FARIDKOT DISTRICT, PUNJAB

CENTRAL GROUND WATER BOARD

Ministry of Water Resources
Government of India North Western Region

CHANDIGARH
2013

GROUND WATER INFORMATION BOOKLET

FARIDKOT DISTRICT, PUNJAB

By

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Scientist 'C'

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	SH	1
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	EC (micro mhos at $25^{o}C$)	591 to 4540
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	Net Ground Water Availability	61226
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1.0 INTRODUCTION

Faridkot district is created by Punjab Government by re-orienting parts of the adjoining Moga, Muktsar, and Bhatinda districts. The district with an area of 1419 Sq. Km. has the unique distinction of being one of the smallest districts in the state. The areal extent of Faridkot district is confined within Northern latitudes of $29^0$54'00" to $34^0$54'00" and the Eastern longitudes of 74^0 15 '00" to $75^0$25'00" located in the southwestern parts of Punjab state with Faridkot city as its district headquarters.

Faridkot district shares common boundaries with Moga, Bhatinda district in the east, Ferozpur district in the North and West and Muktsar district in the south (Plate.I). It is located in the Malwa region of the state. It is elevated at 204.33 m amsl. The district headquarters Faridkot, is connected with Ferozpur and Bhatinda by broad guage railway line and by metalled road. The entire district has a good network of metalled roads connecting all the villages.index map of the district is given in Plate-I.

1.2 Administrative Divisions & Demography

Administratively, the district has been divided into two Tehsils. The administrative set-up of the district is as under:

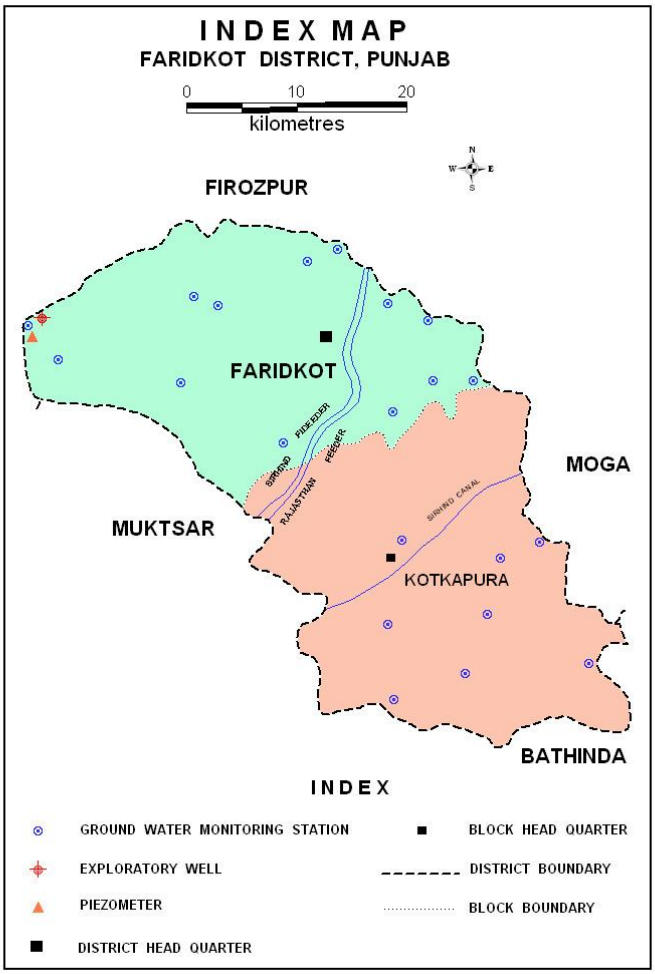
District **Tehsil** **Block**

Faridkot	Faridkot	1. Faridkot
.	Jaitu	2. Kotkapura

Faridkot tehsil comprises of 130 villages while Jaitu has only 41 villages. Faridkot block comprises of 99 villages and Kotkapura 72 villages.

