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Dr. Ashok Babu
Assistant Professor,
Govt Mahila P.G. College,
Hamirpur, Uttar Pradesh,
India

Corresponding Author:
Dr. Ashok Babu
Assistant Professor,
Govt Mahila P.G. College,
Hamirpur, Uttar Pradesh,
India

Analysis of ground water in Bundelkhand region of Madhya Pradesh and U.P.

Dr. Ashok Babu

Abstract
Ground Water is the largest source of fresh water to mankind. Ground water in hidden source of water. Water levels varies for place to place. The depth at which saturated water is available is called water table. Ground water is recharged from the surface. The surface of Bundelkhand region is very hard in the form of fractures of rocks. Ground water is very useafulle for municipal corporations which supplies domestic water for drinking. It is also used in industrial and agricultural purposes. On account of deep and rocky types of layers of soil the problem of water supplies is very difficult in Bundelkhand region of M.P. and U.P In this article the analysis of ground water in Bundelkhan region is discussed. This problem is from centuries. On account of low drinking water females hawe to work hand for domestic water till to day. Bundelkhand region receives water from a number of perennial rivers most of which originate in Madya Pradesh and outfall ni to the Yamuna flows from west to east, its first order tributaries *viz*, Betwa, Ken, Pahuj, Baghain, Pasunj and Gunta flow from. South to north. Second order tributaries of the Yamuna system namely. Dhadan, Jamni, Bearma, Sonar, Patna, Bewas, Kopra etc. also drain the area. The entire drainage forms a part of Ganga basin.

Keywords: Water resources

Introduction
Bundelkhan region receive water from a number of perennial rivers of which originate most of which originate in Madhya Pradesh and outfall into the Yamuna in Uttar Pradesh. While the Yamuna flows from west to east, it first order tributaries *viz*., Betwa, Ken, Pahuj, Baghain, Paisunj and Gunta flow from south to north. Second order tributaries of the Yamuna system namely.
Dhasan, Jamni, Bearma, Sonar, Patna, Bewas, Kopra etc., Forms a part of Ganga basin, the region generally slopes from 600 m above mean sea level (amsl) to 300 m amsl in Madhya Pradesh and to 150 m amsl in Uttar Pradesh. Madhya Pradesh prat is conspicuous of undulation rocky ravine topography coupled with level plain while Uttar Pradesh part gradually slopes from mild ravines to alluvium level plain near the Yamuna [1].
Plate-II shows the physiography and plate-IV shows drainage system prevailing in the Bundelkhand region, Precipitation is the ultimate source of fresh, Green and blue water.
Ground water had played p predominant role in irrigation development in both the states and surface water is relatively under developed in MP when compared to U.P.
There are about 2 lakh dug wells created by the private investment of farmers irrigation 28.6% of the net sown area in MP. on the other hand number dug wells in UP is 78,476 affixation only 8.9% of net sown area in addition to making substantial contributions, dug well are more equitably distributed in both the states. However there is tremendous scope to extend the water availability in the dug well by their recharging. The Central Ground Water Board, after detailed studies has also suggested the additional opens wells can dug. Farm ponds are other possibility which has not been fully exploited in this region [2].
There are 4,604 deep tube wells and 44,870 shallow tube wells in UP compared to 3,124 tuve wells and 16394 shallow wells in MP, Tube well development is more pronounced in alluvium belt in Uttar Pradesh near Yamuna where its average yield is 37.5 ha per structure. The district variation in yield rates is primarily due to the hydrogeological characteristics dominant in the two states. Rivers Betwa, Ken. Baghin Paisuni, Gunta and their tributaries Dhasan Chandrawal, Ohen along with a number of other streams/snllahs run mainly from south to north direction UOT falling TN to the Yamuna, They flow approximately parallel to each other and can be easily net-worked within Uttar Pradesh, Irrigation through reservoirs

Built Only large rivers with catchments in high rainfall zone in Madhya Pradesh are not seriously affected during droughts as is demonstrated in the first two years of recent deficient rainfalls, in subsequent years conjunctive use has supported irrigation in these canal commands, Reservoirs on small streams origination with in Chhatarpur, Mahoba, Chitrakoot and Banda districts of the two states could not withstand droughts during first years mainly due to non perennial nature of the streams and relatively small storages in these rivers, Had there been some possibilities of diversion of water from ken and Dhasan to these are, drought impact could have been arrested to some extent. Such linkages are desired not only during deficit rainfall/runoff period, but also during normal years in order to share equitable resources in an optimal manner, particularly so when the fertile alluvium soils are limited and should ve made use of in the vest possible manner Development in MP is 961 MCM (33%) and balance ground water available is reported at 19145 MCM (76%) in appears to be a rosy picture but present drought cycle of four years has completely depleted the available resource in the absence of recharge from rainfall and it is likely to take quite a few years to replenish aquifers if the good rainfall is restored, The eater yield and re-charging rate are poor and ground water development is economically unsustainable, table 3 shows expected yield in different districts of the region [3], for optimizing production/productivity. Proper networking of rivers and canals within UP are also desirable for efficient utilization of waters during normal times.

