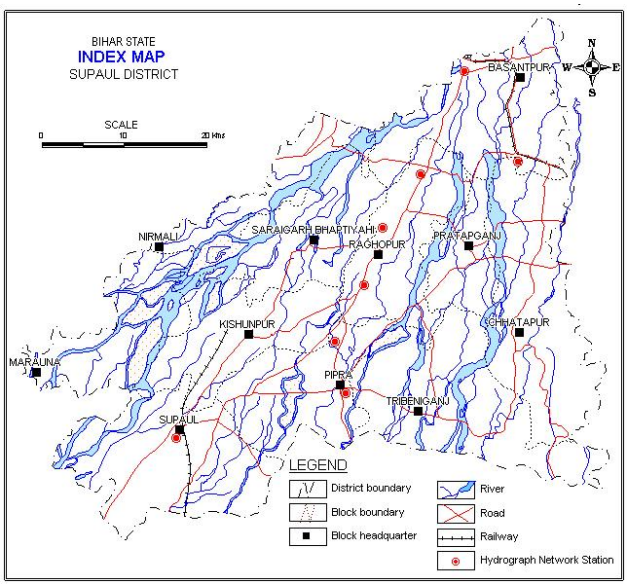
भूजल सूचना पुस्तिका

सुपौल जिला, बिहार

Ground Water Information Booklet

Supaul District, Bihar State



केन्द्रीय भूमिजल बोर्ड
जल संसाधन मंत्रालय
(भारत सरकार)
मध्य-पूर्वी क्षेत्र
पटना

Central Ground water Board
Ministry of Water Resources
(Govt. of India)
Mid-Eastern Region
Patna

सितंबर 2013

September 2013

PREPARED BY - Sri S. Sahu Sc. C

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SUPAUL DISTRICT

DISTRICT AT A GLANCE

Sl. No.		Statistics
1.	**GENERAL INFORMATION**	
	I. Geographical Area (Sq. Km.)	2420
	Administrative Divisions	Supaul, Birpur, Triveniganj and Nirmali
	II. Population (As per 2011 Census)	Total: 2,229,076 Rural: **2,123,518** Urban: **105,558**
	III. Average Annual Rainfall (mm)	1404
2	**GEOMORPHOLOGY**	
	Major Physiographic Units	Younger Alluvium with Newer Flood Plains
	Major Drainages	Kosi River
3	**LAND USE**	
	a) Forest Area	Nil
	b) Net Area Sown	1328 sq. km*
	c) Cultivable Area	1328 sq. km*
4	**MAJOR SOIL TYPES**	Sandy loam, Loam, silty loam
5	**AREA UNDER PRINCIPAL CROPS**	Rice-970 km^2, wheat-409 km^2 (2008-09, Economic Survey 2011)
6	**IRRIGATION BY DIFFERENT SOURCES (Areas and Number of Structures)**	
	Dug wells	0 (2001 MI Census)
	Tube wells/Bore wells	16929, 169 km^2 (2001 MI Census)
	Tanks/ponds	10 km^2 **
	Canals	340 km^2 **
	Other Sources	60 km^2**
	Net Irrigated Area	620 km^2**
	Gross Irrigated Area	1220 km^2**
7	**NUMBER OF GROUND WATER MONITERING WELLS OF CGWB (As on 31-03-2012)**	
	No. of Dug wells	11
	No. of Piezometers	Nil
8	**PREDOMINANT GEOLOGICAL FORMATIONS**	Quaternary Alluvium
9	**HYDROGEOLOGY**	
	Major water bearing formations	Sand zones in Quaternary Alluvium
	Pre-monsoon Depth to water level during 2011	1.90-3.85 m bgl
	Post-monsoon Depth to water level during 2011	1.84-3.0 m bgl
	Long term water level trend in last 10 yrs (1997 –2011) in m/yr	No Significant Decline
10	**GROUND WATER EXPLORATION BY CGWB (As on 31-03-2007)**	
	No. of well drilled (EW,OW, PZ, SH, Total)	Nil
	Depth Range (m)	NA
	Discharge (m/s)	NA
	Storativity (s)	NA
	Transmissitivity (m^2/day)	NA
11	**GROUND WATER QUALITY**	Fresh and potable
	Presence of Chemical constituents more than the permissible limit (e.g.EC, F, As, F)	Iron
	Type of Water	$Ca\text{-}HCO_3$

12	**DYNAMIC GROUND WATER RESOURCES (2009) IN ha.m**	
	Annual Replenishible Ground Water Resources	82365
	Net Annual Ground Water Draft	24726
	Projected Demand for Domestic and Industrial Uses up to 2025	5391
	Stage of Ground Water Development	32.2 %
13	**AWARENESS AND TRAINING ACTIVITY**	
	Mass Awareness Programme Organized	Nil
	Date	Nil
	Place	Nil
	No. of Participants	Nil
14	**EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING**	Nil
	Projects Completed By CGWB (No. Amount Spent)	Nil
	Projects Under Technical Guidance of CGWB (Numbers)	Nil
15	**GROUND WATER CONTROL AND REGULATION**	
	No. of OE Blocks	Nil
	No. of Critical Blocks	Nil
	No. of Blocks Notified	Nil
16	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	No such groundwater issue in district other than patches of elevated iron contamination

Note: Latest available data may be incorporated

*Source: Department of Agriculture and Cooperation, Govt. of India, **Directorate of Statistics and Evaluation, Bihar (As on 1998-99)

1.0 INTRODUCTION

1.1 Location, Area and Administrative Details

Supaul is situated at 25037'-26025' N latitude and 86022' – 87010' E Longitude. It is one of the thirty-eight Districts of Bihar. The district is a part of the Kosi division and covers an area of 2,420 sq km. The district was carved out from the erstwhile Saharsa district on 14 March 1991. Supaul town is the administrative headquarters of the district. The district is bounded by Nepal in the north, Saharsa in the south, by Araria district in the East and on the west by Madhubani district. The district comprises 4 sub-divisions: Supaul, Birpur, Triveniganj and Nirmali. Supaul sub-division consists 4 blocks: Supaul, Kishanpur, Saraigadh-Bhaptiyahi and Pipra. Birpur sub-division is further divided into 3 blocks: Basantpur, Raghopur and Pratapganj. Triveniganj sub-division has 2 blocks, namely, Triveniganj and Chhatapur, and Nirmali sub-division comprises 2 blocks, namely, Nirmali and Marauna.