Total Population of the district, as per the 2011 Census, was 618008 out of which 327121 were males and 290887 were females. The population density is 424 persons per sq.km. There was change of 12.18 percent in the population compared to population as per 2001. In the previous census of India 2001, Faridkot District recorded an increase of 21.07 percent to its population compared to 1991.

Plate -I



C G W B / N W R (S.K. Singh) D.O.NO. 28 / 2009

2.0 CLIMATE & RAINFALL

The climate of the district is classified as sub-tropical steppee, semi arid and hot which is mainly dry except in rainy months and characterised by intensely hot summer and cold winter. During three months of monsoon season from July to September the moist air of oceanic origin penetrate into the district and causes high humidity, cloudiness and monsoon rainfall. The period from October to November constitutes post monsoon season. The cold weather season prevails from December to February followed by the hot weather season or Pre-monsoon season which ends upto the last week of June.

2.1 Rainfall

The normal annual rainfall of Faridkot District is 449 mm in 24 days which is unevenly distributed over the district. The southwest monsoon sets in last week of June and withdraws towards end of September and contributes about 78% of annual rainfall. July and August are the rainest months. Rest 22% of the annual rainfall occurs during non- monsoon months of the year in the form of thunder storm and western disturbances. Rainfall in the district increases from southwest to northeast.

Normal Annual Rainfall	: 449 mm
Normal monsoon Rainfall	: 349 mm
Temperature Mean Maximum :41.1°C(May&June) Mean Minimum :5.1 °C(January)	
Normal Raindays	: 24

3.0 GEOMORPHOLOGY

3.1 PHYSIOGRAPHY

Faridkot district is a part of Punjab Malwa plain and is sub-divided into the following three regions on the basis of soil, topography, climate and natural vegetation.

a. Faridkot Hathar- Sadiq- Sandy Plain

This part extends over Sadiq part of the district commonly known as Hathar area. This part of the district has a large numbers of sand dunes and wind erosion has its own effect on the fertility of soil.

b. FARIDKOT: Uttar- Dhudhi- sandy-loamy

This part of Faridkot district extends over Dhudhi, Kot Sukhia, Tehna and is known as Uttar area. The soil is sandy loam. Due to extension of agriculture and irrigation there is apparent disappearance of sand dunes to a great extent which have been leveled up generally.

c. Jaitu Area: Sandy Loam to Loam

This region extends over and around Jaitu tehsil. The texture of the soil is sandy loam to loam. This area is known for the best staple of cotton.Most of the area is covered under sandy soil followed by clayey soil except some patches where there is appreciable thickness of top clay layer varying from 6.7 to 16.7m. the results obtained by analysis of soil samples collected from different villages by MARKFED, the soil composition has undergone a remarkable change during the last decade. There has been a appreciable rise in pH value and electrical conductivity indicating a remarkable increase in the salt concentration in the soil. At present about 3000 ha of land is alkaline/ saline in nature and problem is very acute in Faridkot block, particularly in Sadiq area. This alkaline soil is unfit for agriculture.

4. AGRICULTURE AND IRRIGATION

Main land use in the district is for agriculture with 89% of the land being used for agriculture. Land put to various uses in the district is given below.

Land use pattern of Faridkot district, Punjab

Type of Land use	Area (hectares)
1.Total Geographical area	141900
2.Forest	2004
3.Land put to non-agricultural use	16719
4.Current Fallows	2239
5.Net area sown	128198
6.Gross cropped area	255573

7.Cropping intensity 198%

Among agricultural crops, paddy, American cotton, wheat are major crops during kharif and rabi respectively. Desi cotton and sugarcane are also grown in the district.Kharif and rabi is cultivated in Faridkot district under two types of soil i.e. loamy sand and sandy loam and the sources of irrigation are canal as well as tubewells. Fodder crops in the district are grown throughout the year with its scaricity in the month of May and June. There are two main harvest seasons in a year, the kharif and the rabi.

