

## **Availability of Water Resources and Future Sustainability in Sambhal District of Uttar Pradesh**

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**Abstract:** Water is the most important substances for all the living being especially for Agriculture, Industries and Domestic purposes. In Sambhal District, canal water source is totally absent and ground water source is the only source where the over exploitation of water is more for domestic and agriculture uses. The blocks of Sambhal district are in dark zone and ground water level has declined rapidly due to over exploitation of water. The future annual availability of ground water demand is more than the present annual ground water supplies. The ground water recharge is only depending upon the precipitation of south-west monsoon during rainy season. The Private Pumpsets for irrigation are increased in number due to shortage of surface water sources. The Secondary data has been used in the preparation of this paper such as Census reports, zila, sankhyika patrika, Sambhal 2001 and 2011 and other published sources. Some statistical techniques and computer assistance have adopted in this paper for representation of the facts and figures. I attempted to highlight the blockwise surface and ground water availability and its future problems related with agriculture and domestic purposes. Besides these, more emphasize would be on the recommendation and suggestions to tackle the problems related to water resources development.

**Keywords:** Surface water availability, Ground water availability, Sustainability of water

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### **I. Introduction**

Water resources are the most important for all the living being and also for the development of economic and socially factors. Ground water irrigation of farmland increased 105 % in 1970 while surface irrigated water increased only 28 % due to increase number of the mechanised and tube wells, the ground water irrigation had increased rapidly over the last 40 years, from less than 1 million in 1960 to more than 19 million in 2000 with the most pump sets in India. The development of bore wells threatens aquifers and most of the groundwater tables have been reported area. (Narain, 1998). Groundwater may also contaminated due weathering of rock and agrochemicals used for irrigation in this area. India is endowed with a rich and vast diversity of natural resources, water being one of them.

Water is nature's most wonderful, abundant and useful compound. Of the many essential elements for the existence of human beings, animals and plants, water is rated to be of the greatest importance. Without food, human can survive for a number of days, but water is such an essential that without it one cannot survive (Pradhan, 2001; Freeda, 2006).

In India, since 1970s ground water irrigation has been expanding at a very rapid pace than the other surface water irrigation. The number of tube wells and wells stood at around 18.5 million in 2001, of which tube wells accounted for 50 % in the data of minor irrigation census conducted in 2001 and also shows that three states of India namely, Punjab, Haryana and Uttar Pradesh accounted for 57 % of tube wells in India, average tube wells of Punjab was 27 tube wells per sq km of net sown area, 21.7 in Uttar Pradesh and 14.1 in Haryana (Shah, 2009). The groundwater irrigation is highly developed by the farmers which easily used for cultivation of the crops. The ground water availability is more but over exploitation, quantity and quality of water are threaten to the water table fluctuation of the aquifers. These water sustainability for future water demand is more important for ground water availability.

Groundwater is an open access common pool resources. The protection of the water resources is not possible unless the farmer agrees to cooperate with the government and manage themselves in a sustainable manner. The Indian institute cooperates to develop the water resources to support and foster community action. (Vijay Shankar, kulkarni and Krishnan. Major issues of the water resources management raised like as water logging and drainage, wastage of irrigation water, preventing groundwater depletion, intensive verses extensive irrigation, conjunctive irrigation, improving level of utilization, time and cost overruns, achieving economy in water use and coping with water abundance and drought (Dhawan, 1995). Today human activities are constantly adding industrial, domestic and agricultural wastes to ground water reservoirs at an alarming rate. Ground water contamination is generally irreversible. It is always better to protect ground water first rather than relying on technology to clean up water from a contaminated source (Singh, 1999; Venkata, 2012).

In the Uttar Pradesh state, so far the principal consumptive user is the irrigation sector. In all there are 819 blocks in the state in which 43 BCM of surface water and about 27 BCM of groundwater has been utilized out of the total of about 161.70 BCM of surface water and about 72 BCM exploitable groundwater resources. Out the total exploitable groundwater resources in the state 37 % has so far been utilized for irrigation purposes. The available groundwater is spatially unevenly distributed. Therefore, there are 85 “dark” and 214 blocks are “grey” in the state. Of these “dark” and “grey” blocks 67 “dark” and 86 “grey” blocks are in the western part of the state (Irrigation 2014).

## 1.2 Study Area

Sambhal district lies 28° 35' N to 28° 59' N latitude and 78° 33' E to 78° 55' E longitude. The district of Sambhal is part of the Moradabad division of Uttar Pradesh. It was announced on 28 September 2011 as one of three new districts in the state. It was formerly named

“Bhimnagar” in honour of Bhimrao Ambedkar but changed after long protest as ‘Sambhal district’ (fig.1). It lies 158.6 km due east from New Delhi, past Ghaziabad, Noida and Hapur district and 355 km northwest from the state capital Lucknow. Sambhal features a typical version of the humid subtropical climate. The warm season lasts from 9 April to 8 August with an average daily high temperature above 36 °C (97 °F). The hottest day of the year is 22 May, with an average high of 38 °C (100 °F) and low of 25 °C (77 °F). The cold season lasts from

