

CENTRAL GROUND WATER BOARD  
MINISTRY OF WATER RESOURCES  
GOVERNMENT OF INDIA



GROUND WATER INFORMATION BOOKLET  
DISTRICT KAPURTHALA

PUNJAB

North Western Region

CHANDIGARH

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## Contributors

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Our Vision

“Water Security through Ground water Management”

GROUND WATER INFORMATION BOOKLET  
KAPURTHALA DISTRICT  
PUNJAB

CONTENTS

DISTRICT AT A GLANCE

- 1.0 INTRODUCTION
- 2.0 HYDROMETEOROLOGY
- 3.0 GEOMORPHOLOGY AND SOILS
- 4.0 GROUND WATER SCENARIO
  - 4.1 HYDROGEOLOGY
  - 4.2 GROUND WATER RESOURCES
  - 4.3 GROUND WATER QUALITY
  - 4.4 STATUS OF GROUND WATER DEVELOPMENT
- 5.0 GROUND WATER MANAGEMENT
  - 5.1 GROUND WATER DEVELOPMENT
  - 5.2 WATER CONSERVATION AND ARTIFICIAL RECHARGE
- 6.0 GROUND WATER RELATED ISSUES AND PROBLEMS
- 7.0 RECOMMENDATIONS

## KAPURTHALA DISTRICT AT A GLANCE

S.no.	ITEM	GENERAL INFORMATION	Statistics
1	GENERAL INFORMATION	Administrative Divisions (As on 31-3-2012)	
		GEOGRAPHICAL AREA	
		Blocks	5 Kapurthala Nadala, Sultanpur Lodhi, Dhilwan Phagwara.
		Panchayats	
		Number Of Villages	
	POPULATION AS PER 2011 CENSUS		817668
		Male	427659
		Female	390009
		Literacy	80.2%
		Density	501 person per Km <sup>2</sup>
		Average Annual Rainfall	779(mm)
	GEOMORPHOLOGY		
		Major physiographic Units	Alluvium
		Major Drainage	Beas River, Black Bein, White Bein
	LAND USE (Sq.km.)	Forest Area:	20
		Net area sown	1350
		Cultivable area	1350
	MAJOR SOIL TYPES	Arid brown soils and Tropical Arid brown	
		AREA UNDER PRINCIPAL CROPS	219000 Ha
	IRRIGATION BY DIFFERENT SOURCES (Areas and Number Of Structures)	Dugwells	-
		Tubewells/Bore wells	54617(135098ha.)
		Tanks/ ponds	-
		Canals	500ha
		Others sources	-
		Net irrigated area	135000ha
		Gross irrigated area	2,21,212ha
	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2012)		
		Dugwells	1
		No of Piezometers	12
	PREDOMINANT GEOLOGICAL FORMATIONS		Alluvium
	HYDROGEOLOGY	*Major Water bearing formation	Sand, Gravel
		*(Pre-monsoon depth to water level )	4.04m-23.05mbgl
		*(Post-monsoon depth to water level )	2.95m-24.21mbgl
		*Long term water level trend in 10 yrs in m	0.33m-1.09m/Yr Fall

		/yr	
	GROUND WATER	EXPLORATION BY CGWB	
		EW	4
		OW	4
		PZ	12
		SH	-
		Depth drilled range(m)	27.5-450
		Discharge(liters per minutes)	248- 3293
		Transmissivity (m <sup>2</sup> /day)	1739
		Storativity (S)	0.0525
	GROUND WATER QUALITY		
	Presence of Chemical constituents more than the permissible limit	EC (micro mhos at 25°C)	245- 2940
		As (mg/l)	0.072
		Type of water	Ca+Mg-Hco <sub>3</sub>
	DYNAMIC GROUND WATER RESOURCES(2011)-inMCM	Annual Replenishable Ground water Resources	653.76
		Net Annual Ground water Draft	1539.55
		Net Ground Water Availability for future irrigation development	-893.59
		Stage of Ground Water Development	242.6%
	ARTIFICIAL RECHARGE& RAIN WATER HARVESTING		
		Projects completed by CGWB	1 (Kala Sangia )
		Mass awareness programmers	1 Nadala
	GROUND WATER CONTROL AND REGULATION	OE Blocks	5-Kapurthala,Nadala, Sultanpur Lodhi, Dhilwan, Phagwara
		Critical Blocks	-
		SAFE	-
		NOTIFIED BLOCKS	5-Kapurthala,Nadala, Sultanpur Lodhi, Dhilwan, Phagwara
		MAJOR GROUND WATER PROBLEMS AND ISSUES	Ground Water Decline

