Name	Pre –Monsoon (mbgl)	Post –Monsoon (mbgl)	Fluctuation (m)
1	Chaure Bazar	7.80	4.00	+3.80

Tehsil : MASODHA  
Block : MASODHA

Sl. No.	Well Name	Pre –Monsoon (mbgl)	Post –Monsoon (mbgl)	Fluctuation (m)
1	Naokua	4.30	2.20	2.10
2	Sakhupura	3.00	2.08	0.92

Tehsil : MAYA BAZAR  
Block : MAYA BAZAR

Sl. No.	Well Name	Pre –Monsoon (mbgl)	Post –Monsoon (mbgl)	Fluctuation (m)
1	Bakarganj	2.45	2.52	-0.07



Tehsil : MILKIPUR

Block : MILKIPUR

Sl. No.	Well Name	Pre –Monsoon (mbgl)	Post –Monsoon (mbgl)	Fluctuation (m)
1	Meethagaon	5.60	5.51	0.09
2	Milkipur	4.85	3.78	1.07

Tehsil : RUDAULI

Block : RUDAULI

Sl. No.	Well Name	Pre –Monsoon (mbgl)	Post –Monsoon (mbgl)	Fluctuation (m)
1	Rudauli	-	2.79	

Shallow water table condition is observed in Amaniganj and Milkipur blocks in south western part.

#### **SEASONAL FLUCTUATION:**

Water table is known to fluctuate in respect to:

- (a) Replenishable recharge from rainfall
- (b) Seepage from surface water bodies
- (c) Inputs to ground water body by applied irrigation.
- (d) Losses due to evapotranspiration.
- (e) Discharge from ground water abstraction structure.
- (f) Ground water movement

Annual seasonal fluctuation of water level has been determined from the premonsoon (May 2007) and post monsoon (Nov. 2007). The fluctuation varies from -0.07 m. to +3.50 m. The maximum rise of water level at Chaure Bazar (+3.50 m). Positive fluctuation rise in water level due to south west monsoon is seen all over the district comprising flood plain of Ghaghra river.

#### **LONG TERM FLUCTUATION:**

Comparative study of water level data recorded during may 1997 and May 2007 shows declining trend have been observed in parts of Bikapur block and Masodha block where as area falling under Maya Bazar and Milkipur block suggest a rising trend in water level (Table-2).

Table-2

**TREND OF WATER LEVEL -ALL**  
**From Year 1998 to Year 2007**

State : Uttar Pradesh  
 District: Faizabad

SI No.	Location	Pre monsoon			Post Monsoon			Annual		
		Data Points	Rise (m/year)	Fall (m/year)	Data Points	Rise (m/year)	Fall (m/year)	Data Points	Rise (m/year)	Fall (m/year)
1-	Faizabad	4			3			12		
2-	Mayabhikhi (Ixm)	3			4			11		
3-	Deodhi	4			3			11		
4-	Naokua	10	0.0625		10		0.1198	38		0.1470
5-	Bakarganj	10	0.0844		10		0.0691	39		0.0103
6-	Sakhupura	10	0.1083		10		0.1098	49		0.0196
7-	Rajepur I	4			4			16		
8-	Gosaiganj	3			1			8		
9-	Milkipur	9		0.1010	10		0.1945	48		0.1717
10-	Khandasa	0			0			1		
11-	Manihanpur	4			4			18		
12-	Meethagaon	10		0.0645	10		0.1901	39		0.1262
13-	Bikapur I	1			0			1		
14-	Charebazar	10		0.1630	9		0.1699	38		0.2904

## HYDROGEOLOGICAL CHARACTERISTICS OF AQUIFER SYSTEM:

Hydrogeological Characteristics of aquifers were determined by using the pumping test data of exploratory borehole drilled by CGWB. The details of parameters are as follows:

