



Ground Water Depletion in Haryana: A Challenge for Sustainability of Agriculture Sector

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Abstract

Haryana is an agriculturally developed state. The total geographical area is 44.21 lakh hectares. Currently, in Haryana, 35.36 lakh hectares (80%) area under cultivation. About 30.06 lakh hectare area which is 85% of the total cropped area is irrigated through tub wells and canals in the states. The share of tub wells irrigated area is 54.20% and canal irrigated area is 45.30% in the state. The remaining 0.5% cropped area is irrigated through other sources. The over-exploitation of groundwater resources through electric and diesel pumping sets leads to a significant alteration in water availability. The groundwater level in various districts like Bhiwani, Charkhi Dadri, Mahendragarh, Gurugram, Kurukshetra, Kaithal, and Panipat has reached below 40 meters. From 1974 to 2019 the average decline in groundwater level is about 10.65 meters in the state. The monoculture of water-intensive crops like rice and wheat cultivation since the past few decades worsened the situation in the state. Curative measures like the balance between groundwater extraction and recharge, crop diversification, micro irrigation, and remunerative prices for low water-requiring crops are necessary for the sustainable use of groundwater resources for future generations.

Keywords:- Ground Water, Irrigation, Crop Diversification, Cultivation.

Introduction

Haryana is a landlocked northern Indian State. The majority of the population is engaged in agriculture and its allied activities. The deep bore wells and tube wells are the main sources of irrigation, particularly in the southern and southwest districts of the state. Groundwater has made a significant contribution to the socio-economy development of the state as it is the main source of irrigation after the green revolution. But over the years indiscriminate use of groundwater for irrigation depleted the water table. The major cause of the depletion of the groundwater level in Haryana is the cultivation of water-intensive crops like rice, wheat, sugarcane, and other commercial crops. In the past few decades, the excessive use of groundwater through subsidies for electric tub wells made the situation grimmer. According to the statistical abstract of the Haryana 2020-21 report, the number of tub wells has increased from 25 thousand to 7.91 lakh during 1966-67 to 2019-20 in the state. The increasing numbers of tub wells are responsible for the excessive extraction



of groundwater for the irrigation of crops. The depletion of groundwater resources could threaten the long-term sustainability of the agriculture sector in the state.

Moreover, the imbalance between groundwater extraction and recharge, erratic rainfall patterns over the years, and cropping patterns are some important factors contributing to the depletion of groundwater resources in Haryana. The primary cause of groundwater depletion in the central part of the state is the cultivation of water hungry crops such as rice and wheat. The continuous paddy wheat cultivation is unsustainable and decreases the water table in the state. Over the past 50 years, the Paddy growing area has increased from 1.92 lakh hectares to 14.22 lakh hectares in the states. The central groundwater boards (CGWB) assess the groundwater level in each state after five years. In 2013, the CGWB assessed 119 blocks in the states out of which 64 blocks were declared as dark zone or over-exploited zones where the groundwater level has gone very deep due to continuous over-exploitation of groundwater through tube wells. The same exercise was repeated in Haryana in 2017 by the CGWB. According to the CGWB report 2017, it has been found that out of 125 blocks in Haryana, 78 blocks were declared dark zone. It was an alarming report that from 2013 to 2017, 12 more dark zones developed in the state. The worst affected districts where the water table is falling one meter per year are Faridabad, Gurugram, Mahendergarh, Bhiwani, Charkhi Dadri, Palwal, Mewat, Kurukshetra, Kaithal, Panipat, and Sirsa. However, districts like Rohtak, Sonipat, and Jhajjar are suffering from the problem of water logging due to excessive canal water supply. Yamuna and Bhakra are the main canal systems in Haryana. The state's total requirement of water for irrigation is near about 20 million acre-feet (MAF) while the state receives only 2.3 MAF water supplies from these channels. According to a study conducted by the soil and water department of Haryana 12 MAF water is received for irrigation through tube wells in the state. There is rapid growth in the area irrigated by electric-subsided tube wells day by day. The Department of Soil and water engineering Chaudhary Charan Singh Haryana Agriculture University Hissar reported that around 30 – 40 years ago the area under paddy cultivation was only 10-20% of the total cropped area which has increased many folds over the years, particularly in the central part of the state. But the reason behind the development of darker zone in southern parts of the states is not the paddy cultivation as the paddy is not the main crop in this part. The other water-intensive crops such as wheat, Mustard, and Cotton are grown in south Haryana and irrigated by deep bore wells. With the continued over-exploitation of groundwater by the bore wells more dark zones developed for this reason over the past few years as the canal system is very poor there. The National Groundwater estimation committee (GEC) reported that two blocks Badhra and Dadri-II in Charkhi Dardri district, Loharu Block in Bhiwani district, and Nangal Chaudhary Block in Mahendargarh district are the most

dangerous dark zones in the country where the groundwater level goes 60-70 meters below the surface. It is due to persistent over-extraction of groundwater for irrigation and poor water recharge system.