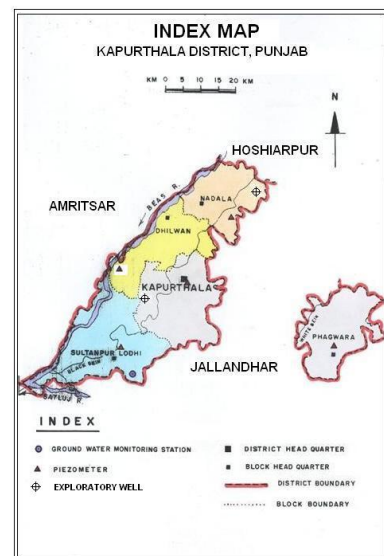
# GROUND WATER INFORMATION BOOKLET KAPURTHALA DISTRICT, PUNJAB

## INTRODUCTION

Kapurthala District is situated in the Bist Doab and comprises two non-contiguous parts, separated by some 32 kilometers. Kapurthala, Sultanpur Lodhi and Bolath Tehsils form one part and Phagwara Tehsil, the second separated portion. The former area lies between North latitude  $31^{\circ} 07'$  and  $31^{\circ} 39'$  and East longitude  $74^{\circ} 55'$  and  $75^{\circ} 36'$  Total geographical area of the district is 1633 sq.km. Kapurthala District is bounded partly in the North and wholly in the West by the Beas River, famed as the Hydaspes River. Kapurthala district is surrounded by Amritsar in the West, Hoshiarpur in the North, Jalandhar in the east and Ferozpur in the South. The Phagwara block is surrounded on three sides, the NW, W and SW by Jalandhar District, on the NE and E by Hoshiarpur District and by Nawanshahr in the South. Kapurthala district ranks 13<sup>th</sup> in Punjab with a population of 817668 which is 3% of the total population of Punjab state, the density of population is 501per Sq.Km. The literacy rate in the district is around 80.2%. The main drainage system of the district forms a part of Beas river system. The flow direction is towards Southwest. West or Black bein drains the central part and flows NE to SW. In Phagwara tehsil East or White Bein Flows West wards and then takes SW turn near western border of the tehsil. It is main drainage system in the tehsil and joins the Sutlej River. The Beas river has tendency to shift westward, there are many small tributaries of Beas Sutlej rivers like Kalna bein, Rau Nala and Kail nala.

## CLIMATE and RAINFALL

The climate of the district is characterised by general dryness except for a short period during south-west monsoon season. There are four seasons in a year namely the cold season from November to March, hot season from April to June, monsoon season from last week of June to the middle of September followed by post monsoon season till the beginning of November.



During cold season, a series of western disturbances affect the climate of the city during the summer months i.e. from April to June, weather is very hot, dry and uncomfortable. The weather becomes humid and cloudy during July to September due to penetration of moist air of oceanic origin into the atmosphere. The normal annual rainfall of the district is 779 mm, which is distributed over 33 days in a year. The south west monsoon which contributes 75% sets in last week of June and withdrawn in middle of September, July and August receive maximum rainfall. Rest 25% of annual rainfall occurs in the non-monsoon months in the wake of western disturbances and thunder storms.

Normal Annual Rainfall	779 mm
Normal monsoon Rainfall	584 mm
Temperature	
Mean Maximum	40 <sup>0</sup> C(May&June)
Mean Minimum	4 <sup>0</sup> C(January)
Normal Rain days	33