Table-3

### DETAILS OF EXPLORATORY WELL DRILLED BY C.G.W.B.

Sl. No.	Location	Depth of tubewell (m)	Static water level (mbgl)	Yield (lpm)	Drawdown (m)	Transmissivity (m <sup>2</sup> /day)	Storativity (S)
1-	Kumarganj	525.00	6.19	2060	11.89	523.00	3.00×10 <sup>-4</sup>
2-	Ranipur	687.0	6.34	2271	25.15	370.66	2.48×10 <sup>-4</sup>

## 4.2 GROUND WATER RESOURCES:

The evaluation of ground water resource potential of Faizabad district has been worked out on the norms of suggested by Ground Water Estimation Committee and shown in the Table-4. A review of the table of ground water balance shows that availability of ground water in the district is 110071.99 ham. Various factors, which are involved in ground water recharge such as rainfall seepage from canal, seepage from applied irrigation, recharge from surface water bodies like pond, lakes and flood plain have been taken into account. The highest ground water recharge has been estimated in Rudauli block which is 19454.10 ham where as lowest recharge is 7248.67 ham in Bikapur block. Similarly the ground water draft from different ground water structure such as dugwell, shallow and deep tubewells of entire district is 73301.55 ham. Maximum ground water draft has been calculated for Rudauli block which is 11427.89 ham where as minimum ground water draft has been worked out for Maya Bazar which is 5000.04 ham. The ground water balance for further exploitation of the district is 33675.20 ham. The maximum groundwater balance is found in Amaniganj block, which is 8113.91 ham. Where as Bikapur block has a balance of 311.60 ham which is lowest.

Table-4

**DYNAMIC GROUND WATER RESOURCES OF UTTAR PRADESH AS ON 31.03.2004**

<b>Sl. No.</b>	<b>Assessment Units Blocks</b>	<b>Annual Ground Water Recharge (In ham)</b>	<b>Net Annual Ground Water Availability (in ham)</b>	<b>Existing Gross Ground Water Draft For All Uses (In ham)</b>	<b>Net Ground Water Availability For Future Irrigation Development (in ham)</b>	<b>Stage of Ground Water Development (in %)</b>	<b>Category of Block</b>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
1	AMANIGANJ	15594.33	14034.90	5687.12	8113.91	40.52	SAFE
2	BIKAPUR	7248.67	6523.81	5851.89	311.60	89.70	SAFE
3	HARINGTEENGANJ	7719.81	6947.83	6284.22	447.02	90.45	CRITICAL
4	MASODHA	10680.81	10146.77	6332.35	3326.96	62.41	SAFE
5	MAWAI	10165.20	9148.68	6686.27	2256.17	73.08	SAFE
6	MAYABAZAR	11033.56	10481.88	5000.04	5244.08	47.70	SAFE
7	MILKIPUR	9626.72	9145.39	7572.87	1300.36	82.81	SAFE
8	PURABAZAR	9378.23	8909.31	5791.60	2894.53	65.01	SAFE
9	RUDAULI	19454.10	17508.69	11427.89	5706.20	65.27	SAFE
10	SOHAWAL	9636.29	8672.67	5210.52	3258.33	60.08	SAFE
11	TARUN	9502.29	8552.06	7456.77	816.05	87.19	SAFE
	<b>TOTAL</b>	<b>120040.03</b>	<b>110071.99</b>	<b>73301.55</b>	<b>33675.20</b>	<b>66.59</b>	

All the blocks of Faizabad district are under safe category except Hasingteenganj block where stage of development has attained 90.45%. The availability of ground water resource potential for irrigation for entire district remain 33675.20 ham for further ground water development. Block wise maximum resource of 8113.91 ham is available in Amaniganj block where the level of development is only 40.52%. The minimum ground water resource is available in Bikapur block where the level of development is highest i.e. 89.70%.