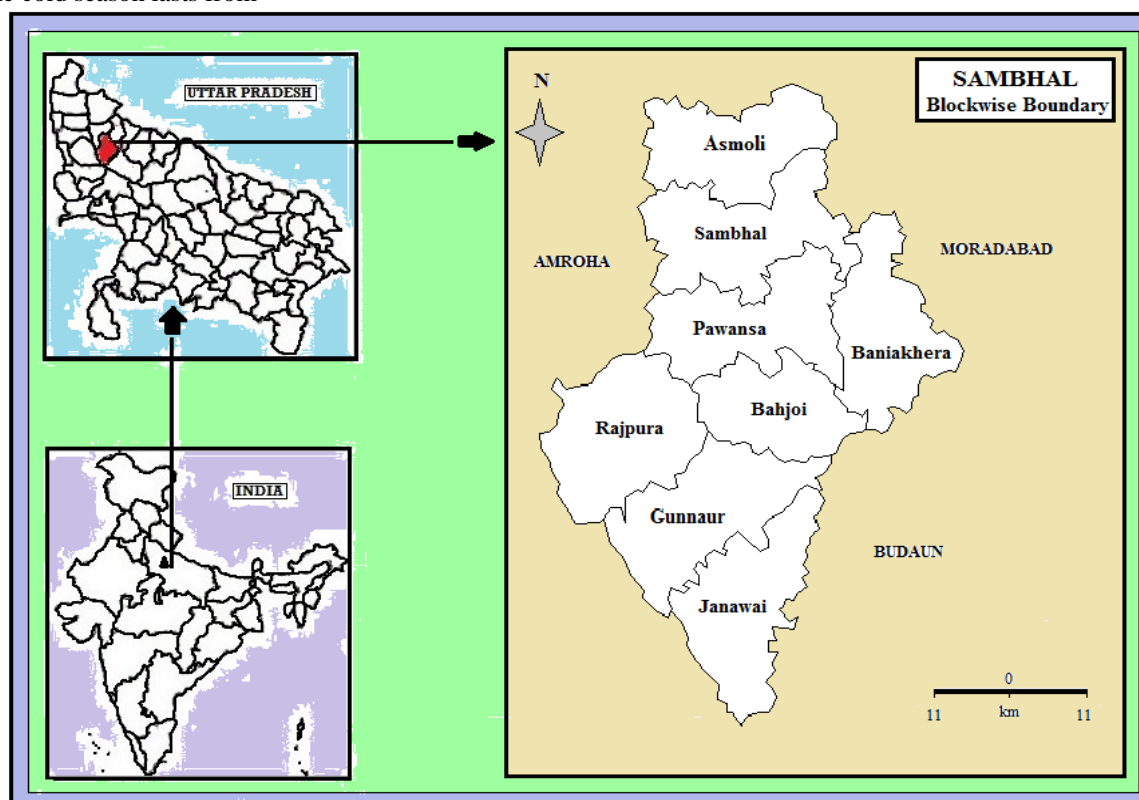


Fig.1 Blockwise map of Sambhal district 2015.

11 December to 11 February with an average daily high temperature below 18 °C (64 °F). The coldest day of the year is 4 January, with an average low of 2 °C (36 °F) and high of 15 °C (59 °F). In early March, the wind direction changes from north-westerly to south-westerly. From March to May the weather is hot. The monsoon arrives at the end of June, along with an increase in humidity. The brief, mild winter starts in late November, peaks in January and heavy fog often occurs. Temperatures in Sambhal usually range from 5 to 40 °C (41.0 to 104.0 °F), with the lowest and highest temperatures ever recorded being 2.0 and 47.8 °C (19.9 and 118.0 °F) respectively. The annual mean temperature is 25 °C (77 °F); monthly mean temperatures range from 13 to 32 °C (55 to 90 °F). The highest temperature recorded in July was 45 °C (113 °F) in 1931. The average annual rainfall is approximately 714 mm (28.1 in), most of which falls during the monsoon in July and August. The average date of the advent of monsoon winds in Sambhal is 29 June. Due to absence of the canal water this district has been announced as dark zone area. In the recent study, There has been a 3-m water level decline around Sambhal, a 0.5 m decline at Gangeswari and a 0.1 m decline at Gunnaur over the last decade (Ala Eldin

et al 2000).

### **1.3 Methodology**

In this paper secondary data has been obtained from the internet website of the state named as zila, sankhykia patrika sambhal district of 2001-02 and 2011-12, gazetter of sambhal district and other government and non government publish report, other published papers and Moradabad report as a brochure and ground water scenario, some blocks taken from Badaun District are also obtained from Badaun Zila, Sankhykia Patrika of 2001-02 and 2011-12 data of Rajpura, Gunnaur and Janawai blocks.(fig.2) The stage of ground water development is defined by,

#### *Stage of ground water development (%)*

$$= \frac{\text{Existing gross ground water draft for all uses}}{\text{Net annual ground water availability}} * 100$$

### **1.4 Water resources availability in Sambhal district**

The Ganga river is the longest river which flows toward South of the Sambhal ditrict through the river only some blocks, Rajpura, Gunnuar and Janawai have benefited because of nearest of the Ganga river but their ground water level also fluctuate for the use of agricultural, domestic and industrial purposes.