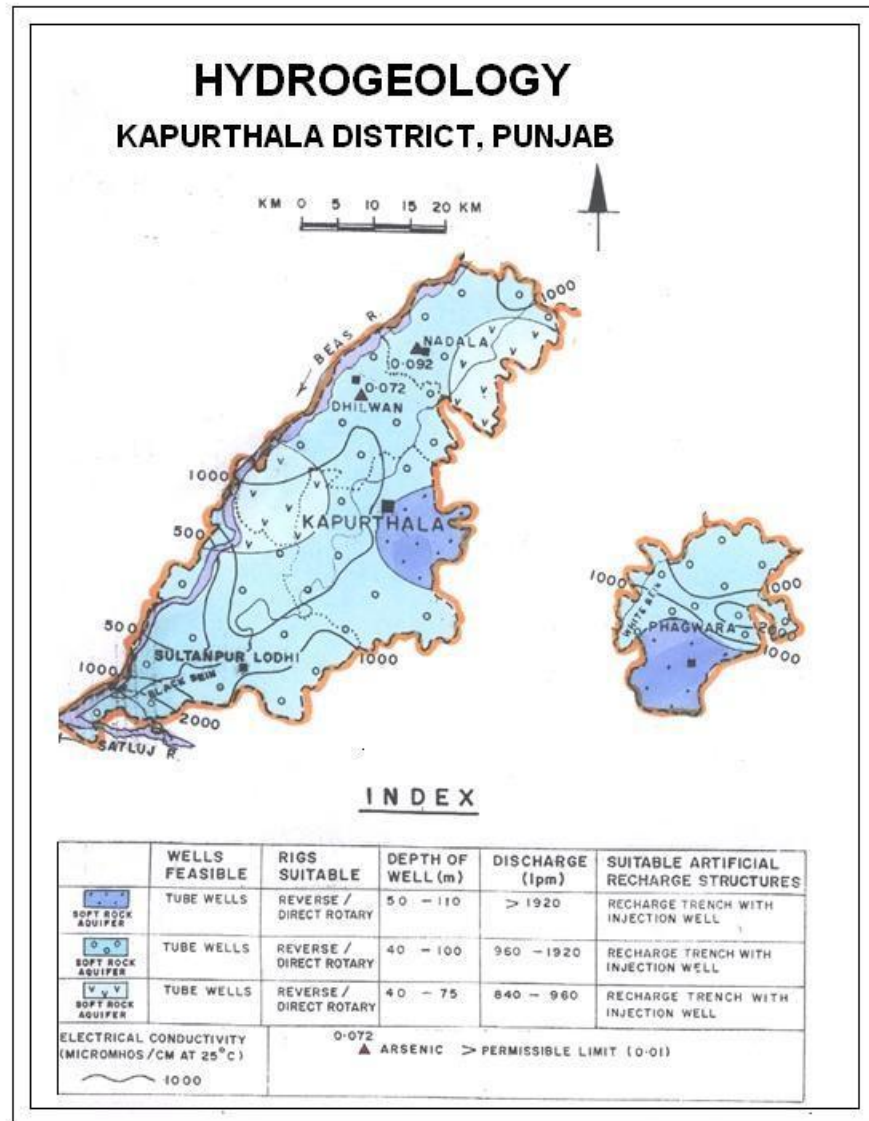
## **GEOMORPHOLOGY AND SOILTYPES**

The Kapurthala district is occupied by Indo-Gangetic alluvium. The major portion of this region lies in the river tract falling between the Beas and Black Bein and is called 'BET'. To the south of the Black Bein lies the tract known as 'Dona'. The word 'Dona' means that the soil is formed of two constituents, sand and clay, with sand predominating. The Phagwara region consists of the Sirowal, Dhak and Manjki tracts lying roughly in the North-East, middle and South-East of the tehsils. Sirowal possesses the characteristics of the 'Bet. The numerous hill streams coming down from Hoshiarpur District keep the soil moist all the year round. Some of these streams are silt laden and at first deposit fertile soil though their later deposits are more and more sandy. Due to the existence of these drainage channels patches and strata's of hard clay are also to be found. The Major Soil types found in the district are the arid brown soils and Tropical Arid brown soils. The arid brown soils are found mostly in Southern parts of the district and Tropical Arid brown soils are found in the Northern part and Phagwara block of the district. The arid brown soils are calcareous in nature and Tropical arid brown

soil is deficient in nitrogen, potassium and phosphorus.