### 4.3 GROUND WATER QUALITY

#### Drinking Water Suitability:

In order to have a clear idea regarding the suitability of Water for domestic use, the drinking water standards as laid down by I.C.M.R. and I.S.I. along with ranges of results of water sample of the Faizabad district are tabulated below. From the table given below its seen that water is generally suitable below its seen that water is generally suitable for drinking & other domestic uses. Details of constituents present in ground water in Faizabad district are given in table.

Table-5

#### SUITABILITY OF GROUND WATER LAID DOWN BY ICMR& ISI

Constituents	ICMR		IDI (1983)		Water Sample Results
	<i>Highest desirable level</i>	<i>Maximum Permissible limit</i>	<i>Highest desirable level</i>	<i>Maximum Permissible limit</i>	
pH	7-8.5	6.5-9.2	7.0-8.5	6.5-9.2	8.0-8.20
TDS	500	1500	500	Up to 3000	260-610
Total Hardware as CaCO <sub>3</sub>	300	600	300	600	150-240
Ca	75	200	75	200	20-36
Mg	50	100	30	100	15-49
SO <sub>4</sub>	200	400	150	Up to 400	9.6-24
Cl	200	1000	250	1000	7.1-78
NO <sub>3</sub>	20	45	45		1.3-22
F	10	1.5	0.6-1.2	Up to 1.5	0.03-0.61

### Irrigation Water Quality Rating:

The quality of irrigation water is classified on the basis of following properties:

- i- Total Concentration of Salt (T.D.S.)
- ii- Sodium absorption ratio (SAR)
- iii- Residual Sodium Carbonate (RSC)
- iv- Presence of trace elements
- v- Total Concentration of salts

The total concentration of salt is reflected on the electrical conductance in micro mhos/Cm at 25<sup>0</sup>C and accordingly water quality rating is given in Table-6.

However, it must be noted that not only the E.C. of irrigation water and type of soil determine the suitability of irrigation water, but factors like kankar pan at shallow depth, effective drainage and sodium percentage also effect the quality rating of irrigation water. In case of sodium percentage greater than 70, the E.C must be reduced to half. The sodium percentage in water is well with in the limit hence the E.C limit given in table below can safely be taken as suitable index for irrigation. It is concluded that the groundwater in the area is suitable for irrigational use.

Table-6

#### WATER QUALITY RATING BASED ON ELECTRICAL CONDITION

Nature of Soil	Upper limit of E.C. for safe use of water for irrigation (micro mhos/cm at 25 <sup>0</sup> C)			
	<i>No. Drainage Limitation</i>		<i>Ground water table &lt;1.5mbgl</i>	
	<i>Semi Tolerant Crops</i>	<i>Tolerant Crops</i>	<i>Semi Tolerant Crops</i>	<i>Tolerant Crops</i>
Deep black Soil /Alluvial Soil : Clay 30%	1500	2000	750	1000
Heavy Textured Soil Clay 20-30%	2000	4000	1000	2000
Medium Textured Soil Clay 10-20%	2000	6000	2000	3000
Light Textured Soil Clay <10%	6000	8000	3000	4000