#### **a) Surface water**

The total surface water supply was 148333 ha. during 2001-02 and 155913 ha. during 2011-12. The growth of surface water supply is 5.12 ha. within the decades. In Rajpura block, area irrigated by surface water was 20405 ha. during 2001-02 and 22514 ha. during 2011-12. The growth of surface water in Rajpura block are 10.34 ha. which are developed during 2001-12. In block of Gunnaur, area for irrigation shows 17846 ha. during 2001-02 and 21653 ha. during 2011-12. The growth of irrigated area are increased 21.33 ha. during 2001-12. In Janawai block, area irrigated by the surface water in Sambhal district are 14350 ha. during 2001-02 and 24045 ha. during 2011-12. The growth of irrigated area developed 67.56 ha. during 2001-12. In block of Asmoli, area irrigated shows 16793 ha. during 2001-02 and 15476 during 2011-12. The growth area for irrigation has reduced as -7.84 ha. during 2001-12. In Sambhal block, area irrigated by surface water was 19116 ha. during 2001-02 and 18035 ha. during 2011-12. Growth of irrigated area has declined as -5.65 ha. during 2001-12. In block of Pawansa, area shows for irrigation by surface water was 21459 ha. during 2001-02 and 12462 ha. during 2011-12. Growth of surface water for irrigation are -41.93 ha. during 2001-12. In Baniakhera block, area irrigation was. 20349 ha. during 2001-02 and 26561 ha. during 2011-12. Growth of surface water are developed as 30.53 ha. during 2001-12. In block of Bahjoi, area shows for irrigation was 18015 ha. during 2001-02 and 15177 ha. during 2011-12. Growth of irrigated areas are -15.75 ha. during 2001-12.

#### **i. Canal**

The canal water supply is totally absent in Sambhal district during the period of 2001-12. The total water supply for the agricultural and industrial purposes are to be used through the ground water supply. The all the blocks Rajpura, Gunnaur, Janawai, Asmoli, Sambhal, Pawansa, Baniakhera and Bahjoi are negligible for the supply of canal irrigation for the cultivation of crops in both 2001-02 and 2011-12 years. The Ganga river has flown toward the south west of the Sambhal district. The three blocks has adjoining to the Sambhal district by the state government as Rajpura, Gunnuar and Janawai blocks which was the blocks of Badaun district. So canal water supply in these blocks are not available.

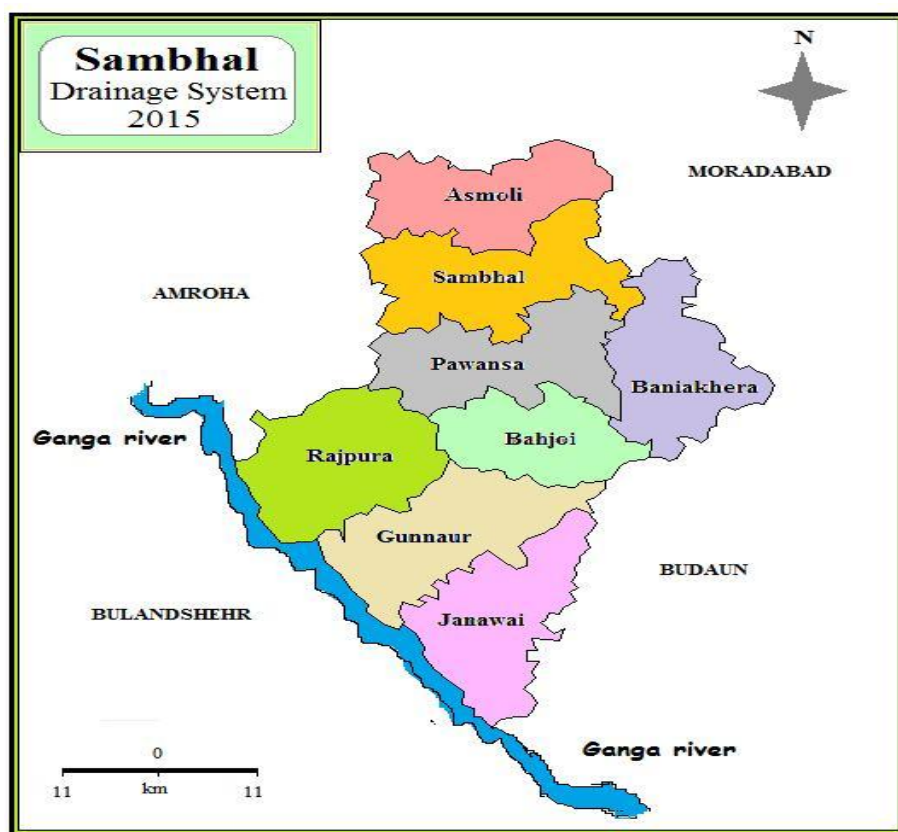


Fig.2

ii. Tubewells

The Public tubewells water supply of Sambhal district are 16399 ha. during 2001-02 and 2072 ha. during 2011-12. The growth of public tubewells are -87.37 ha. which are declined in the ten years decade. The Private tubewells water supply are 126400 ha. during

Table 1. Blockwise Surface Irrigation Sources of Sambhal District during 2011-12 (in ha.)