In 2011, Supaul had a population of 2,229,076 of which male and female were 1,155,283 and 1,073,793 respectively (Table 1). There was change of 28.66 percent in the population compared to population as per 2001. The initial provisional data released by census India 2011, shows that density of Supaul district for 2011 is 919 people per sq. km. In 2001, Supaul district density was at 714 people per sq. km. Average literacy rate of Supaul in 2011 were 57.67 compared to 37.28 of 2001. If things are looked out at gender wise, male and female literacy were 69.62 and 44.77 respectively. With regards to Sex Ratio in Supaul, it stood at 929 per 1000 male compared to 2001 census figure of 920. Agriculture is the major occupation of this district and paddy is the main crop.

Table 1: *Demographic distribution in Supaul district, Bihar.*

Description	2011	2001
Actual Population	2,229,076	1,732,578
Male	1,155,283	902,207
Female	1,073,793	830,371
Population Growth	28.66%	29.95%
Area Sq. Km	2,425	2,425
Density/km2	919	714
Proportion to Bihar Population	2.14%	2.09%
Sex Ratio (Per 1000)	929	920
Average Literacy	57.67	37.28
Male Literacy	69.62	52.42
Female Literacy	44.77	20.81
Literates	**1,033,283**	**509,025**

Male Literates	647,672	372,961
Female Literates	385,611	136,064

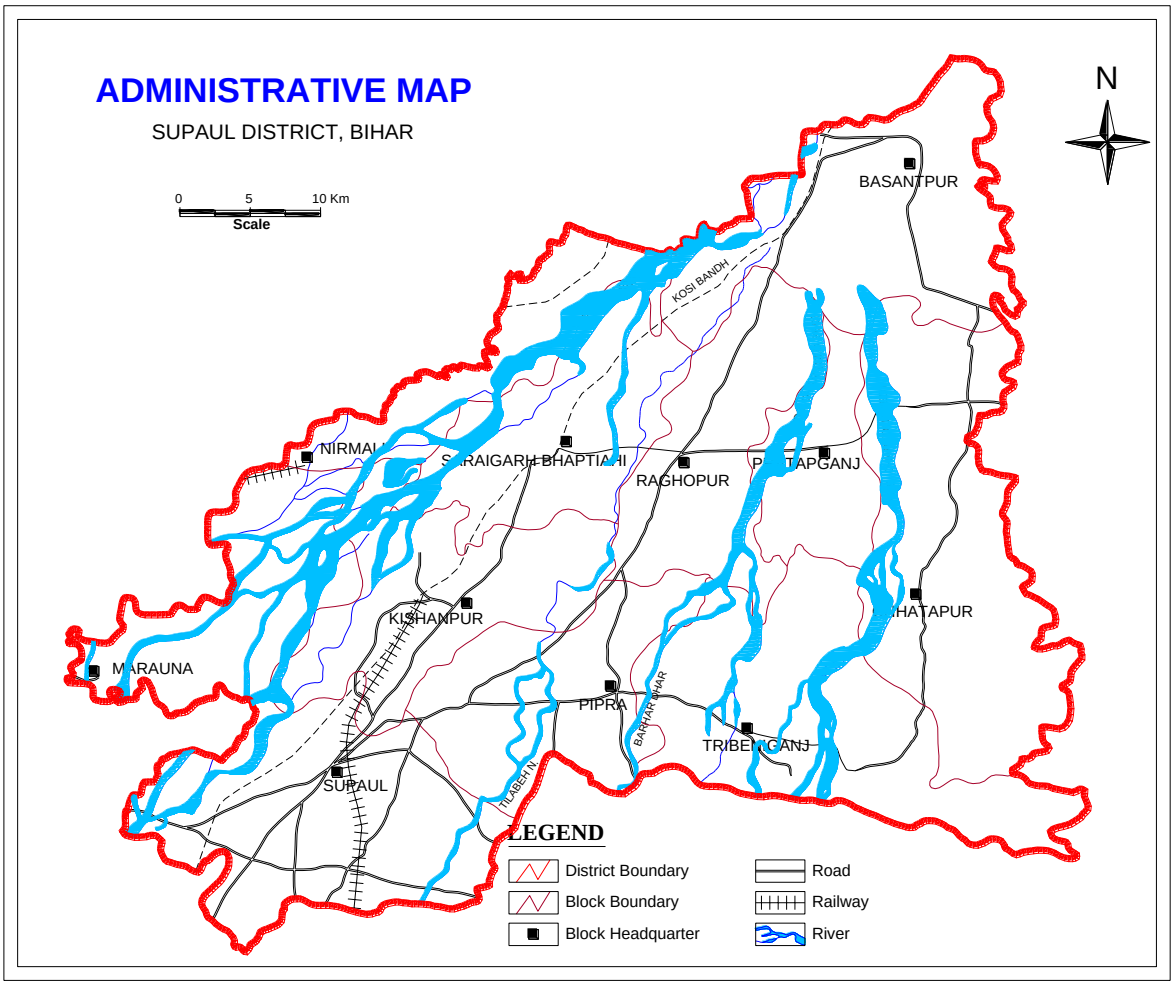


Figure 1: *Administrative map of Supaul district showing eleven blocks, rail and road connectivity.*

1.2 Basin/Sub-Basin and Drainage

The river Kosi flows through the western parts of the district and is considered as the sorrow of not only this district, but for whole of the Bihar state. Tilyuga Chhaimra, Kali, Tilawe, Bhenga, Mirchaiya, Sursar are the tributaries to it (Fig 2). The Kosi River, an important northern tributary of the Ganga River, originates at an altitude of 7000 m above msl in the Tibet Himalayas and is the third largest Himalayan River, after the Indus and the Brahmputra.