Table-7

**DETAILS OF CHEMICAL CONSTITUENTS PRESENT IN GROUND WATER IN PARTS OF  
FAIZABAD DISTRICT, U.P.**

Sl. No.	Location	Well No.	Type of sample	Date of collection	E.C. micro-siemens/cm. at 25°C	pH	-----Concentration in mg/l-----													
							CO <sub>3</sub>	HCO <sub>3</sub>	Cl	NO <sub>3</sub>	SO <sub>4</sub>	F	Ca	Mg	TH as CaCO <sub>3</sub>	Na	K	SiO <sub>2</sub>	PO <sub>4</sub>	B
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
<b>District : Faizabad</b>																				
1.	Milkipur	FZD-28	HP	29.5.05	400	8.1	Nil	268	14	Nd	Nd	.04	20	36	200	18	4.8	-	Nd	
2.	Masodha	FZD-29	HP	29.5.05	340	8.0	Nil	207	14	Nd	14	.39	32	29	200	4.2	2.4	-	Nd	
3.	Tarun	FZD-30	HP	27.5.05	450	8.0	Nil	207	43	18	24	.17	32	34	220	25	3.0	-	Nd	
4.	Harrington	FZD-31	HP	29.5.05	360	8.0	Nil	262	11	Nd	Nd	.26	24	35	205	29	3.7	-	Nd	
5.	Rudauli	FZD-32	HP	29.5.05	320	8.1	Nil	195	14	Nd	9.6	.61	32	24	180	7.4	2.6	-	Nd	
6.	Amaniganj	FZD-33	HP	29.5.05	500	8.2	Nil	281	28	Nd	24	.34	36	36	240	29	2.8	-	Nd	
7.	Mawai	FZD-34	HP	29.5.05	260	8.1	Nil	146	7.1	Nd	24	.03	36	15	150	3.4	2.0	-	Nd	
8.	Bikapur	FZD-35	HP	27.5.05	360	8.0	Nil	220	14	1.3	9.6	.03	28	24	170	21	3.6	-	Nd	
9.	Majo Bazar	FZD-36	HP	28.5.05	610	8.1	Nil	268	78	22	24	Nd	24	49	260	53	4.6	-	Nd	

## **5.0 GROUND WATER MANAGEMENT STRATEGY**

Faizabad district comprises alluvial areas. The cultivators of the area are having small land holding being poor. The fragmented nature of land holdings creating an hardship to an individual formers to develop the ground water resources economically. Following strategy may be taken up to enhance the irrigation for future development.

- (i) Mass awareness programme should be taken up to educate the users regarding declining trend of water level.
- (ii) Marginal farmers may be given financial aids for developing the ground water abstraction structure.
- (iii) Most of the bore wells are fitted with diesel pump set. The pumping costs is higher to poor farmers. Power availability may be enhanced by taking up power projects in future.
- (iv) The canals main branch / distributaries 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.

## **6.0 AWARENESS & TRAINING ACTIVITY**

Mass awareness programme and water management training programme by C.G.W.B. has not been taken place in the Faizabad district

## **7.0 AREAS NOTIFIED BY CGWB/AUTHORITY**

Faizabad district has not been notified as yet.