Name of Block	Canal	Tubewells		Wells	Ponds	Other Sources	Total Water
		Public	Private				
Rajpura	0	70	18347	3882	0	215	22514
Gunnaur	0	170	17463	3807	0	213	21653
Janawai	0	96	16871	6798	0	280	24045
Asmoli	0	253	4185	10479	0	559	15476
Sambhal	0	381	6358	10826	14	456	18035
Pawansa	0	345	4889	6906	0	322	12462
Baniakhera	0	411	2126	23449	9	566	26561
Bahjoi	0	346	2337	11961	18	515	15177
<b>Total</b>	<b>0</b>	<b>2072</b>	<b>72576</b>	<b>78108</b>	<b>41</b>	<b>3126</b>	<b>155923</b>

Source: Zila Sankhiyakiya Patrika, Sambhal District.

2001-02 and 72576 ha. during 2011-12. The growth of private tubewells are -42.58 ha. which are also reduced the area of water supply in Sambhal district (Table.1). In the block of Rajpura the public and private tubewell water supply are 2985 and 16461 ha. during 2001-02, 70 and 18347 ha. during 2011-12. The growth of

Rajpura block are -95.65 and 11.46 ha. Where public tubewell water supply has declined the water supply area and private tubewell water supply has increased the area for agricultural and industrial uses.

**Table 2. Blockwise Surface Irrigation Sources of Sambhal District during 2001-02 (in ha.)**

Name of Block	Canal	Tubewells		Wells	Ponds	Other Sources	Total Water
		Public	Private				
Rajpura	0	2985	16461	0	0	959	20405
Gunnaur	0	3082	13928	0	83	753	17846
Janawai	0	4725	8663	0	214	748	14350
Asmoli	0	337	15739	716	0	1	16793
Sambhal	0	1315	17701	100	0	0	19116
Pawansa	0	550	20473	423	12	1	21459
Baniakhera	0	2836	17002	5006	5	0	20349
Bahjoi	0	569	16433	1013	0	0	18015
<b>Total</b>	<b>0</b>	<b>16399</b>	<b>126400</b>	<b>7258</b>	<b>314</b>	<b>2462</b>	<b>148333</b>

Source: Zila Sankhiyakiya Patrika, Sambhal District.

In Gunnaur block, area irrigated by the public and private tubewell are 3082 and 170 ha. during 2001-02, 13928 and 17463 ha. during 2011-12. The public tubewell irrigated area has declined -94.48 and private tubewell irrigated area has increased 25.38 ha. in growth of 2001-12. In Janawai block, public tubewell irrigated area are 4725 and 96 ha. during 2001-02, 8663 and 16871 ha. in 2011-12 of private tubewell. The public tubewell irrigated area has declined -97.97 and increased the area of private 94.75 ha. in growth of 2001-12. The block of Asmoli has irrigated an area of public and private tubewell are 337 and 253 ha. during 2001-02, 15739 and 4185 ha. during 2011-12 (Table.2). The growth of public and private irrigated area are reduced as -24.93 and -73.41 ha.during 2001-12. In sambhal block, the public and private tubewells irrigated area are 1315

**Table 3 Blockwise Growth of Surface Irrigation Water of Sambhal District during 2001-12**

Name of Block	Canal	Tubewell		Wells	Ponds	Other Sources	Total Water
		Public	Private				
Rajpura	0	-97.65	11.46	0.00	0.00	-77.58	10.34
Gunnaur	0	-94.48	25.38	0.00	-100.00	-71.71	21.33
Janawai	0	-97.97	94.75	0.00	-100.00	-62.57	67.56
Asmoli	0	-24.93	-73.41	1363.55	0.00	55800.00	-7.84
Sambhal	0	-71.03	-64.08	10726.00	0.00	0.00	-5.65
Pawansa	0	-37.27	-76.12	1532.62	-100.00	32100.00	-41.93
Baniakhera	0	-85.51	-87.50	368.42	80.00	0.00	30.53
Bahjoi	0	-39.19	-85.78	1080.75	0.00	0.00	-15.75
<b>Total</b>	<b>0</b>	<b>-87.37</b>	<b>-42.58</b>	<b>976.16</b>	<b>-86.94</b>	<b>26.97</b>	<b>5.12</b>

And 381 ha. during 2001-02, 17701 and 6358 ha. during 2011-12. Both the public and private irrigated has declined the growth irrigated as -71.03 and -64.08 ha. during 2001-12. In pawansa block, areas irrigated by the public and private tubewell are 550 and 345 ha. during 2001-02, 20473 and 4889 ha. during 2011-12. The growth of pawansa block are also reduced both public and private tubewell irrigated area as -37.27 and -76.12 ha. during 2001-12. In Baniakhera block of Sambhal district, area of public and private tubewell are 2836 and 411 ha. during 2001-02, 17002 and 2126 ha. during 2011-12. In Sambhal block, growth area for irrigation are also reduced as -85.51 and -87.50 ha. during 2001-12. In Bahjoi block, area irrigated by public and private tubewell are 569 and 346 ha. 2001-02, 16433 and 2337 ha. during 2011-12. The growth of area irrigated by public and private tubewell declined as - and -85.78 ha. during 2001-12 (Table.3).