## HYDROGEOLOGY

The district is occupied by Indo-Gangetic alluvial plain of Quaternary age. The Central Ground Water Board has drilled 12 Piezometers, in the district to delineate and determine potential aquifer zones, evaluation of aquifer characteristics etc. In alluvium thin granular zones exist down to the entire thickness, the top aquifer ranges from 20 to 45 m. The depth of the top aquifer in the North is upto 40 m., in the south it is upto 45m, in the Central it is 20 m. the top granular zone is interspersed by 2 to 3 thin clay lenses. A thick clay bed of thickness from 15 to 35 m. present beneath the Granular zone. Broadly it



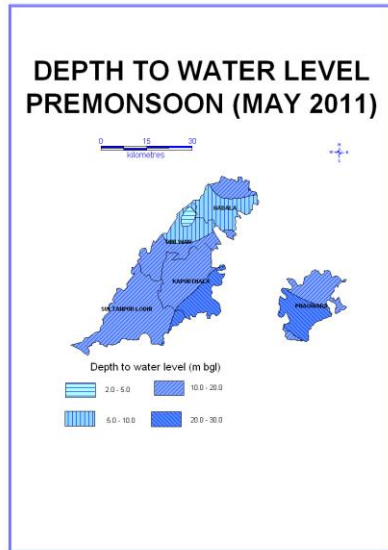
indicates 10 to 12 prominent granular horizons exist down to 350 m. and are separated by thick clay layers. The granular material is comprised of fine to coarse sand and at places mixed with gravel and pebble. Drilling was conducted at 6 locations in the district, Kapurthala, Phagwara, Bolath, Sultanpur Lodhi, Hussainpur and Bhatnura Khurd. The boreholes have been drilled down to depth of 350m. Piezometers have been



constructed at first four sites. Central ground water board has also drilled two exploratory wells at Hussainpur and Bhatnura Khurd sites by tapping medium aquifer (II Aquifer Group) and deep (III Aquifer group). One Pz at each of these two sites have been constructed to monitor ground water regime in shallow (I Aquifer group).

DISTRICT	Block	LOCATION	Type of well
KAPURTHALLA	DHILWAN	-	-
	KAPURTHALA	Kapurthala	PZ (Deep)
		Kapurthala	PZ (Shallow)
		Hussainpura	EW (Deep)
		Hussainpura	EW (Med)
		Hussainpura	PZ (Shallow)
	NADALA	Bolath	PZ (Deep)
		Bolath	PZ (Medium)
		Bolath	PZ (Shallow)
		Bhatnura Khurd	EW (Deep)
		Bhatnura Khurd	EW (Med)
		Bhatnura Khurd	PZ (Shallow)
	PHAGWARA	Phagwara	PZ (Deep)
		Phagwara	PZ (Shallow)
	SULTANPUR	Sultanpur Lodhi	PZ (Deep)
		Sultanpur Lodhi	PZ (Shallow)
		Talwandi Chowdhary	PZ (Shallow)

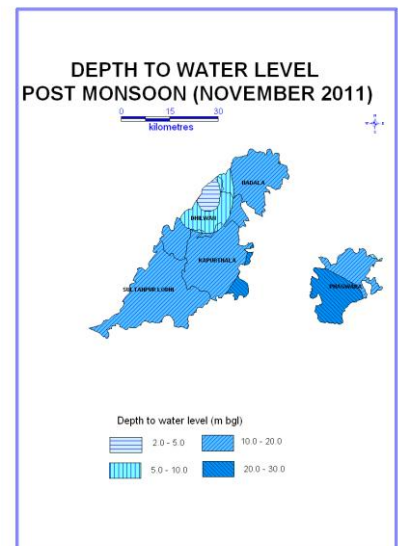
## Water level behavior PRE-MONSOON



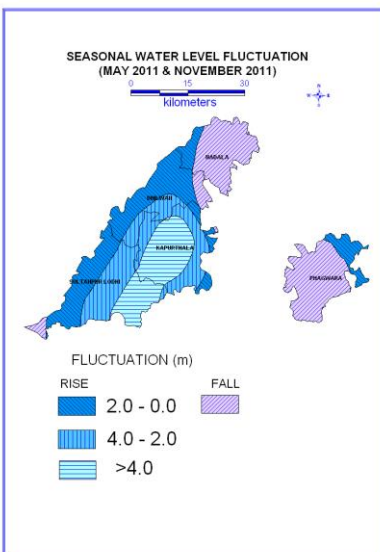
During the pre-monsoon period depth to water in the district varies from 4.04 m bgl (western part) to 23.05m bgl (Eastern part). The depth to water level less than 10m in the Northern (Nadala and Dhilwan blocks) it ranges between 10 to 20 m in Southern parts of district (Sultanpur Lodhi and Kapurthala blocks), water levels still becomes deeper (>20m) in the western parts of the district falling in Kapurthala and Phagwara blocks.