## **8.0 RECOMMENDATIONS**

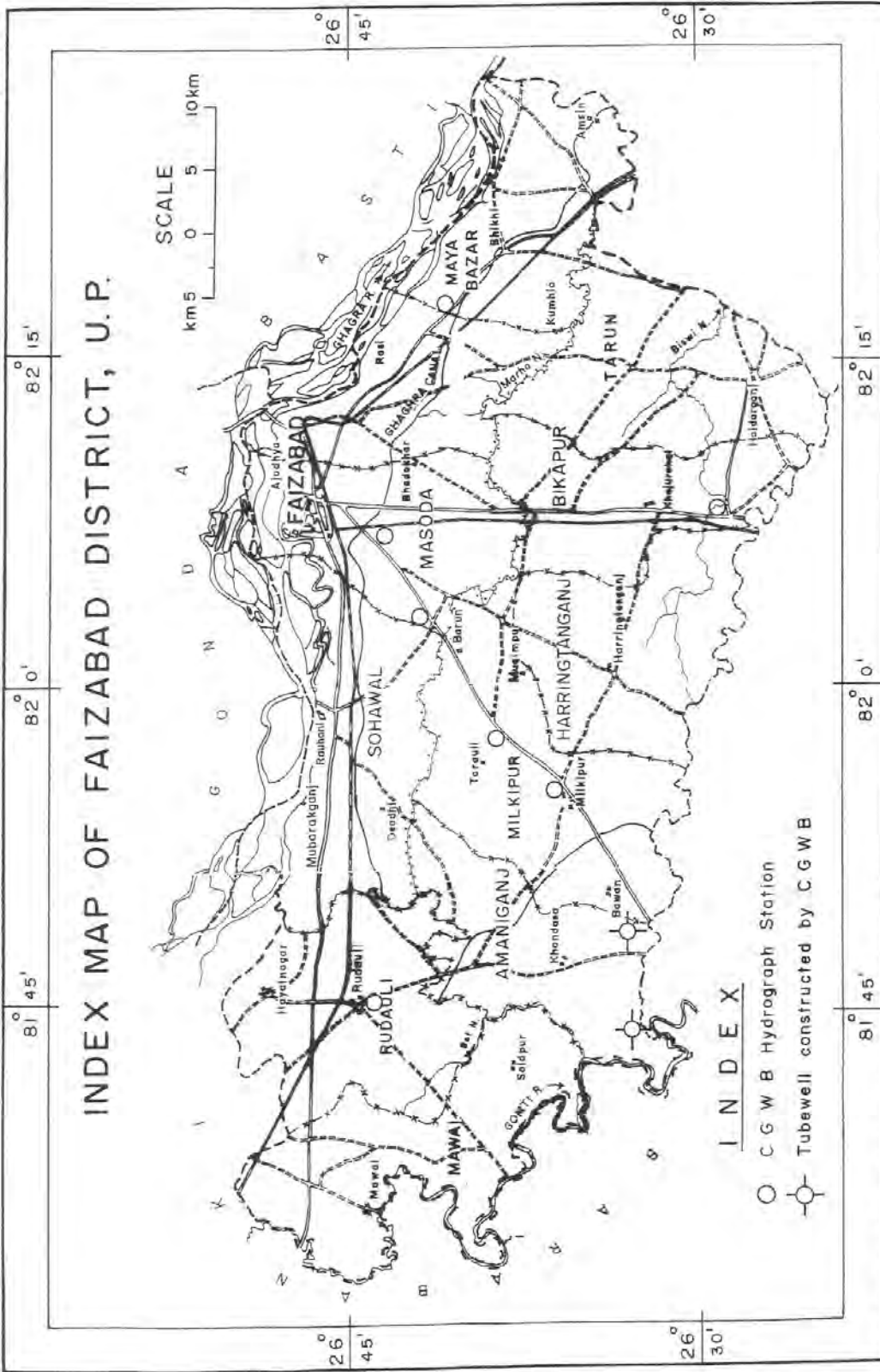
Faizabad district has 33675.20 ham of ground water availability for future irrigation. To increase the agricultural productivity the main requirement is that the



