ISSN: 2456–4397 RNI No.UPBIL/2016/68067 Vol-6* Issue-9* December-2021
Anthology : The Research

Change Level of Groundwater in Mahendergarh Region

Paper Submission: 15/12/2021, Date of Acceptance: 23/12/2021, Date of Publication: 24/12/2021

Subhash Chander
Research Scholar,
Dept. of Geography,
RRBMU Alwar,
Rajasthan, India

Abstract

The study region is present in the southern part of Haryana. The climate of this region is semi arid. The present study deals with planning and management for change the level of groundwater level in mahendergarh region. The phenomena study in this paper helps the planner and policy makers to design the future strategies for efficient budgeting of this natural resource. The potential evaporation, water surplus, water deficit, water balance, rate and magnitude of ground water depletion are main factor which affect this natural resource.

Keywords: Climate, ground water level, strategies, potential evaporation, surplus, deficit, rate, magnitude, depletion,

Introduction

Groundwater is the inexhaustible resource located beneath the earth's surface. It is withdrawn for agriculture, domestic and commercial uses by extraction from wells. The groundwater depletion in semi arid regions that is study area is taken as a first indicator of water scarcity. The availability of groundwater depends on rainfall and recharge conditions. The improper management of water resources and environmental degradation that has led to a lack of access to safe water supply. The fresh water crisis is already evident in many parts of Haryana including Mahendergarh. This crisis is mainly caused human factors. The numbers of wells have rapidly and indiscriminately increased. The depletion of groundwater is due to overexploitation. Although there is possibility there is recharge of water from the other areas. The Mahendergarh region of Haryana indicated the falling of groundwater tables to the extent up to the 25 to 30 metres in last 25 years.

Objective of the study

The aim of the study is examine the rate of depletion of groundwater and suggest various management and strategies

Hypothesis

It is the hypothesized that the depletion of groundwater may be the result of intensive discharge by mechanical and motors and seasonal rivers are almost extinct

Study area

The region of chosen this area is it is Indo-Gangetic plains where groundwater is an important feature and second is researcher has deeply familiar with this region the area has semiarid climate with high temperature and low rainfall it is the plane area approximately in Soto pipe 100 metres above mean sea level it has wide rainfall fluctuation from ear to ear and season to season annual rainfall is 300 to 600MM in this entire region the farmers are largely depend on groundwater for irrigation purpose.

Data source

Secondary data

secondary data is obtained from different sources with block wise the average temperature and rainfall data on irrigation by groundwater numbers of two wells data related to the depth of water table and data on underground quality from groundwater cells of agricultures department of man dragon and statistical abstract from district headquarters the department has many observatree wells which are used for measuring the magnitude and rate of water levels fluctuations between the period 1966 two 2020

Primary data

Primary data on groundwater is collected personally by visiting 10 farmers from each of the five blocks of the districts questionnaires served to the farmers to get various kinds of information. The study unit for an analysis is block wise and time period chosen is 1966 to 2018.

This area is having some peculiar characteristics as follows:

1. There is intensive discharge of groundwater by mechanical lifts for agriculture and growing human population
2. Area has an arid climate with high temperature and low rainfall.
3. Poor surface drainage
4. Seasonal rivers are almost extinct

Potential Evapotranspiration

The potential evapotranspiration is to be dependent on wind and solar radiation conditions. Its value reach higher in sunny and windy days because solar radiation provides the energy for evaporations to occur while the wind rapidly transports the water vapour into the atmosphere. The maximum potential evapotranspiration value was obtained in summer season and minimum in winter season. The negative value of precipitations obtained at all the stations shows that whole of the area is deficit in water availability and soil need water from other sources for vegetation to grow. The deficit rate can help in deciding the irrigation schedule.

Actual Evapotranspiration

The actual loss of water from plant and soil surface is called real evapotranspiration. It is directly related to available moisture and demand. In the present study region an average 100mm to 150mm soil moisture content can holds because soil type is sandy to silt loam. The rate of actual evapotranspiration is depends on the availability of soil moisture an intensity of solar radiation. During winter season actual evapotranspiration is lower than the summer season.

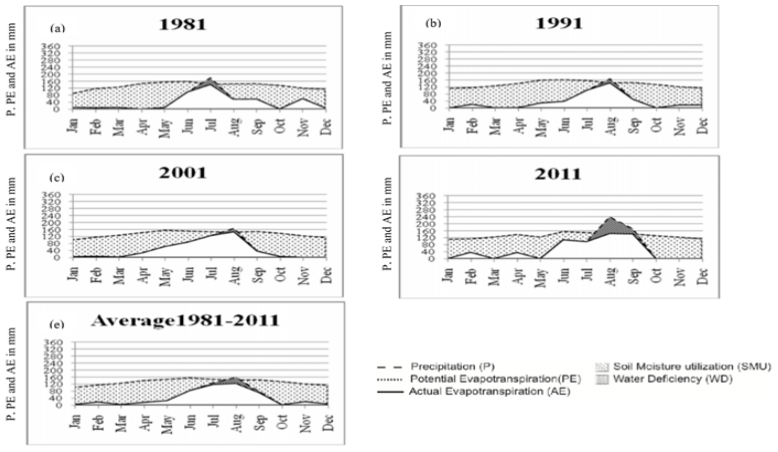
Water Balance Of Mahendergarh (1981-2011), According To Thornthwait's Procedure 1948 (Value In Mm)

