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Study of Drought Risk of Mandhata Block:in District Pratapgarh (U.P.)

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Abstract

The present paper deals with drought risk areas lie along "Bakulahi River Basin", a branch of Sai River, which is tributary of Gomati and it is tributary of River Ganga. In this way the study regions is an integral part of Gangetic plain. It is a seasonal river with the length of 148.5 km and river basin spreads over 706.8 km^2 area. Becaue of continuous drought the economic activities like husbandry and farming gets affected and it impacts on underground water level by lowering its limit. Consequently well gets dry and agricultural lands converted into waste land.

Precipitation effects can be observed only in the form of ground water table, its oscillation, surface drainage density of the area and surface storage capacity. In this paper an attempt is made to calibrate all these Hydrological parameters to evaluate the effect of drought in terms of Hydromorphological condition. Rainwater harvesting schemes and changed cropping pattern is highly recommended to manage and compensate the ground water for the areas indentified as high and moderate drought risk.

Keywords: Hydrological, Drought Risk, Drainage Density, Rain Water Harvesting, Loop Cutting.

Introduction

Generally drought means a temporary condition with lack of water & it represents recurrent phenomenon. Water is one of the most precious resources. Water resource depletion is one of the exiting problem in the world facing today. It causes mainly by environment pollution in water resource, poor resources management planning and over exploitation.

The present paper embodies a micro- level analysis of drought risk areas in "Bakulai River Basin" followed by hydro- morphological approach. In the study area only 33% of the land supported by ground water irrigation by means of both open well and bore well resources. Remaining 67& of the cultivated area directly depends of Rainfall (Through Tanks). Draught, a major problem, is caused by decadal trend of annual rainfall and underground water level in the study region.

Study Area

Obviously Gangetic plain, of which the present river basin is a small segment, marks no significant landform except valley meanders. The Bakulahi is a main branch of Sai river with the total lenght of 148.5 km and river basin occupying approximately 706 km^2 geographical area within the geographical ambit of 25^0 38' N to 25^0 53' N Latitudinal and 81^0 29' E to $82^0$2'E longitudinal extent. Administratively the region falls in the administrative limits of Pratapgarh district of Uttar Pradesh.

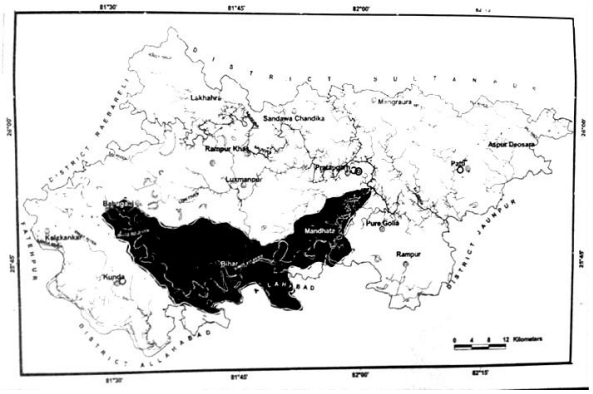

Fig :1 Locational Map of Bakulahi River Basin In Distt. Pratapgarh

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Objectives of the Study

The aim of present paper is to delineate the drought risk areas through investigating the hydro-morphological conditions of the study area.

Database and Methodology

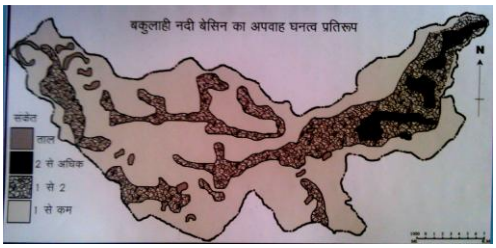
Base map and drainage density map for the present study in 1:50:000 Scale, have been presented by using survey of India toposheet (63 G/5, G/9, G/10, G/13, G/14, 63 K/1). Rain fall data have been collected from 'Sanai Anushandhan Kendra, Pratapgarh (U.P.) and underground water level details have been collected by personal observation. Most of the analysis of the study is based on intensive field work, data collection and emperical observation.