Table 1: Irrigable area and area irrigated from different sources (Thousand ha) in Bundelkhand

District	Geographica I Area	Cultivable Area	Net Sown Area	M & M System Canals	Minor Irrigation (MI) under different source						Total Irrigation From All Sources
					Ground Water			Surface Water		Total MI	
					Dug Wells	Shallow Tube Wells	Deep Tube Wells	Flow	Lift		
Uttar Pradesh											
Lalitpur	386.5	324.8	299.7	27.45	11.34	45.75	59.66	1.38	2.43	120.54	147.99
Jhansi	313.3	219.3	199.9	13.62	9.61	15.75	1.62	4.68	3.90	35.55	49.16
Jalaun	401.4	324.2	303.9	37.92	10.90	34.52	37.74	2.00	3.46	88.60	126.52
Hamirpur	457.8	371.4	337.1	118.09	7.16	26.71	61.00	1.03	0.51	96.41	214.50
Mahoba	484.0	356.2	306.0	57.24	41.43	30.71	8.76	0.83	5.51	87.25	144.48
Banda	509.9	387.7	213.3	46.74	52.08	2.06	3.80	0.17	7.85	60.97	107.71
Chitrakoot	278.0	20.3.7	194.1	8.83	31.95	2.22	0.30	10.63	0.87	45.97	54.80
Total	2830.00	2187.3	1854	309.89	164.47	157.72	172.88	20.72	19.53	535.29	845.16
Percent of Net Sown Area				16.7	8.9	8.5	9.3	1.1	1.1	28.9	45.6
Madhya Pradesh											
Sagar	803.00	552.50	498.00	8.74	73.44	15.66	0.94	2.45	38.55	131.37	140.11
Damoh	574.80	334.40	303.40	1.80	69.30	15.02	1.43	9.30	23.01	118.06	119.86
Panna	458.90	265.90	235.50	2.67	12.06	9.00	1.34	8.16	22.37	53.86	56.53
Chhatarpur	876.70	429.30	363.00	21	171.06	0.57	0.41	20.42	23.86	216.32	238.05
Tikampur	443.90	281.20	240.10	16.85	150.48	2.96	0.31	9.62	7.42	170.79	187.64
Datia	481.00	232.90	212.00	20.72	52.55	9.25	0.53	0.48	1.53	64.34	85.06
Total	3638.3	2096.20	1852.00	72.51	530.15	52.46	4.96	50.43	116.74	754.74	827.25
Percent of Net Sown Area				3.9	28.6	2.8	0.3	2.7	6.3	40.8	44.744.7
Bundelkhand											
Total	6469.20	4283.50	3706	382.40	694.62	210.18	`177.84	71.15	136.27	1290.03	1672.41
Percent of Net Sown Area				10.3	18.7	5.7	4.8	1.9	3.7	34.8	45.1

***Source*:** Third Minor Irrigation Census

Table 2- shows development of ground water in the region.

Table 2: Ground water structures in Bundelkhand

Sub	Deep Tube Wells	Shallow Table Wells	Dug Wells	All Structure
Numbers				
Uttar Pradesh	4604	44870	78476	127950
Madhya Pradesh	3124	16394	97507	217025
Bundelkhand	7728	61264	275983	344975
Average area irrigated (ha) per structure				
Uttar Pradesh	37.5	3.5	2.1	3.9
Madhya Pradesh	1.59	3.2	2.7	2.7
Bundelkhand	23.0	3.4	2.5	3.1

Table 3: Ground water Extent and yield in the Bundelkhand region (area in %)

S. No.	District	Ground Water Yield (liters per second (IPS)			
		<1	1-10	10-25	25-40
		Uttar Pradesh			
1	Chitrakoot	53	-	35	10
2	Banda	-	70	30	-
3	Hamirpur	-	70	30	-
4	Jhansi	-	20	80	-
5	Mahoba	65	35	-	-
6	Jalaun	80	20	-	-
7	Lalitpur	100	-	-	-
		Madhya Pradesh			-
1	Datia	55	45	-	-
2	Panna	95	05	-	-
3	Damoh	98	02	-	-
4	Sagar	100	-	-	-
5	Tikamgarh	100	-	-	-

Suggested networking of rivers and canal systems in UP

Participatory Irrigation Management

Government of Uttar Pradesh has drafted a Bill on participation of beneficiaries for efficient use and maintenance of its resources by water Associations (WUAs), which are presently formed under "Societies Registration Act" or any other Act, Draft and Manuals are in pipeline [6].

Government of Madhya Pradesh passed and Act in September 1999 called "sinchal Prabandhan Me Krishkon ki Bhagidari Adhiniyam" and since then framet draft rules and prepared manuals and have also conducted two election, a number of canal system have been handed over to registered (WUAs.) However, capacity building of farmers/ functionaries, bringing reforms in fixation of water charges and its collection is required [5].

Other means of Conservation

With the completion of ongoing Rajghat Project, UP is going to utilize almost entire of Ist surface water use. Therefore, improving efficiencies of Ist water share and system is the only way to expand the command, Following suggestions may be considered:

1. Completion of the subsidiary of the main canal of Rajghat project and command development should be given highest priority to avoid future delay in flow of benefits.
2. The Canal infrastructure and Warabandi system should be made compatible to sprinkler, drip and other micro irrigation techniques. The system being developed in Rajasthan for Narmbada canal waters from Sardar Sarover May be considered to raise water utilization efficiency
3. Prssibilities of conjunctive use of surface and ground eater may be optimized.
4. Land leveling, promoting seeding/planting on the ridges and irrigation furrows can save 30-40% of water, However, proper machinery, tools implement on custom hiring basis have been recommended in the Agriculture section.
5. Cultivation of water guzzling crops like menthe, sugarcane, rice may be discouraged in the canal commands.
6. Management of flow in rives should also be governed from ecological concerns.

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