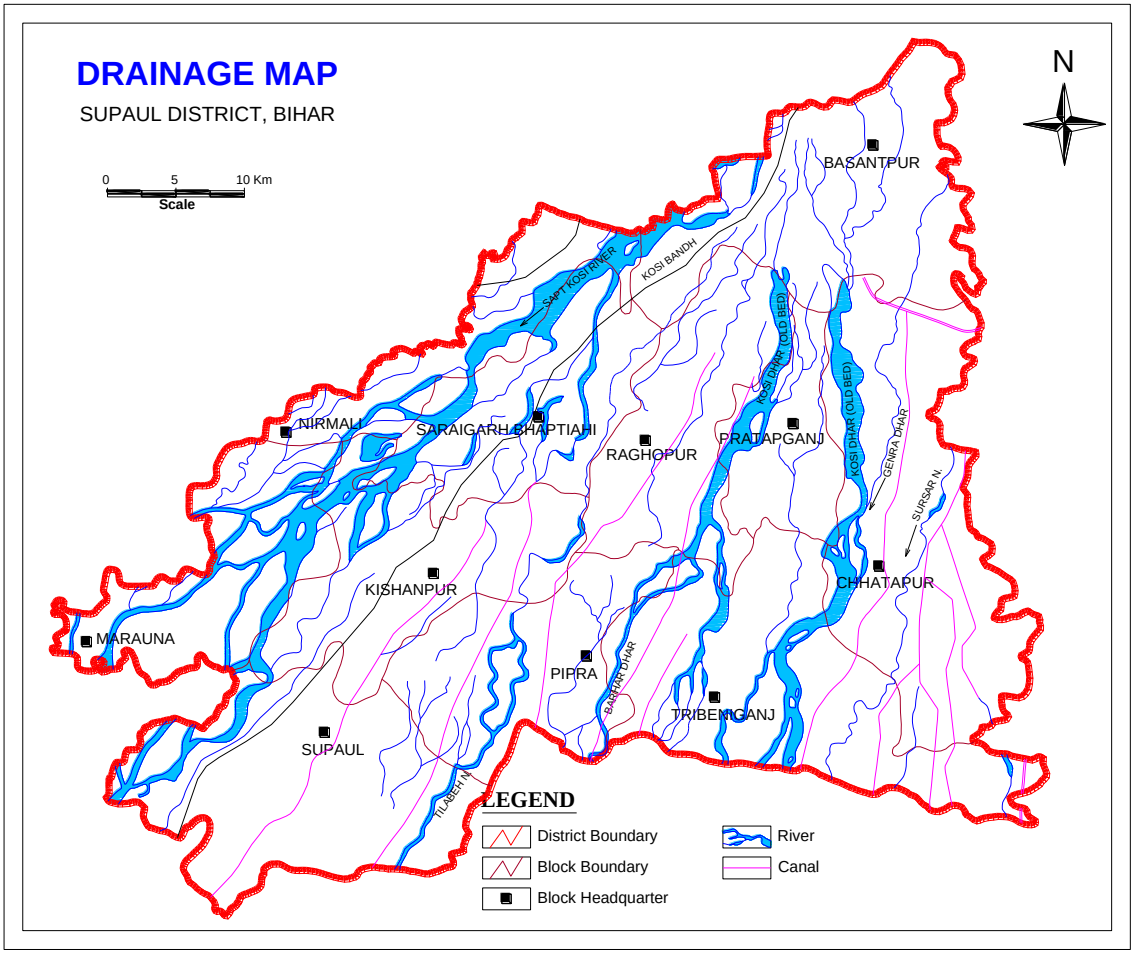


Figure 2: *Map of Supaul district showing important drainages including the Kosi at the eastern parts of the district.*

The Supaul district is located at the north eastern parts of Bihar state, which is situated in the middle parts of Ganga Basin. The district falls in the Kosi Sub-basin. The river has remained dynamic from historic parts and as such few palaeochannels of the river are traced in the district. Mis-fit channels with significant drainage during monsoon flow across the district towards south. The Kosi River has formed a megafan of ~13,000 km2 in Bihar state. The Supaul district is situated at the northern parts of the megafan (Fig. 3).

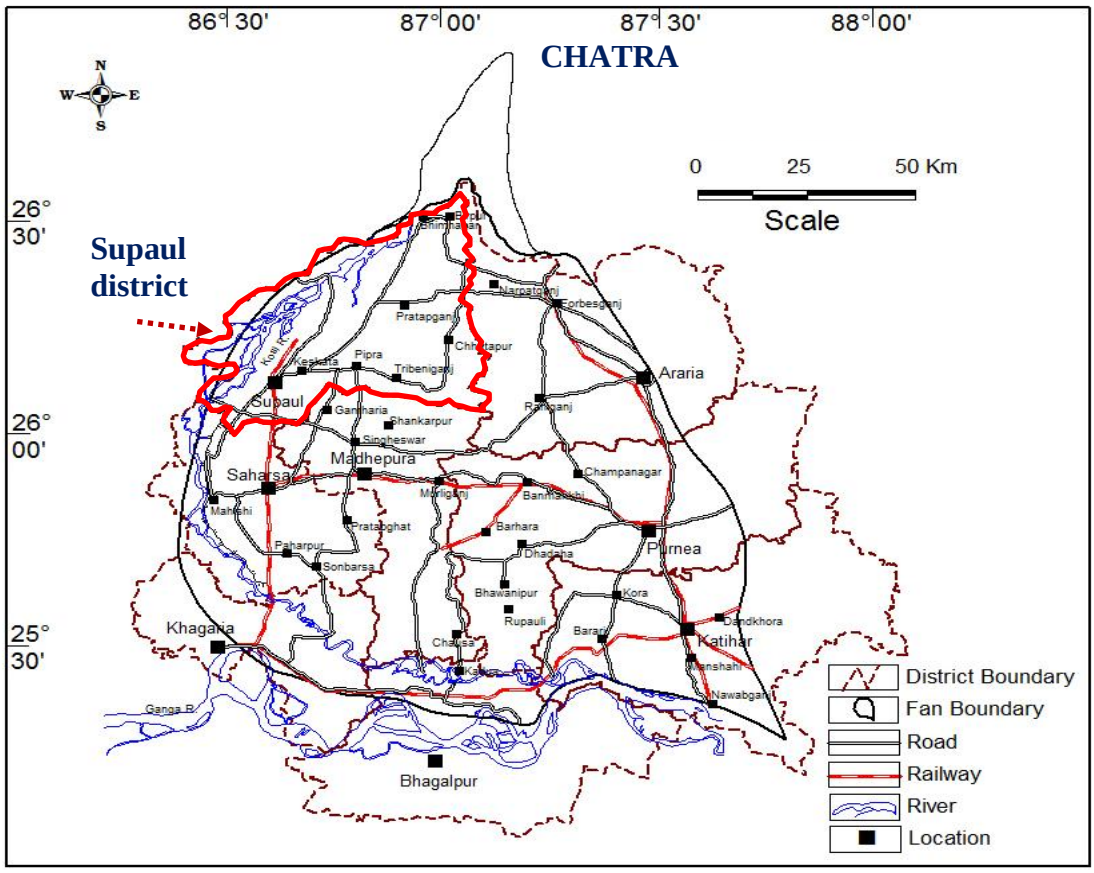


Figure 3: *Map of Kosi megafan and the location of Supaul district in it.*

The Kosi River and others such as Baghmati, Kamla-Balan and Adhwara group of rivers in the northern Bihar plains are highly unstable due to steep slope and high rate of burial of the river-beds with channel sediments, since the sediment load of these rivers is too high. They very often create breaches in their embankments and inundate the adjoining low-lying areas, thereby causing floods. The breach of left embankment of Kosi in 2008 took place at Kusaha, ~12 km upstream from Bhimnagar in Supaul district. It was devastating for life and property.