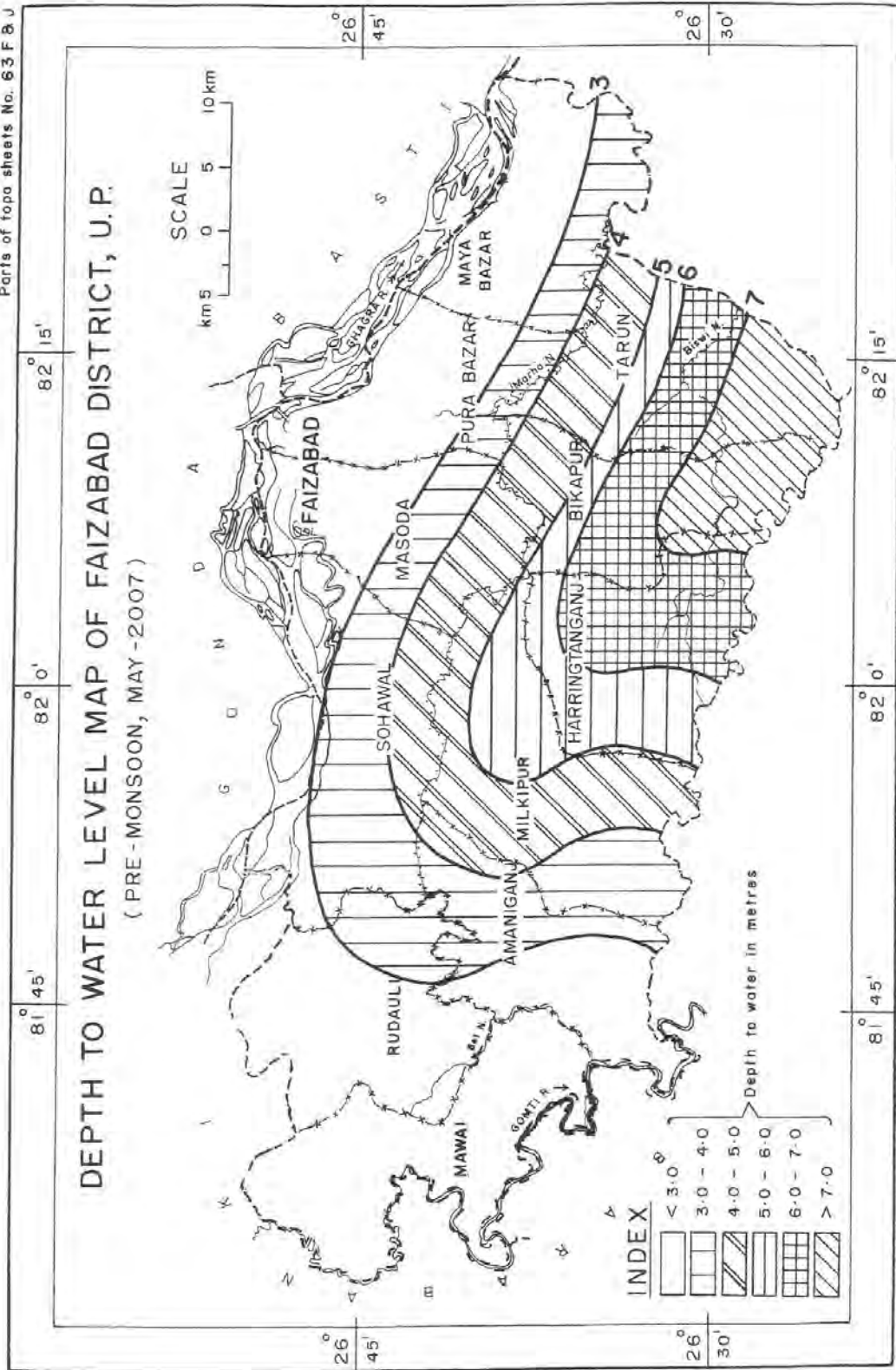
groundwater should be developed in a planned and scientific manner. The recommendations are as follows:

1. The actual utilization of ground water available for irrigation is much less than potential available. All the blocks except "HARIGTEENGANJ" falls under safe category. Multiple cropping pattern should be adopted to utilize the potential available.
2. Marginal and poor farmers should be given financial help for constructing ground water abstraction structure with a view to draw water for irrigation.
3. Industrially Faizabad is backward district. Therefore, water based industry may be promoted for utilizing the resources in a planned manner.
4. High yielding varieties and use of improved technology be adopted to get maximum production per unit of water.
5. 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 given below.
  - (a) Ground water can be used in the Kharif seasons to supplement irrigation requirement to the necessary extent.
  - (b) It can be used during Rabi season when rainfall contribution is much less compared to the irrigation requirement
  - (c) Ground water can also be used for meeting its requirement of summer crops.