The improvement in the canal water supply schemes and the changes in the Ground water regime has changed the cropping pattern of the district with time. The area under rice and sugarcane is increasing year after year and the area under cotton (American and desi) is declining year by year in whole of district similarly area under wheat is also increasing because of its assuredness as compare to other minor crops like gram. barely etc.

Irrigation

Irrigation in the district is carried out both by surface water as well as ground water. As major parts of the district are underlain by saline water, so canal water is major source of irrigation. In some parts where fresh water is available as fresh water lenses, than irrigation is done by skimming wells known as multiple well point system. Faridkot district is a good example of conjunctive use of canal water and ground water for irrigation.

Canal water irrigation

Major source of irrigation is canal where water from Sirhind canal is utilized for irrigation. Important distributories are abohar Branch, Dhoolkot distributary system, Mari distributary system, Faridkot distributary , Kotkapura distributary , Jaitu distributary, Rupana and Doda distributary system. The total length of above distributaries which serve in Faridkot district is 228.44k.m. out of which 206.49 k.m. are lined and 21.85 km are unlined. Gross irrigated area of all the channels are 223021acre and cultural command area is 198343 acres with 294 no. of outlets. Intensity of irrigation is 140%.

Ground Water Irrigation

With the advent of multiple well point system, ground water irrigation is also playing an important role in development of agriculture economy of the district. This is not only release the pressure mounted on the canal water supply but also creates the maximum storage in the unconfined aquifer for fresh ground water through by return flow and canal seepage .

5. HYDROGEOLOGY

The Faridkot district falls in the Sutlej basin. The Sutlej in the historic period formed a tributary of Saraswati which followed the path of present Ghaggar river and later the Sutlej took an easterly trend to form part of Indus drainage. The alluvial deposits underlying Faridkot district form a part of Sutlej/ Saraswati deposits and are located away from the present course of Sutlej river. The area falls within alluvial tract composed of fine sands, silt, and silty clay. There are occasional bands and patches of sand with mica flakes. Relative compact bands of silty clay and thin kankar beds are also reported in some of the well sections in the district. Clay occurs in the form of lenticular bodies at various depths. Principal aquifer in the district is Alluvium and major aquifers in the district are older alluvium, Aeolian alluvium and younger alluvium.