### **iii. Wells**

The total well irrigated area of Sambhal district are 7258 ha during 2001-02 and 78108 ha. during 2011-12. The well growth area for irrigation has increased as 976.16 ha. during 2001-12. The total irrigated area by the wells are developed for cultivation of crops. In Rajpura block, area for irrigation was absent during 2001-02 and 3882 ha. during 2011-12. The growth of well irrigated area are developed within the decades. In Gunnaur block, the well irrigated area of the Sambhal district are absent during 2001-02 and 3807 ha. during 2011-12. The growth of Gunnaur block area also developed in the ten years gap. In block of Janawai, area irrigated was also negligible during 2001-02 and 6798 ha. during 2011-12. The development of the irrigated area is high in block Janawai during 2001-12. In block of Asmoli the irrigated area by the wells was 716 ha. during 2001-02 and 10479 ha. during 2011-12. The growth of well irrigated area are 1363.55 ha. during 2001-12. In Sambhal block, area irrigated by wells was 100 ha. during 2001-02 and 10826 ha. during 2011-12. The growth of well irrigated area is as high 10726 ha. during 2001-12. In block of Pawansa, area shows 423 ha. during 2001-02 and 6906 ha. during 2011-12. The growth of well irrigation area are 1532.62 ha. as a increased area during 2001-12. In Baniakhera block, area irrigated was 5006 ha. during 2001-02 and 23449 ha. during 2011-12. The growth of Baniakhera block are 368.42 ha. as increased area during 2001-12. In Bahjoi block, area irrigated by the wells was 1013 ha. during 2001-02 and 11961 ha. during 2011-12. The growth of well irrigated area are high as 1080.75 ha. during 2001-12.

### **iv. Ponds**

The total ponds irrigated area of Sambhal district are 314 ha. during 2001-02 and 41 ha. during 2011-12 which are reduced the growth irrigated area as -86.94 ha. during 2001-12. In Rajpura block, the ponds irrigated area has totally absent in both the year of 2001-02 and 2011-12. In block of Gunnaur, area shows for irrigation was 83 ha. during 2001-02 and after that it has also absent during 2011-12. So the growth rate has declined as -100 ha. during 2001-12. In block of Janawai, the area irrigated by ponds was 214 ha. during 2001-02 and afterthat it has also shows negligible during 2011-12 so the growth of pond are also -100 ha. during 2011-12. In block of Sambhal, area irrigated by ponds was also absent during 2001-02 and 14 ha. during 2011-12. The growth of area irrigated by pond has not developed during 2001-12. In block of Pawansa, area shows was 12 ha. during 2001-02 and absent during 2011-12. The growth of pond irrigated area are reduced during 2001-12. In Baniakhera block, area irrigated by ponds was 5 ha. during 2001-02 and 9 ha. during 2011-12. The growth of ponds irrigated area as 80 ha. during 2001-12. In Bahjoi block, area irrigated by ponds was also absent during 2001-02 and 18 ha. during 2011-12. The growth of irrigated area are totally absent during 2001-12.

### **v. Other Sources**

The total other sources was 2462 ha. during 2001-02 and 3126 ha. during 2011-12. The growth of other sources irrigated area are 26.97 ha. during 2001-12. In block of Rajpura, area irrigated by other sources was 959 ha. during 2001-02 and 215 ha. during 2011-12. The growth of irrigated area by other sources are reduced as -77.58 ha. during 2001-12. In Gunnaur block, area irrigated by other sources was 753 ha. during 2001-02 and 213 ha. during 2011-12. The growth of other sources irrigated area also declined as -71.71 ha. during 2001-12. In Janawai block, area irrigated was 748 ha. during 2001-02 and 280 ha. during 2011-12. The growth irrigated area are as -62.57 ha. during 2001-12. In Asmoli block, area shows for irrigation was 1 ha. during 2001-02 and 559 ha. during 2011-12. The growth irrigated area of other sources are 55800 ha. during 2001-12. In Sambhal block, area irrigated area was absent during 2001-02 and 456 ha. during 2011-12. The growth of irrigated area are low developed during 2001-12. In Pawansa block, the area shows for irrigation was 1 ha. during 2001-02 and 322ha. during 2011-12. The growth of irrigated area by other sources are 32100 ha. during 2001-12. In block of Baniakhera, area irrigated by other sources was absent during 2001-02 and 566 ha. during 2011-12. The growth of Baniakhera has constant during 2001-12. In Bahjoi block, the area irrigated by other sources was also absent during 2001-02 and 515 ha. during 2011-12. The growth of other sources irrigated area is constant during 2001-12.