1.3 Water use habits

Supaul district has abundant water resource both surface and groundwater. There are number of rivers and rivulets, perennial in nature, flowing across the district such as Sursar, Bhenga, Mirchaiya, Kali, Tilyuga, Gera, Dhemra, Hahiya etc. The groundwater level remains usually shallow (Fig 4). Hand boring with one length of pipe is suffice to give adequate discharge to a 5 HP diesel pump set.

Figure 4: *Water table exposed in a small pit of hardly 1.5 m deep during November in Pratapganj block of Supaul district.*

The people in the villages of Supaul district depend upon groundwater for their domestic supply, including drinking water. Since water in the district lies very close to ground surface, this was a convenient way of getting potable water by digging and setting a ring well of hardly 7 m deep. In last decade and half, people have got a more easy way to access the groundwater by auguring a hole up to 5–7 m (usually one length pipe) and putting a locally designed hand pump assembly into that. In many cases bamboo is also used as the hand pump assembly pipe.

1.4 Land use, Agriculture and Irrigation Practices

Agriculture is the main occupation of the people in Supaul district. In general, there are four agricultural seasons in one year; (i) *Bhadai* (ii) *Aghani* (iii) *Rabi* & (iv) *Garma*. During Rabi the important crops, which are grown in the district include wheat, rice, corn, mustard, jawar etc. Paddy is mainly grown during June to November. The climate allows round the year vegetable cultivation of cabbage, cauliflower, carrot, radish, chili, capsicum, beans and long beans, gourd, potato, onion, coriander, turmeric, ginger, Garlic etc. The staple cereal of this district is rice.

Irrigation plays a vital role in the agriculture in this district. Though, the district falls in the eastern Kosi command area and a major part of the irrigation in the district is met from groundwater. In summer, canal system remains dry. Again, due to very heavy siltation (Fig 5), capacity of the canal reduces significantly. It is observed that groundwater forms a major irrigation source in the district with more than 50 % of the net irrigated area getting the source from groundwater (NIC-1997-98, Govt. of Bihar). The water level remains shallow and the people try to have their own tube well in the agr-filed with a local design. Bamboo wells, constructed within a depth of 5-15 m are used locally. However, selling and buying of water for irrigation is an usual practice in the district.

irrigation. In general farmers buy water for their crops from the neighbor.

Figure 5: *High siltation in canals of Kosi command area in Supaul district. The image showing de-siltation work.*

As on 2008-09, the net sown area in the district was at 1328 km^2 with the average agriculture intensity at 151%. The district possesses an area of 677 km2, which is sown more than once (Table 2).

Table 2: Agriculture and irrigation status in Supaul district.

S.No	Blocks	Geog. Area (km^2)	Net shown Area (km^2)	Area sown more than once (km^2)	Gross area Sown (km^2)	Agri. Intensity (%)	Irri. Intensity (%)	Gross area irri. (km^2)
1	Nirmali	135.9	46.0	19.2	65.2	142	46	29.9
2	Raghopur	200.4	140.5	68.3	208.8	149	78	163.5
3	Pratapganj	104.3	77.6	39.1	116.7	150	55	64.3
4	Supaul	313.4	176.2	99.3	275.5	156	51	141.5
5	Chhattapur	312.9	205.8	0.0	205.8	100	20	45.9
6	Basantpur	247.3	45.2	15.5	60.8	134	30	18.2
7	Tribeniganj	322.9	234.3	275.4	509.7	218	72	364.8
8	Marauna	168.6	100.9	23.1	123.9	123	68	84.1
9	Kishanganj	219.1	110.9	51.3	162.2	146	63	101.7
10	Saraigarh	178.5	59.1	33.9	93.0	157	47	43.8
11	Pipra	200.5	131.7	51.7	183.4	139	59	107.8
	Total	**2403.6**	**1328.1**	**676.8**	**2004.9**	**151**	**58**	**1165.3**

Source: District Statistical Office- Supaul (As on 2008-09)

1.5 Studies/Activities carried by CGWB

Exploration activity in the district is yet to be taken up by CGWB. However, water samples are being collected from hand pumps (shallow tube wells) and dug wells at regular intervals in order to assess the development of arsenic in a response to the water table fluctuation. Water levels from some particular dug wells, known as Hydrograph Network Stations, are being taken four times in a year. These data reflect any change in ground water regime in the dug wells in a response to the monsoonal pattern (shallow aquifer) and are used to estimate the ground water resource available in the district for irrigation, drinking and industrial purposes.

2.0 CLIMATE AND RAINFALL

The area has warm and humid climate with high temperature and medium to high rainfall. The temperatures are lowest during December-January with an average minimum of 8^0C to 10^0C and maximum of 24^0C to 25^0C. The temperatures in the hottest months of April to June are minima 23^0C to 25^0C and maxima 35^0C to 38^0C. The normal rainfall for the district stands at 1404 mm. Most of the rainfall (80% to 90%) is received from mid-June to mid-October (Fig 6.A). The late September-October rains (locally known as 'Hathia') are very crucial to agriculture in the region and their timing and distribution make all the difference between plenty and scarcity.

The last 18 years annual rainfall data (Fig 6.B) shows that the variation within the minimum of 669 mm (2006) to a maximum of 1794 mm (1999). After the year 1999/2000, there has been an overall decrease in the annual rainfall