Plate-II

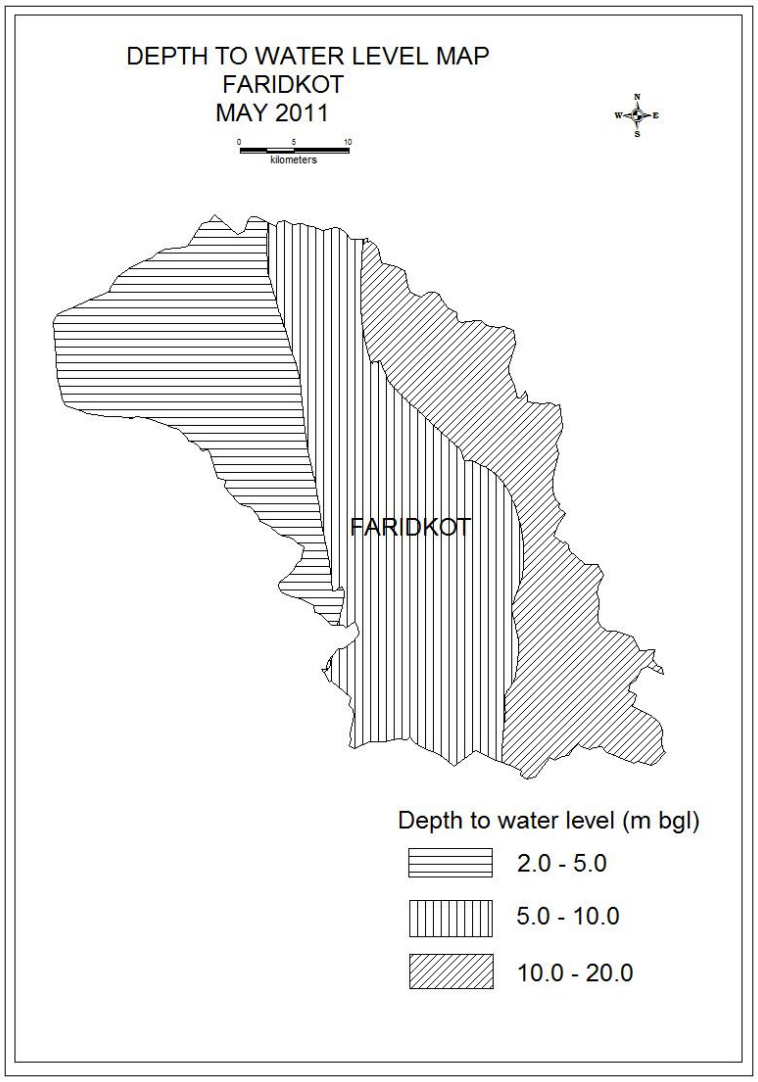
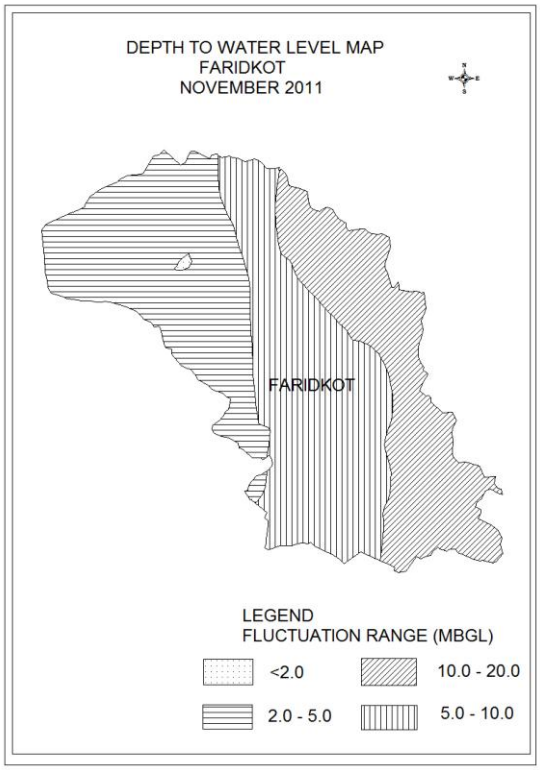
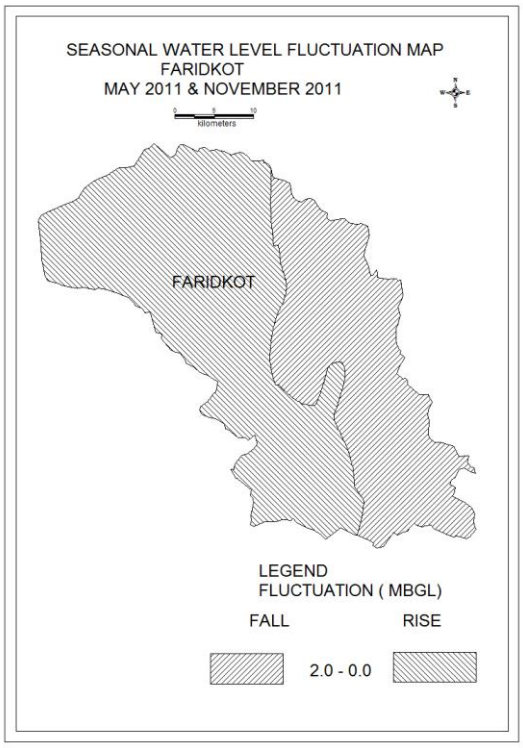