Drainage Density of the Study Area

Fig. 2 Show the surface drainage density of the study area. The value of drainage density varies from 0.8 to 5.0. Using the range, the drainage density class of the study area has been derived as Low, Moderate and High. In low density category, the drainage value varies among 0.8 to 1.0, while the moderate category consist the range of density from 1.0 to 2.0 If the density is more than 2.0 it is considered to be as higher density of the study area.

The drainage density depicts the surface configuration of water body, characteristics of run off and ground water condition of the area, so it can be said the where the drainage density is higher, there is the tolerance level of drought would be bigger. The level of drought tolerance will be difficult where drainage network is poor.

Fig :2 Map of Drainage Density



In the Drainage density map it can be show that there are very poor condition of drainage network in Mandhata and Gaura blocks. These blocks have delineated as high drough risk areas of Bakulahi River Basin. The area coloured in dark black shade denotes the higher drainage density. But it is found only in negligible Arial extension.

In the analysis of drought risk area, Ground water level is an important parameter.

During the recharge and discharge period. Fig. 3 denotes the huge difference of ground water level between Babaganj and Mahdhata blocks.

Fig. 3 Denotes the Huge Difference of Ground Water Level Between Babaganj And Mahdhata Blocks.

Well code	Well Location	MSL (Inm)	AnnualMean G.W.L.	Premanson (In feet)	Post Mansoon (In Feet)	Fluctutation (In Feet)
1	Bakol	106	9.82	10.5	9.2	+0.7
2	Kondr khas	104	6.7	7.0	6.5	+0.5
3	Kondar Khurd	104	6.7	7.0	6.5	+0.5
4	Sari Shubhadra	103	7.0	7.2	6.8	+0.5
5	Lalu Patti	104	7.1	7.5	6.8	+0.7
6	Pue Basudev	104	7.4	7.5	7.3	+0.3
7	Anjani	102	13.7	14.0	13.5	+0.5
8	Bihar	100	17.0	7.5	6.5	+0.5
9	Mandhata	97	26.7	27.0	26.5	+0.5
10	Hainsi Pargi	97	27.5	27.0	28.0	-1.0
11	Pure Torai	99	34.5	34.0	35.0	-1.0
12	Gaura	99	42.2	42.0	42.5	-0.5
13	Bhat Purwa	100	39.5	39.0	40.0	-1.0
14	Dhema	100	37.8	37.5	38.0	-0.5
15	Ramanagar	99	42.8	42.5	43.0	-0.5
16	Jamua	97	44.8	44.5	45.0	-0.5
17	Unch Deeh	100	25.7	26.5	25.0	+1.5
18	Delhupur	97	27.7	28.0	27.5	+0.5
19	Bhikhanapur	97	29.8	30.0	29.5	+0.5
20	Rajgarh	96	29.8	29.5	30.0	-0.5

Table – I Source: Personal observation 2013-14.

It is very clearly shown by the table that ground water level is in good condition in Babaganj of Bihar block, because approximately 20% area of both blocks covered with the water of Tal, Pond and Canal Tails. Thus there is positive fluctuation of water level besides the low rate of rainfall. But in the Mandhata block of Baulahi Basin we can observed gegative fluction of Ground wter level due to lack of surface storage and low rare of rainfall.

Annual Fluctuation of Underground water level [2013-14]

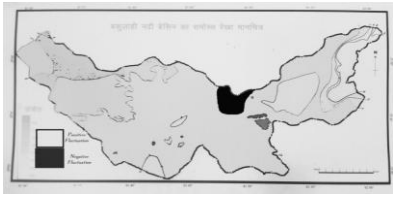


Fig:3 Rainfall In District Pratapgarh.

Year	200102	20034	2007-08	2013-14
Rainfall in MM	1023.7	1107	507	527

Table 2 [Rain fall june to sep]

Rainfall is also an important parameter for analysis of drought risk areas. Table 2 shows the decadal condition of rainfall from 2001-02 & 2003-4, in district Pratapgarh. There are very low rate of rainfall in the study area during 2007-08 to 2013-14. It impacts on ground water level by lowering its limit mainly in Mandhata block of the study area.