Objectives

1. To Study the Ground Water depletion trends in Haryana.
2. To Study the Curative measures for the sustainable use of Ground Water resources.

Methodology

The present study is based on secondary sources of data. The secondary data used in the study has been collected from various issues of Statistical Abstract of Haryana, Yearbook of Groundwater Haryana, and various newspapers and websites.

Groundwater Depletion Trends in Haryana

Table 1.1: Ground Water depth in meters in Different Districts in Haryana

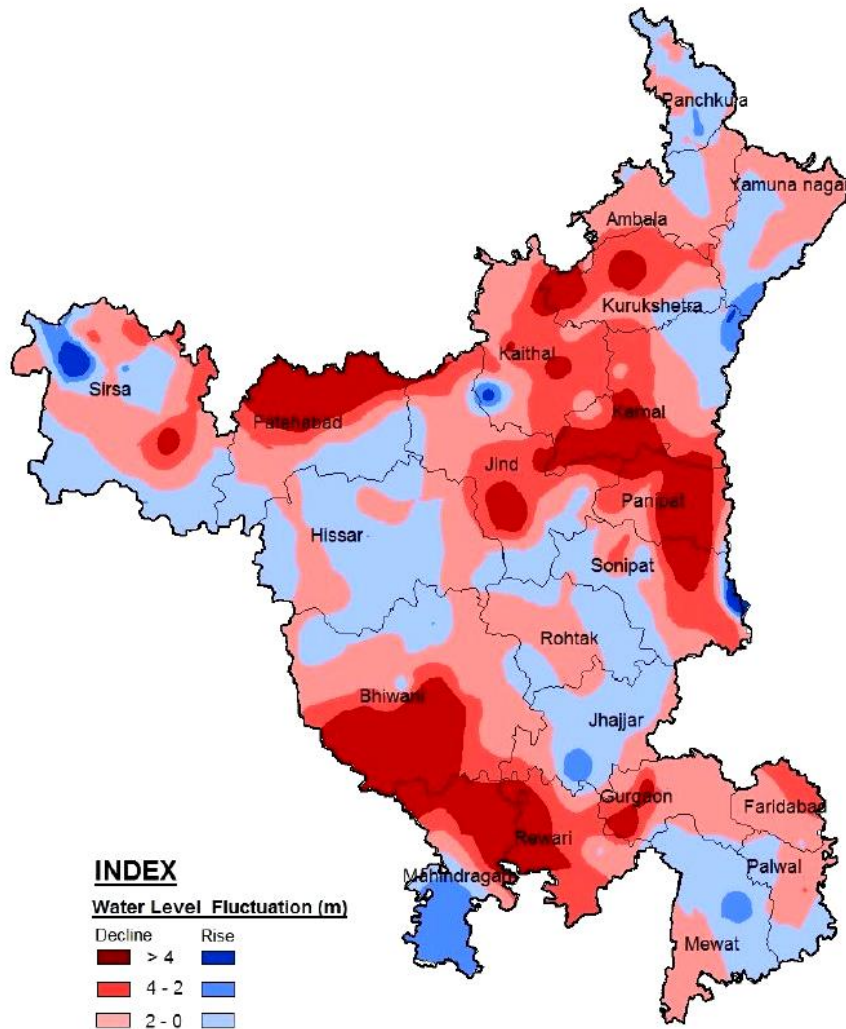
Sr. No.	Districts	1999	2016	2022
1	Ambala	5.45	11.24	14.45
2	Bhiwani	16.19	21.97	29.88
3	Faridabad	8.71	17.65	21.00
4	Fatehabad	6.42	25.98	32.86
5	Gurugram	15.22	28.87	30.09
6	Hisar	5.92	7.82	7.43
7	Jind	5.87	14.48	15.54
8	Jhajjar	4.48	5.10	4.31
9	Kurukshetra	17.25	35.30	40.93
10	Kaithal	7.78	26.69	32.09
11	Karnal	7.59	18.75	20.63
12	Mahendergarh	25.01	46.39	49.33
13	Mewat	-	11.53	12.15
14	Palwal	-	10.55	12.77
15	Panipat	8.53	18.81	22.05
16	Rohtak	3.80	4.10	3.74
17	Rewari	13.07	26.97	30.75
18	Sonipat	5.33	9.08	10.50
19	Sirsa	9.45	20.48	23.64
20	Yamunanagar	7.13	12.96	12.60
21	Panchkula	11.17	17.15	18.06
22	Charkhi Dadri	-	-	30.85
Total Average		9.70	18.66	21.62