DEPTH TO WATER LEVEL MAP
FARIDKOT
MAY 2011
0 5 10
kilometers
N
W
E
S
FARIDKOT
Depth to water level (m bgl)
2.0 - 5.0
5.0 - 10.0
10.0 - 20.0

Plate- III & IV





Depth to water level map of Pre-monsoon (May 2011) and post monsoon period

(November 2011) are given in plates I & II. It has been observed that in the eastern part of the district water levels are in the range of 10 to 20 m, in the central part of the district the water levels are in the range of 5 to 10 m bgl and in western part of the district the water levels are shallower in the range of 2 to 5 meters range. Pre monsoon (May 2011) water levels ranges from 3.50 to 15.35 m bgl and post monsoon water levels ranges from 1.94 to 16.1 m bgl. Seasonal water level fluctuation map (Plate-III) shows a rise and fall in the range of 0.00 to 2.00 meters in western and eastern part of the districts respectively.

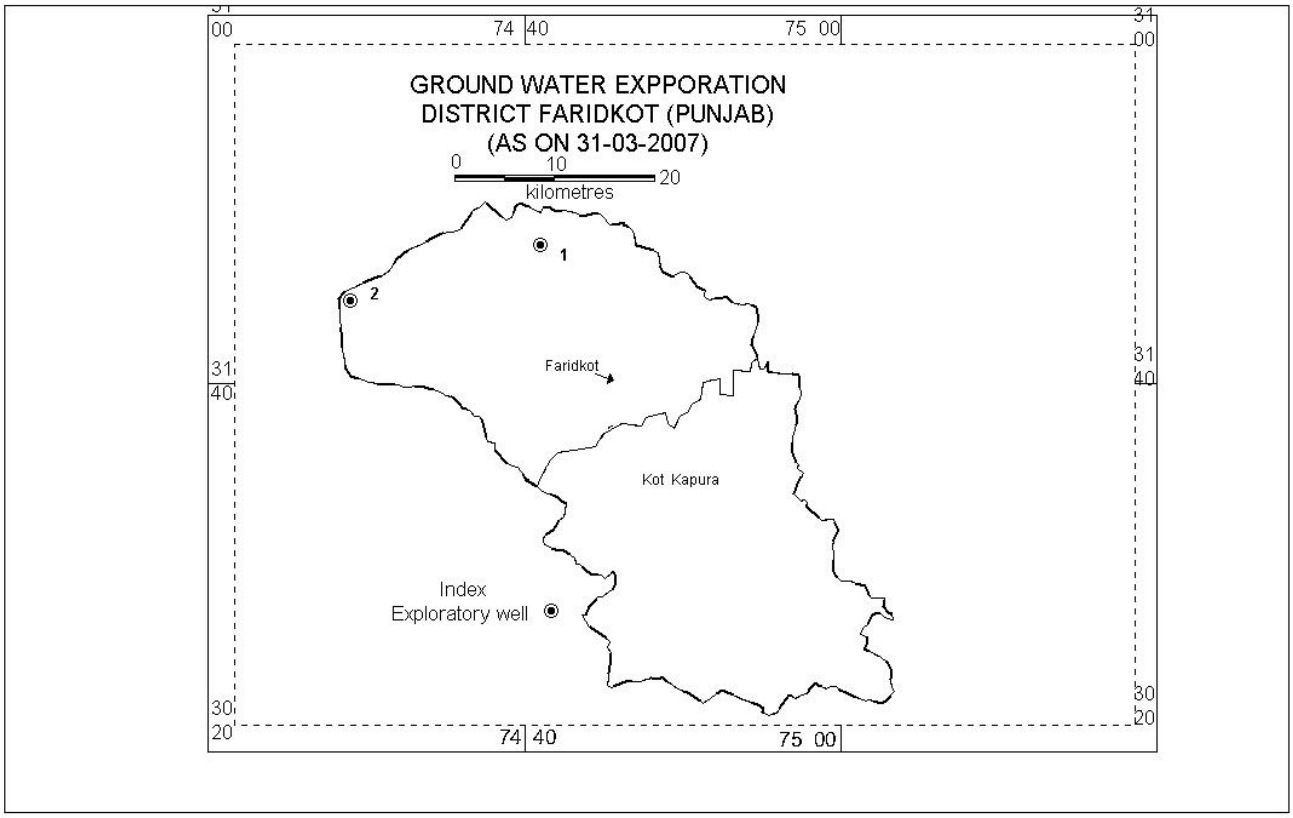
6. GROUND WATER EXPLORATION

The Faridkot district falls in the Satluj basin of Quaternary age. The thickness of Alluvium is more than 1000 m. The alluvium comprises unconsolidated sand, Silt, Clay, Kankar and their admixtures in varying proportions. Gravel & Pebbles mixed with sand are also encountered at various depths. The Central Ground Water Board has drilled one Piezometer, in deep singhwala to delineate and determine potential aquifer zones.

Exploratory drilling was carried out (Plate-V) at two locations in the block. The slim hole at Golewala was drilled down to 343.78m bgl and poor quality of formation water was found to occur. The exploratory well at Deep Singh wala was tested at discharge of 3885 lpm.

The aquifer performance test was conducted at the borehole at Kumharwali. The aquifer was 6 m in thickness from 39 to 45 m below ground level and the transimissivity was worked out to be 284m^2/day while storage coefficient came to be 3.8*10 $^{-2}$

Plate-V



7.0 GROUND WATER QUALITY

The development of high productive agricultural practices, industries and changing life style of people have taken place which has affected the quality of surface and ground water and which has become more prone to deterioration. Range of various constituents in ground water are given below:

Range Of Chemical Constituents

EC (µmhos at 25^0C) : 591-4540

F (mg/l) : 0.28-4.35

As (mg/l) : nd-0.0076

Fe (mg/l) : 0.12-2.73

The distribution of various constituents varies greatly in the district. In some cases higher limits of certain important parameters exceed the maximum permissible limit making water un potable.