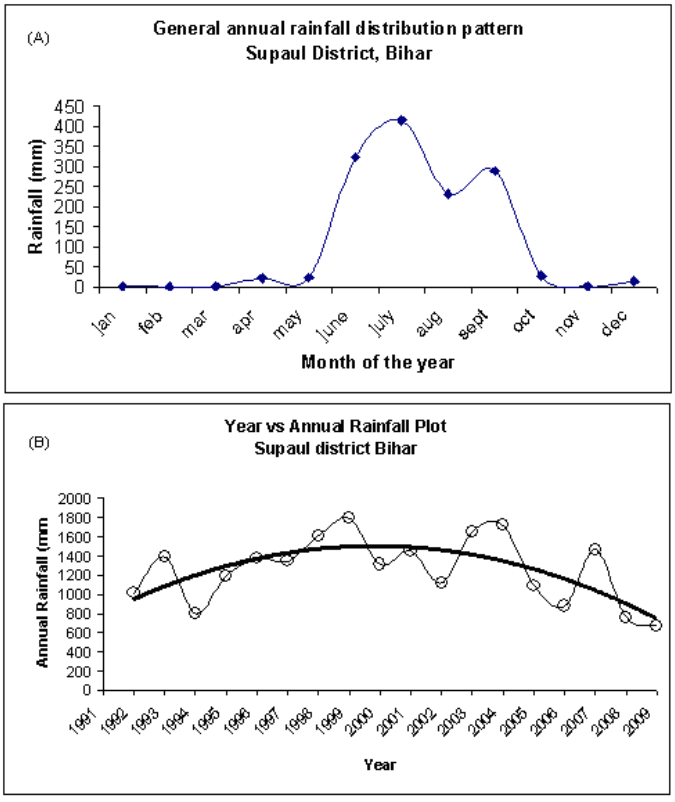


Figure 6: *(A) General annual rainfall distribution pattern in Supaul district of Bihar. Most of the ranfall comes during June to October. (B) Year vs annual rainfall plot depicting the trend (polynomial) of rainfall in the region during last 18 years.*

3.0 GEOMORPHOLOGY AND SOIL

3.1 Geomorphology

The district forms a part of the Kosi megafan. The river is known for its notorious shifting and channel abandonment approximately in every 25 years. The district Supaul is subjected to frequent flooding related to either shifting of the river Kosi or bank over-topping/breaching by floodwater.

Sweeping of the river in the megafan has created the alluvial landscape with abandoned channels and the flood plains. The abandoned channels exhibit sand bodies of huge dimension, often exposed or buried under thin veneers (~1.0 m) of mud. They also characterize the depressions in the megafan surface, which are prone to water-logging. Often the channels are occupied by mis-fit channels of smaller dimension (Fig 7). During lean period, these channels get water from the aquifers. These smaller channels rework and redistribute the flood plain sediments, and hence contribute in the evolution of the flood plain architecture.

The land surface in the district slopes southward with 30-35 cm/km at the northern half, while it is 45-55 cm/km at the southern half with an average value of ~ 40 cm/km. The reach segment of the Kosi River within the district Supaul is wide (6 to 8 km) and highly braided in nature.

Figure 7: *One abandoned channel of Kosi at Tribeniganj, showing heaps of sand, which generallt get deposited on the channel bed as bar deposits. A mis-fit channel now occupies the course.*

3.2 Soil

The district in general possesses alluvial soil. The soils are of poorly drained type. The areas close to the Kosi channels possess soil types of sandy loam, loamy sand and sand character, whereas, the areas away from the river channels consist of silty sand to sandy silt in nature. The soils in general are fine textured away from the river course and rivulets and coarse textured along their courses.

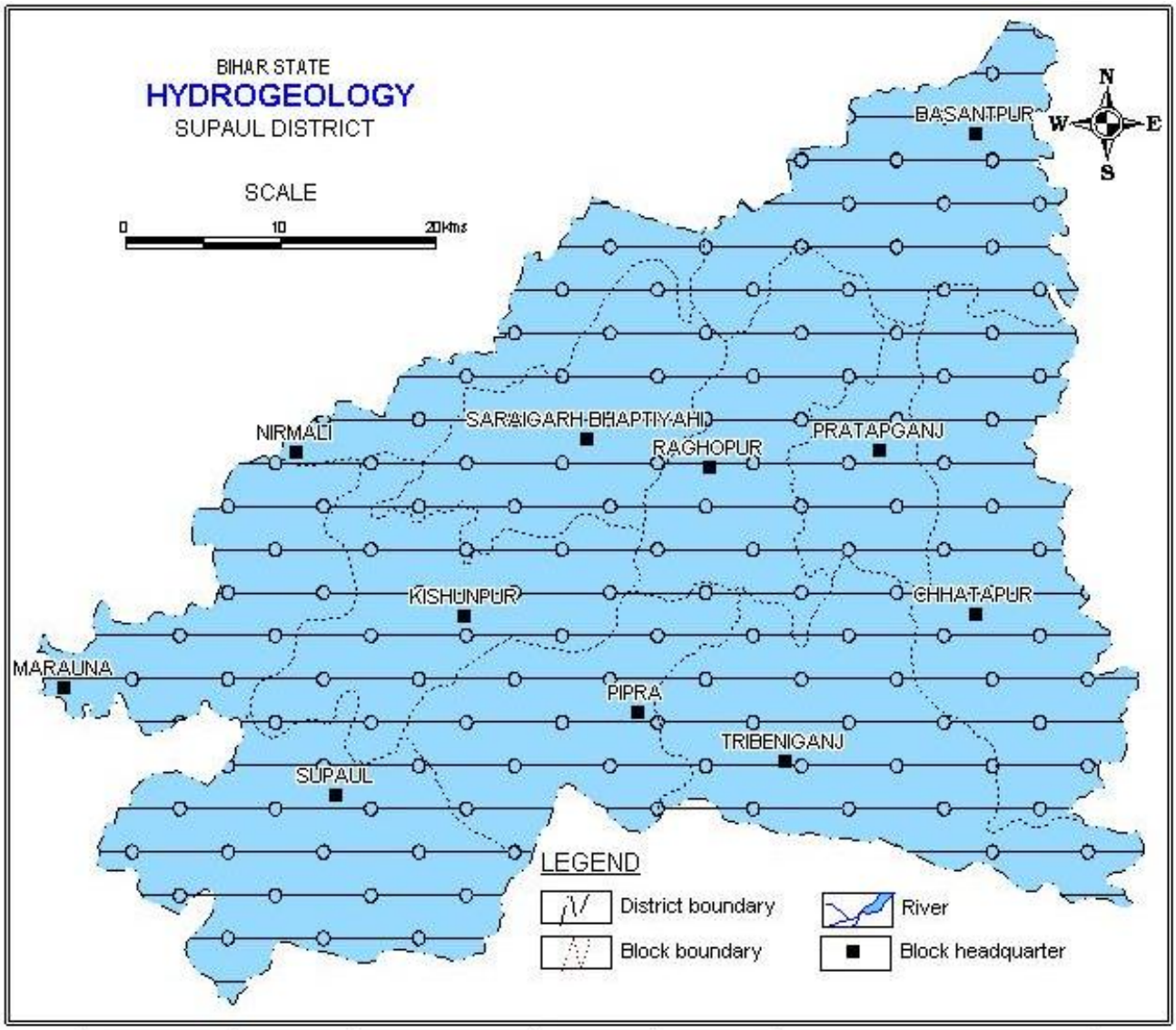
4.0 GROUND WATER SCENARIO

4.1 Water Bearing Formations

The Supaul district is underlain by Quaternary Alluvium (Fig 8) down to hundreds of meters depth. Thick sand bodies with minor interleaves of mud make prolific aquifer in the Kosi megafan area.