Source:- *Amar Ujjala* 17 April,2017 and *Dainik Bhaskar* 14 August,2022

Table 1.1 predicts that except in Rohtak and Jhajjar District, the declining trends in the water table have been observed across the state. The worst affected districts are Mahendergarh, Kaithal, Kurukshetra, Bhiwani, Charkhi Dadri, Fatehabad, and Rewari. The water table situation is very grim in some districts

such as Mahendergarh, southern Bhiwani, and Charkhi Dadri. Districts like Rohtak, Jhajjar, and Sonipat have an abundance of canal water supply, as a result, these districts are suffering from the problem of water logging and salinity.

Figure: 1.1 Water Level Fluctuation Map Haryana State (2011-20)



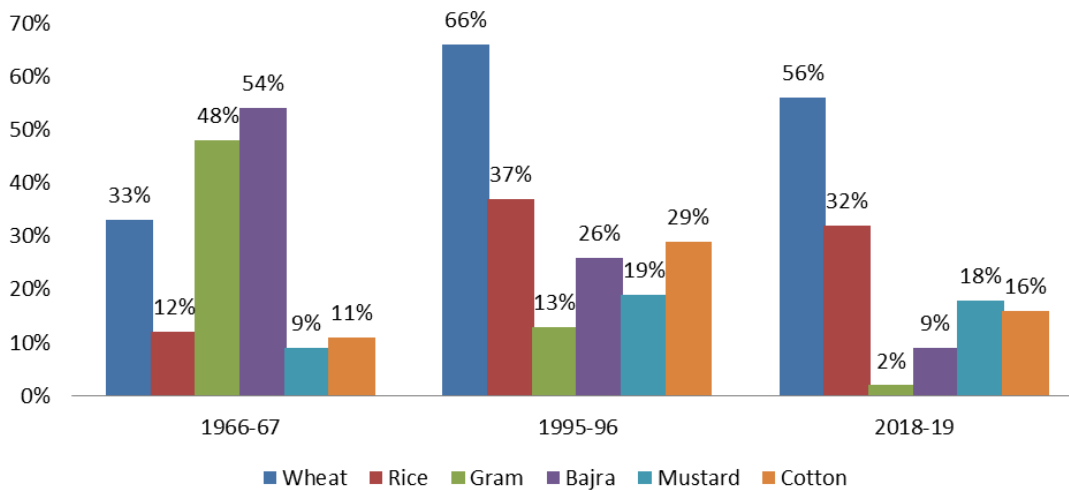
Source: Groundwater Year Book Haryana 2020-21

The Groundwater level is on a declining path in the state for the past few decades due to persistent exploitation there are various factors responsible for water table depletion in Haryana. Some of them are discussed below.

1. Cropping Pattern:- The shifting of cropping pattern from Bajra & Gram to Rice and Wheat in the past few decades has over-exploited the groundwater resources in the state because rice and wheat are more water-intensive crops. In southern districts such as Bhiwani, Charkhi Dadri, Mahendergarh, and some parts of Hisar the cropping pattern has shifted from Gram to Wheat and Mustard in the Rabi season and Bajra to Cotton in the Kharif season in past years. Meanwhile, in the North and Central part of the states, the cropping pattern has changed from Maize and Bajra to Rice, Wheat, and sugarcane.

Figure 1.2

Changes in Cropping Pattern (Percentage)



Source:

<http://agriharyana.nic.in/cropwisearea1.htm>

The above figures show that the area under cultivation of bajra was the highest (54%) followed by gram (48%), wheat (33%), rice (12%), cotton (11%), and mustard (9%) in 1966-67. In 2018-19 the area under cultivation of wheat, rice, mustard, and cotton increased to 56%, 32%, 18%, and 16% respectively while the area under cultivation of gram and bajra declined to 2% and 9% in the same period.