Suitability of Ground Water for Drinking Purposes

Ground water occurring in the shallow aquifer is saline except in some places where ground water is fresh which is due to occurrence of fresh water lenses created by return seepage and canal seepage. Salinity, Chloride, Nitrate and Flouride are the important parameters that are normally considered for evaluating the suitability of ground water for drinking uses and it is found that only 29% of the ground water of the district is suitable for domestic use.

Suitability of Ground Water for Irrigation

As per USSL classification, the salinity hazards are represented by C1 (low salinity), C2 (medium salinity), C3 (high salinity) and C4 (very high salinity) and sodium hazards by S1 (low sodium) up to 10, S2 (medium sodium) from 10-18, S3 (high sodium) from 18-26, and S4 (very high sodium) above 26. It is observed that about 50% of water samples fall under C2S1, C3S1 and C3S2 classification. These samples generally do not pose any problem for customary irrigation. 50% of samples fall under C4S2 and C4S4 classification and use of this water on soil may lead to either salinity or sodium hazards or both.

8.0 GROUND WATER RESOURCE

Ground water resources of Faridkot district has been computed according to the GEC-1997 methodology. The block-wise resources are given below.

Stage of Ground Water Development of Farodkot District

as on 31st March, 2009

Block	Net Annual Ground Water Availability (ham)	Existing Gross Ground Water Draft for irrigation (ham)	Existing Gross Ground Water Draft for domestic and industrial water supply (ham)	Existing Gross Ground Water Draft for all users (ham)	Provision for domestic and industrial requirement supply upto 2025 (ham)	Net Ground Water availability for future irrigation development (ham)	Stage of ground water development (ham)
Faridkot	34070	53068	898	53966	898	-19896	158 %
Kotkapura	27156	42184	1045	43230	1045	-16074	159 %
Total	61226	95253	1943	97195	1943	-35969	159 %

The table gives the stage of ground water development of Faridkot district. Net ground water availability of the district is 61226 ham, ground water draft for all users is 97195 ham, whereas net ground water availability for future irrigation development is -35969 ham. All the blocks in the district, the stage of ground water development is more than 100%. All the two blocks fall in Over-exploited categories ie stage of groundwater development is 159 %.