The top ~15 m is grey coloured fine sand, whereas at deeper levels, the coarseness of sand increases. Shallow tube wells in the area have the potential of yielding 50 m^3/hr for nominal drawdown of 2 m only. The clay capping is thin (< 1 m to 5 m) and even absent at many places.

In general, the Kosi megafan shows two major formations (Singh et al., 1993); the upper formation is of 8-10 m thickness (less commonly from 16 to 40 m) and is composed typically of fine sand and mud, whereas the lower formation is thicker (> 60 m) and composed up of in general medium to coarse sand to gravel (Fig 9). The lower formation is thought to have been deposited by a highly braided Kosi River during the Late Quaternary. The upper formation represents the sequence of strata deposited by the Kosi during the latest sweep across the megafan from east to west. The upper formation forms the younger Alluvium, while the lower one is thought to belong to an older sequence.



FORMATION	AGE/GROUP	LITHOLOGY	LANDFORM	SYMBOL	GROUND WATER POTENTIAL
Unconsolidated	Quaternary	Recent alluvium, clay silt, sand & gravel etc.	Alluvial plain		Good to very good Yield ranging from 100-200 Cu.m./hr.

Figure 8: *Map showing the hydrogeology of Supaul district. The district is covered with Quaternary deposits down to few hundred meters.*

The lithological logs indicate that the ground water occurs under unconfined condition. In Supaul district. Shallow tube wells are suitable up to a depth of 50 m with discharge of 20 to 40 m^3/hr. The deep tube well of more than 100 m depth can also be constructed with estimated discharge of 100-200 m^3/hr. Whereas Bamboo Boring of 20 to 25 m depth tapping water table aquifer can yield 10 to 20 m^3/hr with a safe draw down.

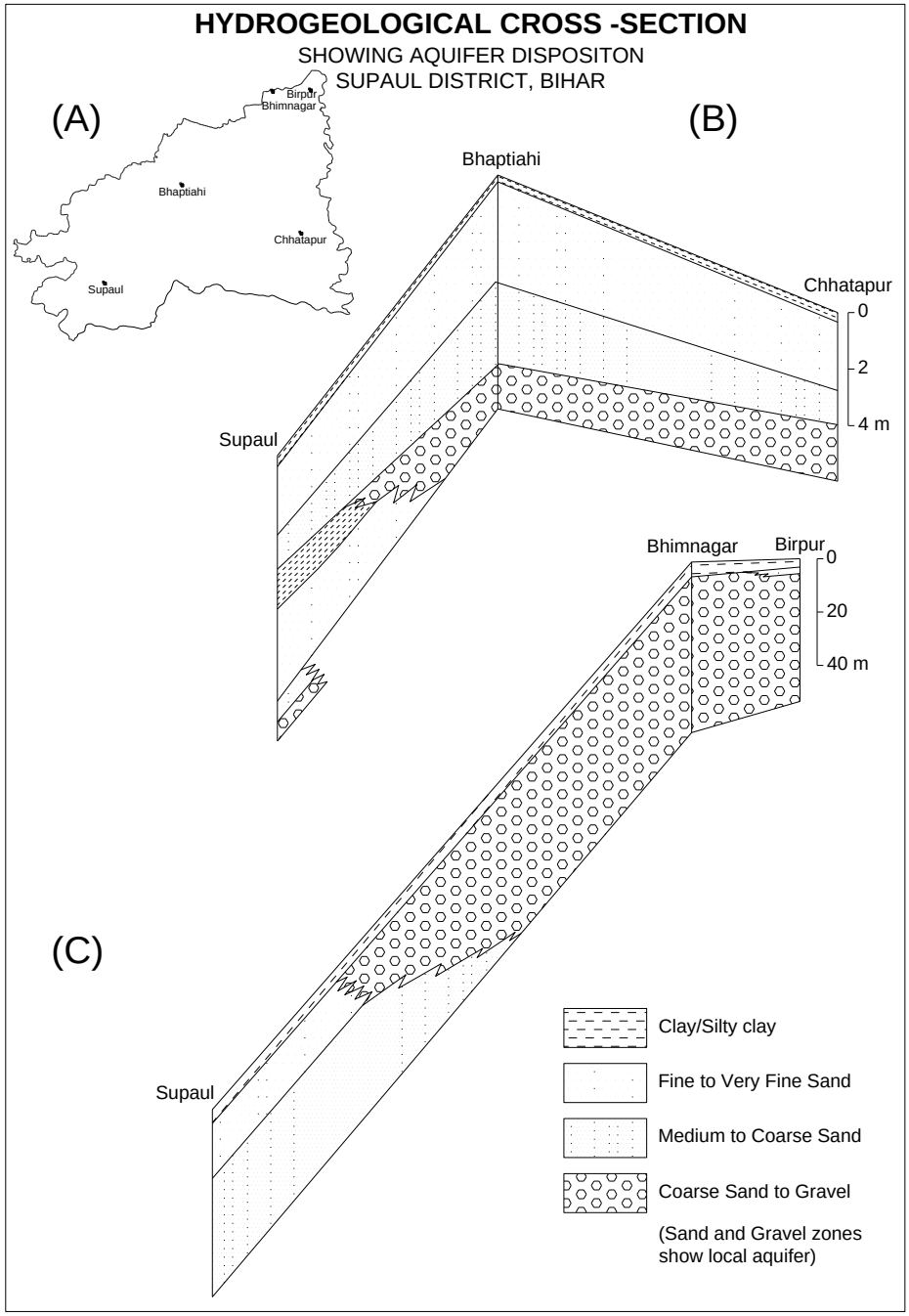


Figure 9: *Hydrogeological-cross sections showing the aquifer dispositions and their nature.*

4.2 Depth to Water Level

Depth to water level in the Supaul district remains shallow during pre- as well as post-monsoon periods, going maximum up to 5.0 m bgl at few patches (Fig 10). Water level for the year 2011 indicates a maximum of 3.85 m bgl during the pre-monsoon measurement. Few patches even possess depth to water levels within 2.0 m bgl, creating water-logging conditions. The water level in the district possesses a relation with the bed level elevation and flow in the Kosi River at the western parts of the district.