## POST-MONSOON

During the pre-monsoon period depth to water in the district varies from 2.95 m bgl (western part) to 24.21m bgl (Eastern part). The depth to water level less than 10m in the Northern (Nadala and Dhilwan blocks) it ranges between 10 to 20 m in Southern parts of district (Sultanpur Lodhi and Kapurthala blocks), water levels still becomes deeper (>20m) falling in Phagwara block.



## Seasonal water level fluctuation



Water level rise upto 2m has been recorded along river Beas in Kapurthala, Nadala and Sultanpur Lodhi blocks. South central part covering Kapurthala and Sultanpur blocks has observed water level rise more than 2m. Northern part of Nadala and southern part of Phagwara blocks have observed decline upto 2m.

## LONG-TERM WATER LEVEL TREND

The long-term (2003-2012) water level trend indicates that the pre monsoon water level decline ranges from 0.0.1316m/yr Bolath to 0.8693m/yr at Phagwara. During post-monsoon water level declined at rates of 0.3666m/yr at Dalla to 1.0824m/y at Phagwara. Annual water level trends indicate that water declined at rates of 0.0971m/yr at to 1.0906m/y at Phagwara. Maximum decline has been noticed in Phagwara block.

### Ground water flow

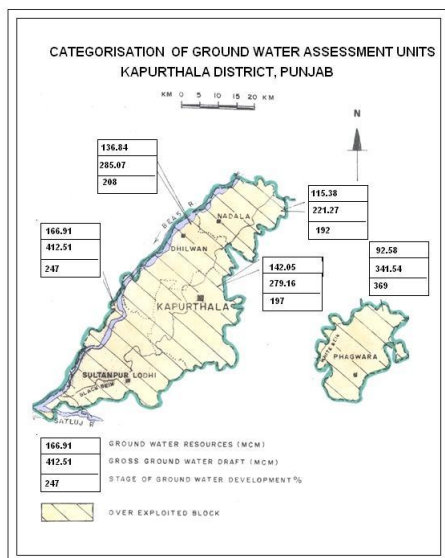
The elevation of the water table in the district varies from 221.34 to 229.34 m above mean sea level. The water table elevation map shows the general slope of the water table towards South SE from North. The average gradient of the water table is of the order of 1.5 m/km. The overall flow of ground water is from north to southeast direction.

### GROUND WATER RESOURCES

The block wise ground water resource potential in the district has been assessed as per GEC-97. The stage of ground water development ranges between 192% (block-Nadala) to 369% (block- Phagwara). The total replenishable ground water resource in the district is 653.76 mcm. The net ground water draft is 1539.55 mcm thus over exploiting 893.59mcm .The stage of ground water development in the district is 242.6%.

GROUND WATER RESOURCE AND DEVELOPMENT POTENTIAL OF KAPURTHALA DISTRICT, PUNJAB AS ON 31<sup>ST</sup> MARCH, 2011 in ha m

Assessment Unit	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for irrigation	Existing Gross Ground Water Draft for domestic and industrial purposes	Existing Gross Ground Water Draft for all uses (11+12)	Provision for domestic, and industrial requirement supply to 2025 years	Net Ground Water Availability for future irrigation development (10-11-14)	Stage of Ground Water Development 13/10*100 (%)
NADALA	11538	21667	460	22127	568	-10697	192
DHILWAN	13684	28082	425	28507	519	-14917	208
KAPURTHALA	14205	26588	1327	27916	1532	-13915	197
PHAGWARA	9258	32937	1216	34154	1453	-25133	369
SULTANPUR LODHI	16691	40808	443	41251	580	-24697	247
DISTRICT TOTAL	65376	150082	3871	153955	4652	-89359	242.6