9.0 GROUND WATER DEVELOPMENT AND MANAGEMENT

Urban and rural water supply schemes

Drinking water supply to all rural as well as urban parts of the district is based on Canal as well as ground water. The quality of ground water in general is saline and non potable all over and the depth to water level is within 10 to 20m in eastern parts, whereas in western parts depth to water levels is between 2 to 5 meters. The tubewells constructed by Public Health Department, Punjab for drinking water supply are generally between 80 to 150m deep.

Future Ground Water Development and management aspects

The stage of ground water development for the district is 159%, whereas in 2004 the stage of ground water development in the district was 106%. All the two blocks fall in over-exploited categories. This means that the ground water is under stress and the ground water level is declining but there is scope for further ground water development because water level is between 5 to 10 mbgl in more than 50% area of Faridkot district. Emphasis should be given on construction of more multiple well point system to exploit maximum quantity of fresh and marginal saline quality of groundwater for irrigation purpose which will provide more space for fresh groundwater formed by return flow, rainfall recharge and canal seepage. Some actions which should be adopted to reach these three objectives are as follows:

I. Ground Water Withdrawal

a Multiple well point system

The hydrogeological data generated through exploratory test drilling and with the help of Public health tube wells and the agriculture tubewells studied during draft survey has provided vital information regarding identification of aquifer systems, demarcation of their vertical and lateral extent, delineation of potential aquifer characteristics. These studies also provide information on well design and drilling techniques. As Faridkot block comprises fine grained sand which is a potential aquifer of the area, so multiple well point system is very popular among the farmers which not only yield ground water with optimum discharge but will also yield fresh ground water from fresh water lenses. Multiple well point consists of 4 well points spaced at 6m in a line connected horizontally at about a meter below the land surface, pumped centrally are found to be technically satisfactory performance which do not mix floating good quality groundwater with the underlying saline groundwater. Screen in each well point should be of at least 3m length with 16% effective perforation and surrounded by pea size, well rounded gravel envelop. Blank pipe may be adjusted as per the topography. Emphasis should be given on construction of more multiple well point which will create

more subsurface storage for fresh ground water lenses formed from rainwater, canal seepage and return flow.

c. Cyclic use of poor quality groundwater and canal water

In Faridkot district, availability of good quality water is often limited and farmers have to resort to the use of saline and / or sodic groundwater. Use of poor quality groundwater and available canal water , is not only beneficial for raising of crops, but also helps in lowering of water table which will create more storage for fresh ground water resulting from natural recharge, return flow and canal seepage. This can be done by two ways.

i. Conjunctive use of poor quality ground water and canal water by mixing in different ratio.

ii. Cyclic use of canal water and poor quality groundwater.

II. Ground Water Recharge

Due to urbanization and reduction in forest and green areas, the natural recharge to ground water has substantially decreased. Further, the improvement in drainage pattern has caused reduction in percolation of rain water to the ground water thereby affecting the natural recharge. There is an urgent need to take up schemes of artificial recharge to ground water in a big way. Rooftop rain water harvesting in urban areas, construction of check dams and use of canal water during monsoon period to recharge ground water and other feasible recharge techniques will result in augmentation of the ground water reservoir and arrest further decline of water levels. Ground water recharge through surface spreading in Faridkot district will be a very effective method which can be done in following

i Rainwater conservation in paddy fields

Paddy fields covering an area of about 86100 ha, in Faridkot district offer a great potential for storage of rainfall, The increase in rainfall conservation in paddy fields by increase in height of bunds results in reduction of irrigation water applied and increase in groundwater recharge, It has been estimated that about one third of the standing water in paddy fields joins back to water table as return

flow. The optimum dike height for light, medium and heavy soils is recommended as 15, 17.5 and 20 cm respectively under average rainfall condition.