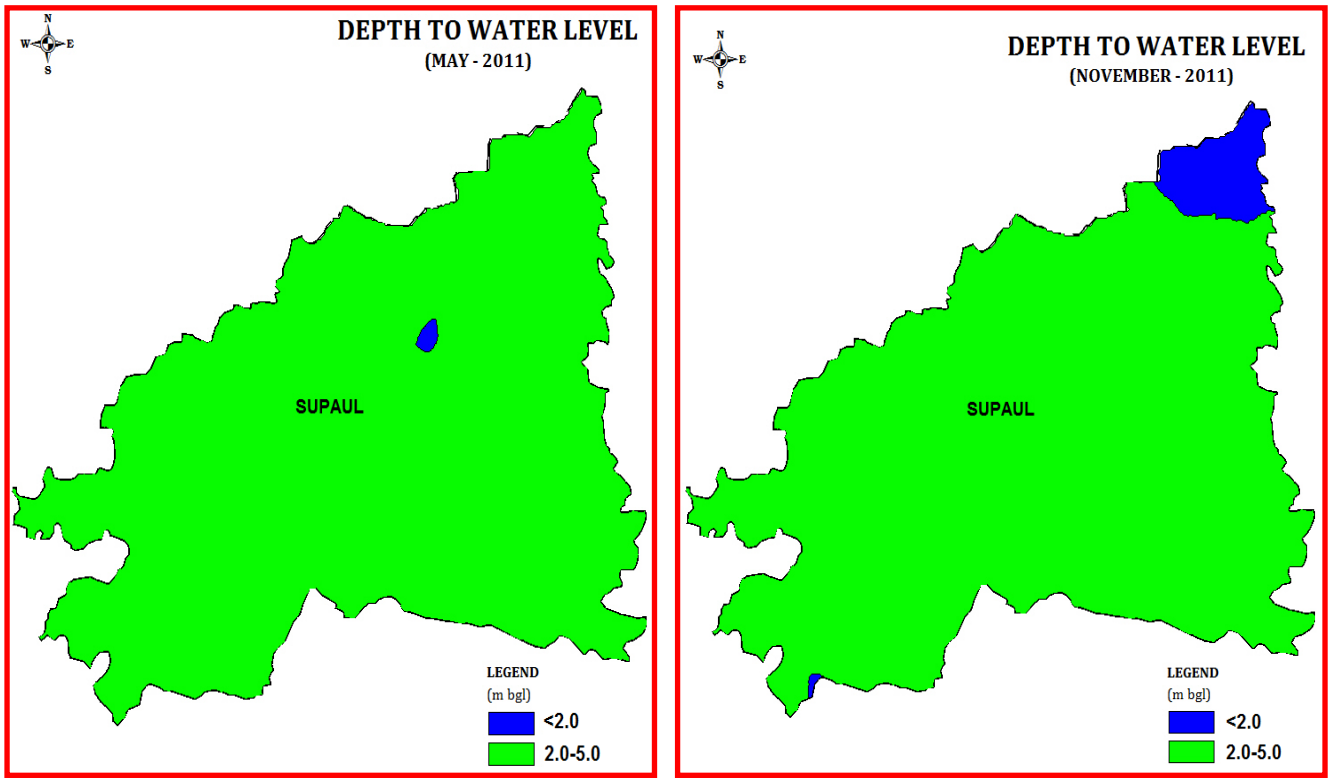


Figure 10: *Pre- and post-monsoon depth to water level maps of Supaul district.*

4.3 Ground Water Quality

Ground water samples were collected from the key well locations in the district and analyzed for the concentration of different chemical constituents in them. The general chemical quality in the district is produced Table 3.

Table 3: *Ground water quality of Supaul district.*

Chemical constituents (mg/l)	Shallow Aquifer	Drinking Water Standard (As per BIS norms)	
		Highest Desirable	Maximum Permissible
pH	7-8, 8.25 (max.)	6.5 – 8.5	No relaxation
E.C (Micro-siemens/cm at	398-1730	500	2000
Total Hardness ($CaCO_3$)	115-350	300	600
Bicarbonate	98-531	200	600
Calcium	18-96	75	200
Magnesium	3.6-66	30	100
Chloride	11-497	250	1000
Sulphate	-	200	Up to 400 if Mg is <30
Nitrate	-	45	100
Fluoride	-	0.6 – 1.2	1.5
Iron	0.105 – 16.94	0.30	1.0
Manganese (ppm)	< 0.05 – 4.83		
Sodium	7.5-121		
Potasium	2.8-300	1.90 - 50	

In the Kosi megafan area, concentration of Iron (Fe) more than the permissible limit has been reported as the major groundwater quality problem. A study indicates 53 % of the total number of samples exceeding the permissible limit of 1 ppm. Out of these, 45.9 % shows iron concentration between 1 ppm and 5 ppm and 8.16 % of samples show concentration of more than 5 ppm, reaching to 16.94 ppm at Bhawanipur in the district.

4.4 Ground Water Resources

The net annual replenishable ground water resource as on 31st March 2009 works out to be 74519 ha.m. The gross annual draft for all uses works out to be 24726 ha.m. Allocation of ground water for domestic and industrial use for 25 years works out to be 5391 ha.m. The stage of ground water development is 32.2%. The stage of ground water development is highest in Pipra (44.7%) and lowest in Nirmali (22.9%). As stages of ground water development in all the blocks are less than 70% and there is no long-term decline in water levels, all the blocks are under safe category. The stage of ground water development is depicted in Fig. 11. The block-wise ground water resource is given in Table 4.

Table 4: *Blockwise Dynamic Ground Water Resource (ham) of Supaul District (As on 31st March 2009.)*

Sl. No	Assessment Unit/District	Net Annual Ground water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground water Draft for Domestic and Industrial Water Supply	Existing Gross Ground Water Draft For all Uses (10+11)	Allocation for Domestic and Industrial Requirement supply upto year 2025	Net Ground Water Availability for future irrigation development (9-10-13)	Stage of Ground Water Development (12/9)*100 (%)
1	2	9	10	11	12	13	14	15
1	Basantpur	7906	2754	332	3086	648	4504	39
2	Chattapur	10059	3354	393	3747	676	6029	37.3
3	Kishanpur	5700	1565	247	1813	426	3709	31.8
4	Marauna	4045	1005	207	1212	355	2685	30
5	Nirmali	4395	814	191	1005	397	3184	22.9
6	Pipra	7415	3024	288	3312	495	3895	44.7
7	Pratapganj	3143	748	147	895	252	2143	28.5
8	Raghopur	6390	1752	294	2046	505	4133	32
9	Supaul	8716	2261	516	2777	956	5499	31.9
10	Triveniganj	11726	3245	217	3461	481	8001	29.5
11	Saraigarh Bhaptiahi	5024	1281	90	1371	200	3542	27.3
	Total	**74519**	**21804**	**2922**	**24726**	**5391**	**47324**	**32.2**