**b) Ground water availability**

The total annual ground water recharge of sambhal district was 78853 ham during 2004-05 where the only source of ground water recharge is rainfall. The net annual ground water availability was 62013 ham whereas the existing gross ground water draft for all uses is 64303 ham. The stage of ground water development of Sambhal district is over exploited during 2004-05. The three blocks are in the safe zone category of ground water resources Rajpura, Gunnaur and Baniakhera (Table.4). The two blocks are in semi critical category of Sambhal district as Janawai, Pawansa and Asmoli. The three blocks are in over exploitation of the ground water of Sambhal and Bahjoi

**Table 4. Dynamic Ground Water Resources of Sambhal District during 2004-05.**

Name of Block	Annual Ground Water Recharge (in ham)	Net Annual Ground Water Availability (in ham)	Existing Gross Ground Water Draft For All Uses (in ham)	Stage of Ground Water Development (in per cent)	Category of Block
Rajpura	11362	9985	8821	88.34	safe
Gunnaur	12096	1136	1001	88.11	safe
Janawai	10023	9254	8923	96.42	semi critical
Asmoli	8475	7627	7472	97.97	semi critical
Sambhal	10372	9334	12604	135.03	over exploited
Pawansa	10416	9374	9334	99.57	semi critical
Baniakhera	9294	8829	7792	88.26	safe
Bahjoi	6815	6474	8356	129.07	over exploited
<b>Total</b>	<b>78853</b>	<b>62013</b>	<b>64303</b>	<b>103.69</b>	-

Source: District Brochure of Moradabad and Baduan.

**i. Government Tubewells**

The number of government tubewells available in the Sambhal district was 514 during 2001-02 and 528 during 2011-12. The number of growth of government tubewells are 14.40 during 2001-12. In Rajpura block, the number of government tubewells was 30 during 2001-02 and 30 during 2011-12. The number of growth of government tubewells are not developed within the decade. In block of Gunnaur, government tubewells shows in number was 43 during 2001-02 and 108 during 2011-12. The number of government tubewells are developed as 151.16 during 2001-12. In Janawai block, government tubewells shows in number was 24 during 2001-02 and 43 during 2011-12. The growth of government tubewells are increased as 79.17 in number during 2001-12. In Asmoli block, the number of government tubewells was 71 during 2001-02 and 78 during 2011-12. The growth in number of government tubewells are developed as 9.86 during 2001-12. In block of Sambhal, the number of government tubewells are 114 in number during 2001-02 and 95 during 2011-12. The growth of government tubewells are reduced as -16.67 during 2001-12. In block of Pawansa, government tubewells shows 81 in number during 2001-02 and 75 during 2011-12. The number of growth of government tubewells are -7.41 during 2001-12. In Baniakhera block, government tubewells are shown in number as 86 during 2001-02 and 92 during 2011-12. The government tubewells growth are developed as 6.98 in number during 2001-12. In block of Behjoi, the number of government tubewells was 65 during 2001-02 and 67 during 2011-12. Growth of government tubewells are increased as 3.08 in number during 2001-12.

**ii. Private tubewells**

The private tubewells in number was 5079 during 2001-02 and 43288 during 2011-12. Its growth are developed as 752.29 in numbers of private tubewells during 2001-12. In block of Rajpura, the private tubewells in number was 57 during 2001-02 and 676 during 2011-12. Growth of private tubewell in number are increased as 1085.96 during 2001-12. In Gunnaur block, the number of private tubewells was 63 during 2001-02 and 788

during 2011-12. The growth of private tubewells in number are developed as 1150.79 during 2001-12. In block of Janawai, private tubewells was 64 in number during 2001-02 and 769 during 2011-12. The number of private tubewells growth are developed as 1101.56 during 2001-12. In Asmoli block, private tubewells was 902 in number during 2001-02 and 4994 during 2011-12. The growth of private tubewells are increased as 453.66 in number during 2001-12. In Sambhal block, the number of private tubewells was 2105 during 2001-02 and 9196 during 2011-12. The growth of private tubewells are developed as 336.86 in number during 2001-12. In block of Pawansa, private tubewells shows 207 in number during 2001-02 and 10089 during 2011-12. The growth in number of private tubewells are gradually increased as 4773.91 during 2001-12. In Baniakhera block, private tubewells in number was 1368 during 2001-02 and 9957 during 2011-12. The private tubewells growth are developed in number as 627.85 during 2001-12. In block of Bahjoi, the number of private tubewells was 313 during 2001-02 and 6819 during 2011-12. Growth of private tubewells are as 2078.59 in number during 2001-12.