Ii Recharge from drains

The network of natural drains in Faridkot district offers excellent channels to recharge groundwater reservoirs by constructing series of check structure and recharge shafts on the channels.

II. Water Conservation

To address the problem of depletion, it is imperative that ground water withdrawal is reduced substantially. Options available are :

i. Recycling of water

Due to increased demand of water and limited ground water resource, there is need to recycle the water for its conservation. Waste water can judiciously be utilized to reduce stress on exploitation of ground water for various purposes including domestic, industrial and horticultural needs.

ii. Change in Cropping Pattern

In Punjab State, cropping pattern has changed substantially. The farmers have adopted paddy cultivation due to profitability and incentive from the government. The paddy cultivation in the district has caused extensive development of ground water resources. There is need to change the cropping pattern in the area and adopt cultivation of those crops which require less irrigation. Cultivation of sunflower, maize, barley etc needs to be implemented instead of paddy, sugarcane etc.

iii. Change in Irrigation Policy

The current irrigation policy of the State was formulated three decades back. The irrigation policy is required to be modified as per the prevailing ground water conditions. The water allowances in those parts of the State which are facing water logging are required to be reduced and the water saved can be diverted to the areas where ground water is depleting at fast pace. Thus, rationalization of the irrigation policy will help in controlling ground water depletion in the over-exploited areas and water logging in affected areas.

iv. Irrigation Practices

In the district, irrigation is being done by flooding. Due to water deficiency, this practice requires change. Sprinkler and drip irrigation should be adopted wherever feasible. For this, government should come forward and provide infrastructure and other benefits.

v. Realistic Irrigation Power Pricing

Rate of power for tubewell irrigation is irrational and requires modification. There should be no free power for irrigation so that due care will be taken by the consumers for its economic and judicious use. Instead of flat rates, metering may be introduced.

vi. Mass Awareness Program.

Management of ground water resources can not be successful without public participation. Therefore, public awareness is of prime necessity. To make the public aware, it is necessary to organize mass awareness program at grass root level and impart training on rainwater harvesting techniques for ground water recharge to various State government agencies at regular intervals so that water policies made by government can be effectively implemented.

vii. Ground Water Regulation

Ground water regulation may be enforced in the district for management of ground water resources. Ground water regulation should be enforced in both blocks as the blocks are over exploited.

10.0 GROUND WATER RELATED ISSUES & PROBLEMS

Ground water decline and salinity

Ground water decline and salinity is the major problem in the district. As there is vast Canal network in the block so presence of fresh water lenses due to return flow and canal seepage caused partial dependence on groundwater which causes water level decline. Ground water is declining at a rate of 0.23 m/yr. The blocks are Over exploited, the stage of ground water development is 159%.

10.0 RECOMMENDATIONS

1. In order to arrest the declining trend of water levels in the district, the rooftop rainwater harvesting technology should be adopted and recharge structures may also be constructed in depression areas where water gets accumulated during rainy season. This will help in enhancing the recharge to ground water reservoir.
2. The crops consuming less quantity of water may be grown in place of crops requiring more water in the over exploited blocks
3. The construction of roof top rainwater harvesting structures should be made mandatory in building bye-laws, which will help in checking the falling water level trend in the Faridkot town.
4. The abandoned dug wells may be cleaned and should be used for recharging the ground water by utilising the surface monsoon runoff.
5. The conjunctive use of poor quality groundwater and canal water by mixing in different ratio.
6. Cyclic use of canal water and poor quality groundwater.
7. The water level monitoring network needs to be increased in the block.
8. Local populace to be educate regarding consequences of mining of ground water and need for its effective and economic use.