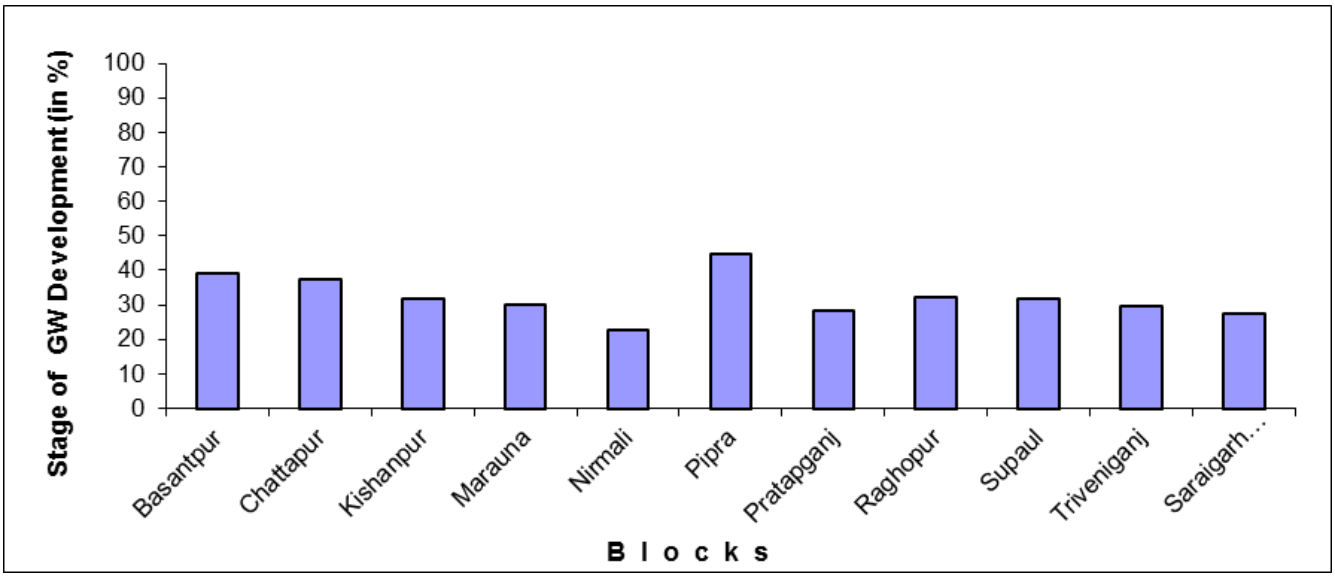


Figure 11: *Bar diagram depicting block-wise stage of groundwater development in Supaul district.*

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development

As per the resource evaluation (31st march 2009) the average utilisation of ground water in the district is less than 36.7%, which means none of the blocks in the district comes under semi-critical/critical or over exploited category. The present infrastructural facilities yield only 17278 ham of groundwater for irrigation and there is a vast surplus replenishable ground water potential of 32402 ham to be tapped.

5.2 Design and construction of Tube Wells

5.2.1 Construction and yield of wells

As per MI census 2000-2001, a total of 13928 shallow tube wells (~ 10 STWs per km^2) and 14 deep tube wells are in use in Supaul district. Most of the STWs in the district are constructed within the depth range of 5-15 m. These wells can sustain the discharge of a 5 HP pump of about 20 m^3/hr. The granular zones tapped trough deep tube wells within the depth of 100 m can yield up to 200 m^3/day

5.2.1.1 Design of Tube Wells

(a) Sallow Tube Wells

The district is blessed with potential mono-aquifer down to the explored depth of 100 m. The STWs in the depth range of 30–50 m bgl can yield up to 50 to 75 m^3/hr. A well assembly of about 76 to 102 mm diameter with about 10 to 20 m slotted pipe can be used for construction of such wells.

(b) Deep Tube Wells

Table 5: *Proposed Model of DTWs in Supaul district*

Sl.No.	Discharge (m^3/hr)	Proposed Depth of well (m bgl)	Proposed Diameter of well (mm)	Assembly Length (m)
1	100	100	306 – casing pipe 153 – slotted pipe 153 – blank pipe	25 24 51

The slot size should be recommended depending on the grain size of the granular zones as given below;

Table 6: *Proposed slot openings for tube wells in Supaul district.*

Fine sand	: 1/64” (0.04 cm) to 1/32” (0.08 cm)
Medium to coarse sand	: 1/16” (0.15 cm)
Gravel	: 1/8” to 1/16”

Both the shallow as well deep tube wells should be artificially packed with gravels of size ranging within 2–4 mm and a bail plug of 2–5 m should be provided in order to the yield and life of the well.

5.3 Water Conservation and Artificial Recharge:

No such water conservation and artificial structure has been constructed in the district so far.

6.0 GROUND WATER RELATED ISSUES AND RELATED PROBLEMS:

No such issues and problems have been reported from Supaul district other than pockets of groundwater iron contamination.

7.0 MASS AWARENESS AND TRAINING PROGRAMME:

Mass awareness/training programme is yet to be carried out in Supaul district.

8.0 AREA NOTIFIED BY CENTRAL GROUND WATER AUTHORITY/ STATE GROUND WATER AUTHORITY

Since all blocks of the district come under safe category from groundwater development point of view, no area is notified either by Central Ground Water Authority or State Ground Water Authority till date.

9.0 RECOMMENDATION

- Ground water needs to developed at an increased rate through installation of addition STWs. About 20 to 30 STWs can run effectively (within 50 m depth) per km^2, considering the safe operational distance between any 2 tube wells to be 200 m. In the western parts of the district, adjoining to the Kosi River, sustainable and economically more viable STWs of less depth can be constructed.
- Water level shoud be lowered through groundwater development, which can mitigate the problem of water-logging.
- Energisation of all the tube wells should be made on priority basis for increasing the cropping intensity. For this, financial support to small and marginal farmers should be provided.
- Chemical quality of groundwater has been observed to be in general suitable for drinking and irrigation purpose. In areas where high iron concentration is present, domestic water supply should be made after proper treatment of groundwater. Alternate deeper aquifers, free from iron may also be found for the purpose.