**iii. Pumpsets**

The number of pumpsets in Sambhal district was 40533 during 2001-02 and 65906 in numbers during 2011-12 whereas the growth of pumpsets in number are increased as 62.60 during 2001-12. In Rajpura block, pumpsets shows in number was 5689 during 2001-02 and 6732 in numbers during 2011-12. The growth of pumpsets in Rajpura block are increased in number as 18.33 during 2001-12. In block of Gunnaur, the number of pumpsets was 6206 during 2001-02 and its other pumpsets was 9034 in numbers during 2011-12. The growth of the pumpsets are also developing in this block as 45.57 in number during 2001-12 (Table.5)

**Table 5. Blockwise Ground Water Sources of Sambhal district during 2001-02 (in number)**

Name of Block	Government Tubewell	Private Tubewell	Pumpsets	Ground Pumpset	Permanent Wells	Rahat
Rajpura	30	57	5689	3	2883	2883
Gunnaur	43	63	6206	0	2703	2703
Janawai	24	64	3681	0	3877	3877
Asmoli	71	902	6629	0	0	0
Sambhal	114	2105	7248	522	0	0
Pawansa	81	207	1581	0	123	38
Baniakhera	86	1368	4149	545	172	30
Bahjoi	65	313	5350	0	262	45
<b>Total</b>	<b>514</b>	<b>5079</b>	<b>40533</b>	<b>1070</b>	<b>10020</b>	<b>9576</b>

Source: Zila Sankhiyakiya Patrika, Sambhal District.

Janawa block, the number of pumpsets during 2001-02 was 3681 and 8929 in numbers during 2011-12. The growth in number of pumpsets are increased as 142.57 during 2001-12. In block of Asmoli, the number of pumpsets shows in number was 6629 during 2001-02 and during 2011-12, number of pumpsets was 5262. The growth of pumpsets in Asmoli block are reduced as -20.62 in number during 2001-12. In block of Sambhal, the number of pumpsets during 2001-02 was 7248 in number and 9084 during 2011-12. The growth of pumpsets has increased as 25.33 in number during 2001-12. In Pawansa block, the pumpsets shows in number was 1581 during 2001-02 and 10076 in number of pumpsets during 2011-12. The growth of pumpsets are increased as 537.32 during 2001-12. In block of Baniakhera, the number of pumpsets during 2001-02 was 4149 in numbers and 10029 during 2011-12. The growth of pumpsets of Baniakhera block are highly developed as 141.72 in number during 2001-12. In block of Bahjoi, the number of pumpsets was 5350 during 2001-02 and 6760 during 2011-12. The growth of number of pumpsets increased as 26.36 in number during 2001-12.



**i. Ground pumpsets**

The total number ground pumpsets in Sambhal district was 1070 during 2001-02 and 181 ground pumpsets during 2011-12 (Table.6). The growth of ground pumpsets during 2001-12 are reduced as -83.08. in block of Rajpura, the number of ground pumpsets was 3 during 2001-02

**Table 6. Blockwise Ground Water Sources of Sambhal District during 2011-12 (in No)**

Name of Block	Govt Tubewell	Private Tubewell	Pumpsets	Ground Pumpset	Permanent Wells	Rahat
Rajpura	30	676	6732	0	0	0
Gunnaur	108	788	9034	1	0	0
Janawai	43	769	8929	0	0	0
Asmoli	78	4994	5262	45	0	0
Sambhal	95	9196	9084	35	0	0
Pawansa	75	10089	10076	23	0	0
Baniakhera	92	9957	10029	65	0	0
Bahjoi	67	6819	6760	12	0	0
<b>Total</b>	<b>588</b>	<b>43288</b>	<b>65906</b>	<b>181</b>	<b>0</b>	<b>0</b>

Source: Zila Sankhiyakiya Patrika, Sambhal District.

**Table 7 Blockwise Growth of Ground Water of Sambhal District during 2001-12**

Name of Block	Govt Tubewell	Private Tubewell	Pumpset	Ground Pumpset	Permanent Wells	Rahat
Rajpura	0.00	1085.96	18.33	-100.00	-100.00	-100.00
Gunnaur	151.16	1150.79	45.57	0.00	-100.00	-100.00
Janawai	79.17	1101.56	142.57	0.00	-100.00	-100.00
Asmoli	9.86	453.66	-20.62	0.00	0.00	0.00
Sambhal	-16.67	336.86	25.33	-93.30	0.00	0.00
Pawansa	-7.41	4773.91	537.32	0.00	-100.00	-100.00
Baniakhera	6.98	627.85	141.72	-88.07	-100.00	-100.00
Bahjoi	3.08	2078.59	26.36	0.00	-100.00	-100.00
<b>Total</b>	<b>14.40</b>	<b>752.29</b>	<b>62.60</b>	<b>-83.08</b>	<b>-100.00</b>	<b>-100.00</b>

and absent during 2011-12. Its means all the ground pumpsets has been reduced. The growth of ground pumpsets are not developed within the decades. In Gunnaur block, ground pumpsets was absent during 2001-02 but 1 ground pumpsets has developed during 2011-12. The growth has constant of ground pumpsets during 2001-12. In block of Janawai, ground pumpsets are not grounded both the period of 2001-02 and 2011-12. In Asmoli block, the ground pumpsets during 2001-02 was absent but in 2011-12, ground pumpsets was 45 during 2011-12. The growth of ground pumpsets seems in progress during 2011-12. In Sambhal block, the ground pumpsets has 522 in number during 2001-02 and 35 during 2011-12. The growth of ground pumpsets has already declined as -93.30 during 2001-12. In block of Pawansa, the number of ground pumpsets was absent during 2001-02 and 23 during 2011-12. The growth of ground pumpsets are reduced during 2001-12. In block of Baniakhera, the number of ground pumpsets was 545 during 2001-02 and 65 during 2011-12. The growth of ground pumpsets are also declined as -88.07 during 2001-12. In Bahjoi block, the number of gorund pumpsets was absent during 2001-02 and 12 during 2011-12. The growth of ground pumpsets are declining during the period of 2001-12.