Item	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
P	1981	9.47	7.11	8.72	0.00	8.08	98.30	180.17	56.67	57.74	0.25	60.26	5.94	492.69
	1991	0.00	20.77	1.02	1.64	28.85	37.56	102.46	167.62	49.34	0.26	17.11	16.91	443.52
	2001	3.90	6.60	1.73	25.35	62.22	87.42	124.87	167.02	35.77	5.01	0.00	0.00	519.91
	2011	0.00	36.00	0.00	35.00	0.00	108.00	97.00	239.00	171.00	0.00	0.00	0.00	686.00
PE	1981	88.56	117.19	125.29	145.95	154.82	158.31	142.11	144.32	144.76	135.78	119.47	113.87	1590.46
	1991	112.22	116.42	127.00	140.45	159.70	161.59	157.35	144.33	145.84	134.82	121.57	114.28	1635.56
	2001	101.99	117.04	128.10	143.53	156.82	152.48	148.56	146.30	149.97	139.69	124.69	115.34	1624.52
	2011	110.29	112.94	123.69	137.77	123.69	155.24	148.67	144.07	141.64	131.25	122.50	113.23	1564.98
P-PE	1981	-79.10	-110.09	-116.57	-145.95	-146.74	-60.02	38.06	-87.65	-87.02	-135.54	-59.22	-107.93	-1097.77
	1991	-112.22	-95.66	-125.98	-138.81	-130.85	-124.02	-54.90	23.28	-96.49	-134.57	-104.46	-97.37	-1192.04
	2001	98.09	-110.44	-126.37	-118.18	-94.60	-65.06	-23.69	20.73	-114.20	-134.69	-124.69	-115.34	-908.43
	2011	-110.29	-76.94	-123.69	-102.767	-123.69	-47.24	-51.67	94.93	29.36	-131.25	-122.50	-113.23	-878.98
St	1981	0.00	0.00	0.00	0.00	0.00	0.00	38.06	0.00	0.00	0.00	0.00	0.00	38.06
	1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.28	0.00	0.00	0.00	0.00	23.28
	2001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.73	0.00	0.00	0.00	0.00	20.73
	2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	94.93	100.00	0.00	0.00	0.00	194.93
ΔSt	1981	0.00	0.00	0.00	0.00	0.00	0.00	38.06	-38.06	0.00	0.00	0.00	0.00	0.00
	1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.30	-23.30	0.00	0.00	0.00	0.00
	2001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.73	-20.73	0.00	0.00	0.00	0.00
	2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	94.93	5.07	-100.00	0.00	0.00	0.00
AE	1981	9.47	7.11	8.72	0.00	8.08	98.30	142.11	56.67	57.74	0.25	60.26	5.94	454.63
	1991	0.00	20.80	1.02	1.64	28.85	37.56	102.46	144.33	49.34	0.26	17.11	16.91	420.27
	2001	3.90	6.60	1.73	25.35	62.22	87.42	124.87	146.30	35.77	5.01	0.00	0.00	499.18
	2011	0.00	36.00	0.00	35.00	0.00	108.00	97.00	144.07	141.64	0.00	0.00	0.00	561.71
WD	1981	79.10	110.09	116.57	145.95	146.74	60.02	0.00	87.65	87.02	135.54	59.22	107.93	1135.83
	1991	112.22	95.66	125.98	138.81	130.85	124.02	54.90	0.00	96.49	134.57	104.46	97.37	1215.32
	2001	98.09	110.44	126.37	118.18	94.60	65.06	23.69	0.00	114.20	134.69	124.69	115.34	1125.34
	2011	110.29	76.94	123.69	102.767	123.69	47.24	51.67	0.00	0.00	131.25	122.50	113.23	1003.26
WS	1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2001	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.29	0.00	0.00	0.00	24.29

Source: Calculated by Author, based on Metrological data (for 100 mm Moisture Holding Capacity)

P -Precipitation, PE –Potential Evapotranspiration, AE-Actual Evapotranspiration, St.-Storage, ΔSt-Storage Change, WD-Water Deficit, WS - Water Surplus

Water balance of Mahendergarh district



Water surplus

If the precipitation is more than potential evapotranspiration than Surplus water is left in the subsoil which either flow in as runoff or may down by leaching process. The study of surplus water is essential because it is beneficial for design and operation of several hydrological projects and systems for this reason. It also helps in raises the groundwater table. The study shows that there was no surplus water in the year 1981,1991, 2001 and 2011

Water deficit

The water deficiency means an amount by which the precipitation fails to meet the demand of evapotranspiration even after use of soil measures completely. The irrigation is required for crop protection.

Water balance and groundwater potential

The groundwater potential of any area is dependent upon its accumulated water surplus. Water deficiency exists throughout the study area in all the years. It indicates that water needs is higher than the water supply by the precipitations. The groundwater utilizations taking place faster than it's recharged.

Rate and magnitude of groundwater depletion

The phenomena of depletion start when the extraction exceeds the amount that enters the groundwater to replenish the supply. The transit imbalance occurred due to the seasonal factors. With the end of monsoon water table keeps receding, goes to lower level during summer month and starts rising again with the onset of next monsoon. Therefore such temporary changes in the water table are not considered as serious as these do not lead to a permanent lowering of water table. The problem of groundwater depletion has been reported in many countries of the world. It is widely accepted almost in every part of the world that falling water table has been resulting due to unplanned and uncontrolled use of groundwater in order to meet the immediate needs without realizing its long term consequences.

The dependence of groundwater has been increasing with increasing population. This trend is more prominent in densely populated areas. excessive pumping of groundwater has been a matter of serious concern among the hydrologists, geographers, and concerned government agencies. This problem is more evident in areas having low and medium rainfall.

Conclusion

All factors responsible for water balance in the study area were observed to be quite unstable over the period of study (1981 to 2011). There was no set pattern or correlation was observed between evapotranspiration, water surplus and water deficit. The study area is homogenous in topography, geomorphic history, climate and soil type which result less variability in factors affecting the distribution of water balance pattern.

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