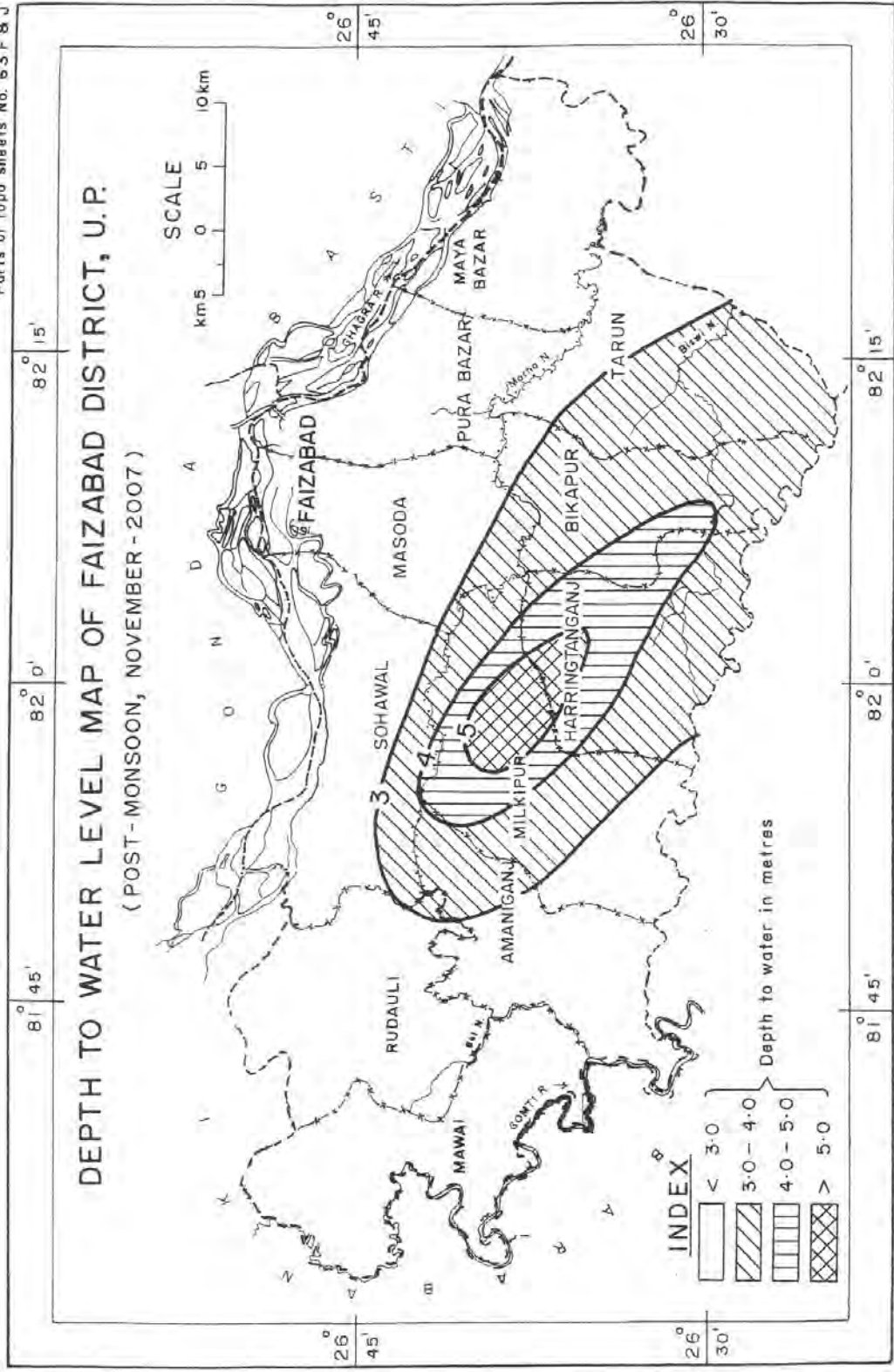
# INDEX MAP OF FAIZABAD DISTRICT, U.P.



C G W B, N.R., Drg. No. 3949A/10 (RAKESH), 3950/10



C.G.W.B, N.R, Drg. No. 3949 / 10 ( RAKESH ), 3951 / 10



# MAP SHOWING STAGE OF GROUNDWATER DEVELOPMENT FAIZABAD DISTRICT, U.P.