## **ii. Permanent Wells**

The Total number of Permanent wells in the district of Sambhal was 10020 in number during 2001-02 and continuously permanent wells are reduced during 2011-12, there is no permanent wells after the period of 2001-02. The permanent wells during the period of 2001-02 in Rajpura block was 2883, in Gunnaur 2703, in Janawai 3877, in Pawansa 123, in Baniakhera 172, in Bahjoi 262, Asmoli and Sambhal are absent. During 2011-12, there is totally absent of permanenr wells (Table.7).

## **iii. Rahat**

The total number of rahat during 2001-02 was 9576 whereas it was totally absent during 2011-12. In block of Rajpura, it has 2883 numbers of rahat during 2001-02. In Gunnaur block, it has 2703, in Janawai block 3877, in Pawansa 38, in Baniakhera 30, in Bahjoi 45, Asmoli and Sambhal has also totally zero.

The district is underlain by alluvial sediments having thickness of around 1000m (ONCG) comprising clay, silt and various grades of sand. Limited drilling carried out for ground water exploration down to a depth of 450 mbgl reveals the presence of potential aquifers with a marked change in sedimentation below 390mbgl. The sediments down to 390 m can be boradly divided into two aquifer groups. The upper aquifer group down to 180 m being exploited extensively by public & private tubewells. The second potential aquifer group present below 180 m depth, still remains to be fully harnessed for optimum utilization. For proper management of ground water resources, it is recommended to tap this aquifer in future. Deep drilling below 400 m is the need of the area for proper understanding of deeper aquifers.

Central Ground Water Board, Northern Region under its exploratory drilling programme has drilled Bahjoi (Bahjoi block), Bhataua (Sambhol block) and Maseri Rasoolpur (Baniakhera block), down to a depth varying 50.00 to 350.00 mbgl with an objective of mapping of sub-surface sediments and aquifer system.

The cumulative thickness of screened granular zones in these aquifer groups varies from 36 to 112 m. The average yield varies from 1445 to 5220 lpm for drawdown ranging from 1.85 m to 8.7 m. The specific capacity of tubewells varies from 222 to 1263 lit/min/m of drawdown. Depth to water level in the area during premonsoon period vary from 2.57 to 14.54 mbgl and in postmonsoon period vary from 1.70 to 13.69 mbgl. During 2006 the annual seasonal water level fluctuation varies 0.04 to 0.60 m. Due to insufficient data available with CGWB, no trend has been determined, however based on GWD data from year 2002 to 2006 the trend of water level of premonsoon period is 05.63 m/year and in postmonsoon period is 0.049m/year.

## **II. Conclusion**

In the sambhal district, the availability of ground water has declined rapidly due to Over Exploitation and Semi Critical blocks, whereas the groundwater recharge is only possible at the time of rainy season the surface water sources are not enough but ground water has been exploited in the use of agricultural and domestic purposes with the high intensity of dwelling in Sambhal, Asmoli and Behjoi blocks. The number of pumpsets has increased in numbers during 2011-12 than 2001-02 periods. In all eight blocks of Sambhal district The Stage of ground water development during 2004-05 was 103.69 per cent of Sambhal district which are over exploited. The future ground water level has fluctuated in pre monsoon and post monsoon period in different blocks. The sambhal district in the north uttar Pradesh is only district where the ground water level declined 3m around the district.

### **III. Recommendation and Suggestion**

- i. Artificial canal should be developed through blocks for recharge of the ground water aquifer.
- ii. Groundwater resource potential assessment is to be done at micro levels so as to know the spatial and temporal availability of groundwater resources at local and regional scale.
- iii. The susceptibility of groundwater resources wastage, over-exploitation and quality deterioration needs to be assessed in order to planning for all the purposes.
- iv. An awareness campaign should be initiated about the declining trend in the water level and the depletion of groundwater resources.
- v. it is observed that water level is declining very fast of Sambhal district blocks and strongly recommended that exploitation of ground water through pumpsets in first aquifer group in the blocks Asmoli, Sambhol, Pawansa, Bahjoi, janawai should be stopped as semi-critical and over exploitation.

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### **Internet websites**

1. [http://updes.up.nic.in/spatrika/engspatrika/select\\_distt\\_yr.asp](http://updes.up.nic.in/spatrika/engspatrika/select_distt_yr.asp)