## GROUND WATER QUALITY

Chemical quality data obtained from the analysis of ground water samples representing shallow aquifers reveals that ground water is Alkaline in nature and fresh to moderately saline. Concentrations of various chemical parameters, except nitrate at Kapurthala (105 mg/l), all ground waters are within permissible limits for safe drinking water (BIS, 1991, Rev.2007). Among anions, bicarbonate is the dominant anion and among cations, Ca and Mg are dominant. Arsenic is more than the permissible limit (0.01 mg/l) at Dhillwan (0.072 mg/l). By and large, Ground water is suitable for drinking purposes. Salinity (EC), Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) are the basic parameters considered for ascertaining the irrigational suitability of ground water. Based on the plot of EC and SAR on USSL diagram for rating irrigation water, it is observed that all ground water fall under C<sub>2</sub>S<sub>1</sub> except ground water at Phagwara which falls under class C<sub>3</sub>S<sub>1</sub>. Such waters cause neither salinity nor sodium hazards when used for customary irrigation. From this it is concluded that ground water of the district is suitable for irrigation.

TABLE 2: Range of concentration of Chemical constituents

PH	6.95	8.21	
Specific conductivity	245	2940 micromhos/cm	at 25°C
CO <sub>3</sub>	Nil		

HCO <sub>3</sub>	106	863	mg/l
Cl	6.7	310	“
NO <sub>3</sub>	0	173	“
F	0.1	1.05	“
Ca	8	210	“
Mg	3.7	60	“
Na	12	415	“
K	2	570	“
Total hardness as CaCO <sub>3</sub>	72	773	mg/l

TYPE OF WATER: The shallow ground water in the district is of Ca +Mg HCO<sub>3</sub> type .

## **SUITABILITY OF WATER**

### **Domestic**

Ground water occurring in the shallow aquifer is fresh to moderately saline by and large Ground water in the district is suitable for drinking purposes. All the elements were found within the permissible limit except at a very few small patches in Phagwara block.

### **Irrigation**

Ground water of the district is suitable for irrigation. The ground water is Medium to Highly saline with low sodium hazard. Ground water fall under C<sub>2</sub>S1 except ground water at Phagwara which falls under class C<sub>3</sub>S1.

## **STATUS OF GROUND WATER DEVELOPMENT**

The water supply to the district is mainly based on groundwater through tubewells 60% of the urban population is covered under drinking water supply scheme. The water supply to the villages is met out with the installation of hand pumps by the villagers as spot and convenient source of water. The canal irrigation cover small eastern part of the Phagwara block and a very small part in Kapurthala block. The remaining part of the district is not irrigated by canals. The depth of tubewells in the district ranges from 40 to 150m with a discharge of 400 to 1000 lpm. Most of the shallow tube wells are either run by diesel engines or electric motors. There are 54617 motors working in the district. The major part of the district is being irrigated through ground water. The unit well draft calculated for irrigation during the year is 4.39. The ground water discharge is between 960 to 1920 lpm in the North and it is more than 1920 lpm in the Southern part of Phagwara block.

## **GROUND WATER MANAGEMENT STRATEGY**

### **Ground Water Development**

The hydrogeological data generated through exploratory test drilling has provided vital information regarding identification of aquifer systems, demarcation of their vertical and lateral extent, and delineation of potential aquifer characteristics. These studies also provide information on well design and drilling techniques. A well assembly of 305/203mm dia. Combination, using about 40m to 50m housing length having slot size of 1.19mm would be ideal for the district area. The "V" wire galvanized Johnson Screen having 1.0mm slot width may also be used against granular zones, as it has more open area for the entrance of water. The shallow tube wells upto 40m depth should have 203mm single dia pipe assembly with a suitable screen length. Direct Rotary rig can carry out the drilling in the district area.

### **RECOMMENDATIONS**

- In order to arrest further decline in water levels, the **roof top and farm pond** rainwater harvesting techniques have to be adopted and recharge structures need to be constructed in low lying areas where water gets accumulated during rainy season. This will help in enhancing the recharge to ground water reservoir.
- The wheat – paddy cycle needs to be replaced by crops consuming less water.
- Water conservation structures may constructed in catchment areas of Black bein and White bein the natural drains and if possible, may be connected with the canal system so that water flows for more time thereby replenishing the ground water through recharge and by reducing the dependence on ground water for irrigation.
- The Canal network in the block should be increased in order to decrease the over dependence on ground water.