2. Agriculture Area:- The area under cultivation of different crops is also another factor responsible for the depletion of groundwater resources in the states. Haryana is an agrarian state and around 80% of the total geographical area is under cultivation of different crops. Due to a better irrigation system, 85% of the total cultivated area is under irrigation through different sources such as tube wells, canals, and other



sources in the state. The area under principal food grains crops has increased in the state during the past few decades.

Table 1.2

The area under Principal Crops

Area in Lakh hectare

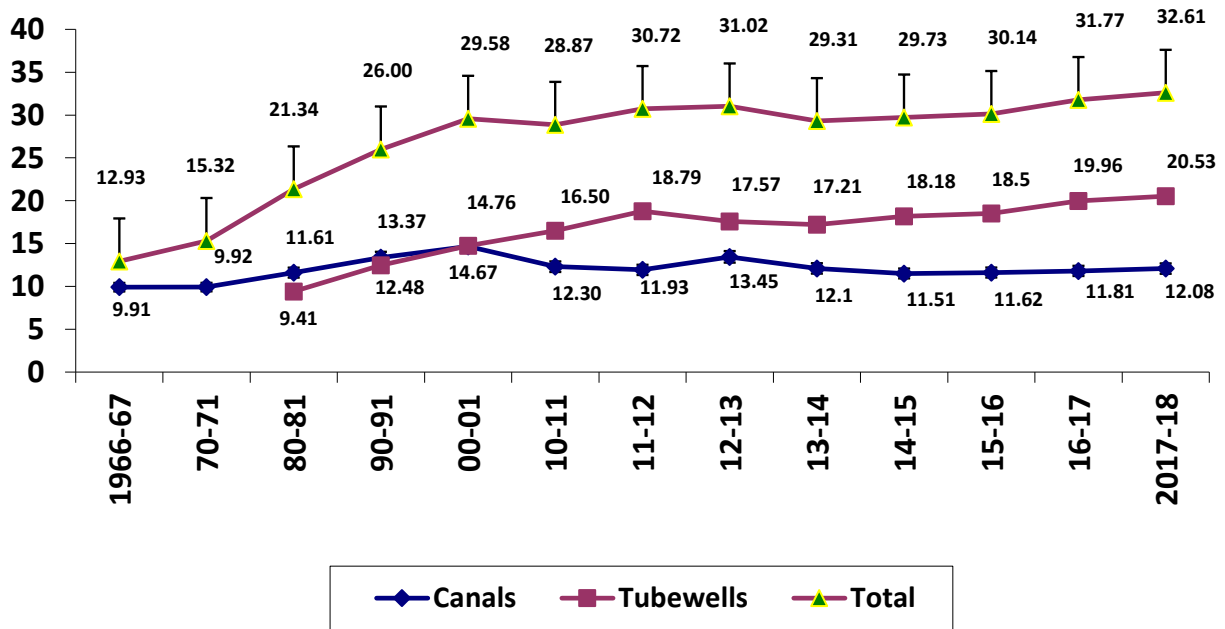
Year	Wheat	Rice	Cotton	Total Food Grains
1966-67	7.43	1.92	1.83	35.20
1970-71	11.29	2.69	1.93	38.68
1980-81	14.79	4.84	3.16	39.63
1990-91	18.50	6.61	4.91	40.79
2000-01	23.55	10.54	5.55	43.40
2010-11	25.04	12.43	4.93	47.02
2017-18	25.30	14.22	6.69	45.33
2018-19	25.53	14.47	7.08	45.58

Source: Department of Agriculture and Farmers Welfare, Haryana.

Table 4.4 shows that the wheat cultivated area was 7.4 lakh hectares in 1966-67 in Haryana and increased to 25.53 lakh hectares in 2018-19 and the area under rice cultivation has also increased from 1.92 lakh hectares to 14.47 lakh hectares in the same period. Similarly, the cotton sown area also increased from 1.83 lakh hectares to 7.08 lakh hectares during 1966-67 to 2018-19 in the state. But declining trends have been observed in the area under cultivation of some crops like bajra and maize in recent years. The area under total food grains has increased during the past few decades in the state. In 1966-67 the total area under food grains was 35.20 lakh hectares and increased to 45.58 lakh hectares in 2018-19.

3. Irrigation Pattern:- During the past few years the canal-irrigated area has declined while the share of agriculture irrigated by tube wells has increased in the states. Haryana is an agriculturally developed state. The annual average rainfall is 545mm in the state. Tube wells and canals are the main sources of irrigation. North-central and eastern parts of the state are fertile whereas south-western parts are dry and sandy. Out of the total 44.21 Lakh hectare area of the state 80% area is under cultivation and 85% of the total cultivated area is under irrigation. The state has a wide network of canals based on the Yamuna and Bhakra canal systems. Currently, the tube-wells are the main source of irrigation throughout the state. The over-exploitation of groundwater by tube-wells irrigation deepened the groundwater level in most parts of the state and many blocks have been declared as dark zone mostly in south Haryana.