Result and Discussion

From the foregoing discussion it is simply clear that there are two risk areas in Bakulahi River Basin one is flood risk area and other drought Risk area. Flood risk areas in Babaganj and Bihar blocks have originated due to canal tails and shallow tals. But condition of ground water level and drainage density of drought risk areas which spreads over 60% area of Mandhata Block, is in very poor condition. Drought risk areas are classified as high and moderate risk areas in the present study-

Higher Drought Risk Areas

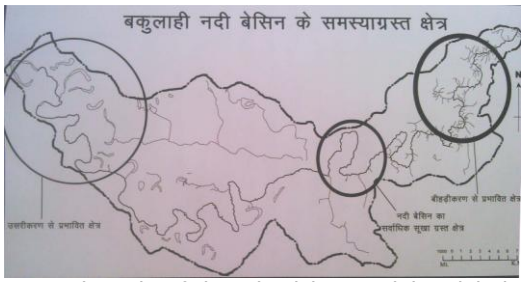
There are two blocks of river basin (Mandhata and Gaura) have identified as higher Drought risk area, characterized by higher magnitude of drought causing parameters. Among the drought risk areas, the drainage density is frequently less than 1km/km^2 .

In the loop cutting area ground water level is frequently exceeding 40 feet from ground level (Msl 95-97). The fluctuation range is -0.5 to -1.0 between the period of discharge and recharge. So frequently well gets dry and people are suffering with the problem of drinking water in these village – Hindupur, Mandhata, Jamua, Hainsi Parji, Dhema, Pure Torai, Gaura, Bhattpurwa etc. The village which comes under the threat of higher hydrological drought. It shares 17% total geographical area of Mandhata Block.

Moderate Drought Risk Area

Approximately 30% area of the river basin has identified as moderate drought risk area. Among the moderate drought risk area, Drainage density consists the range of density from 1.0 to 2.0 km/km^2 and ground water level frequently exceeding 22-30 feet from the ground level. Vishwanathganj, Shanidev, Rajgarh, Delhupur, Bhikhanapur, Khajurani, Khusfara, Sansarpur, etc. are the villages, which comes under the moderate drought risk area.

Fig 4 risk Area of Bakulahi River Basin



The rain of drought risk area (Fig. 4) is loop cutting area of Bakulahi River. In the loop cutting area, human activities have profoundly affected the natural flow of the river. So a lot of problems have generated around the Loop cutting area of Mandhata block. Thousand people of dozen villages, (Pure Torai, Gaura, Babupur, Chattauna, Hindupur, Shivera, Hainsi Parji, Dhema, Bhatt Purwa, Ramnagar, Jamua etc) living around the Loop cutting area have been suffering with the problem of drinking water in the month of May and June, consequently well gets dry and agricultural lands converted into waste land. So husbandry and farming gets in trouble since 1999.

The observation shows that loop cutting of the Bakulahi when it flowed in its previous path, the condition of ground water was not as poor as now. Thus no porblem was seen in cultivation before 1999 and people farmed wheat and rice in large scale. But now the farmers leaves farming of wheat and rice in these villages because of low profit rate due to increasing investment of money in form of irrigation, so the production of wheat and rice shows the decreasing mode.

Conclusion

1. Drought risk is quantified with reference hydrological parameters,i.e. rainfall, ground water level fluctuation, geomorphologic parameters which includes drainage density of the study area.
2. About 30 Km^2 area of river basin comes under the higher drought risk.
3. Low rate of rainfall, Poor Recharging nature of ground water and human activities (in form of Loop cutting) are major factors of hydrological drought in the study area.

Suggestion

1. Water harvesting schemes and managements of tanks are highly recommended for tolearting the risk of drought.
2. It is highly recommended to solve the problem of drought in Loop Cutting area is that the river water should be released in drawught risk area throuh previous path of Bhakulahi River, as per need.

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