Figure 1.3
Main Sources of Irrigation in Haryana
(In Lakh Hectare)



Source:- Statistical Abstract Haryana 2018-19

Figure 4.11 shows that the total irrigated area by different sources of irrigation has increased from 12.93 lakh hectares to 32.61 lakh hectares during 1966-67 to 2017-18 in the state. The area under canal irrigation was 9.91 lakh hectares in 1966-67. This has increased to 14.6 lakh hectares in 2000-01. But after that, the area of canal irrigation continuously decreased and reached 12.08 lakh hectares in 2017-18. Currently tube wells are the main source of irrigation in Haryana. The area under tube wells irrigation has increased from 9.41 lakh hectares in 1980-81 to 20.53 lakh hectares in 2017-18.

Government Initiatives to Conserve Groundwater Recourses

Water conservation and harvesting is a state subject. But even after that, the central government of India has done notable work regarding the conservation and harvesting of groundwater resources across the country. The Government of India sanctioned 6000 crores for sustainable management of groundwater resources through the Atal Bhujal Yojana (Atal Jal). The scheme is being implemented in 80 water-deficient districts of various states such as Haryana, Rajasthan, Madhya Pradesh, Gujrat, Maharashtra,



Karnataka, and Uttar Pradesh. The Ministry of the “Jal Shakti” Government of India also launched “Jal Shakti Abhiyan” in 2019 to Improve the groundwater resources in water-stressed zones in different districts of the country. The districts were selected based on the groundwater situation report assessed by the central groundwater board committee.

Moreover, The Government of Haryana also launched the “Jal Hi Jeewan” scheme in water-stressed districts of the state to conserve the underground water resources for sustainable use of water resources for future use. The State Government started a cash incentive of Rs 2000 per acre to the farmers growing crops that require lesser amount of water like maize, pigeon peas, bajra, and gram in various blocks such as assandh (Karnal), Pundri (Kaithal), Narwana (Jind), Thanesar (Kurukshetra), Amabala I, Radaur (Yamunanagar), and Gannaur (Sonipat). The state Government has also put on hold the new electric tube wells connections in the dark zones across the state. The Government of Haryana is only providing tube wells connections for drip and micro irrigations systems.

Future Prospects

Water is an invaluable and limited natural asset. If the present rates of groundwater extraction persist the state will face a severe water crisis shortly. The rainfall pattern is erratic in Haryana. Therefore there is an urgent need for sustainable utilization of groundwater resources not only in Haryana but across the country. The subsidized electric pumping systems which have over-exploited the groundwater resources need to be evaluated frequently. Crop diversification is necessary to break the Rice-Wheat cropping pattern which exploits the groundwater resources. New technology such as micro irrigation should be adopted for sustainable use of groundwater resources for the agriculture sector. The better remunerative prices for the cultivation of low water-requiring crops are also essential to promote the farmer for growing such crops instead of Rice and Wheat.

Conclusion

The groundwater depletion is the consequence of the Rice-Wheat monoculture cropping pattern in the central part of Haryana. Paddy and Rice are water-intensive crops. Over the years the area under cultivation of such crops has increased manifold due to high production and better market prices (MSP) in the state. The electric and diesel pumping set are the main sources of irrigation where groundwater is used. The prolonged and continuous over-exploitation of groundwater resources for irrigation of water-intensive crops has depleted the water table in the major parts of the state. But the depletion of groundwater is not confined to the Paddy-Wheat cultivation region. The study reveals that the water table is not only receding in the Paddy-Wheat region but also decreasing in some other districts such as



Faridabad, Gurugram, Bhiwani, Charkhi Dadri, and Mahendargarh where Paddy is not the main crop. Some other water hungry crops like Wheat, Mustard and Cotton are cultivated in the southern part of the states. The indiscriminate utilization of groundwater for irrigation by subsidized electrical bore wells is responsible for groundwater depletion in south Haryana. About 53% area of the state has experienced a decline in the water table. Some districts such as Sonapat, Jhajjar, and Rohtak has high water table due to the abundance of canal water supply and suffering from the problem of water logging. The study finds that there is an immense need to make a balance between the extraction and recharge of groundwater for the sustainability of the agriculture sector.

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