International Journal of Agriculture Sciences
ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 12, Issue 13, 2020, pp.-10012-10014.
Available online at https://www.bioinfopublication.org/jouarchive.php?opt=&jouid=BPJ0000217

Research Article

GIS MAPPING OF DRY WELLS IN KARNAL, HARYANA

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Received: July 01, 2020; Revised: July 12, 2020; Accepted: July 13, 2020; Published: July 15, 2020

Abstract: Ground water levels are declining in various parts of Haryana, India. In order to arrest this problem, an Android based Mobile App was developed for GPS based dry well mapping. GIS Mapping of Dry wells in Karnal was conducted using the mobile based App. Attributes such as diameter, depth to water table and type of well (lined or unlined) etc. were also be collected during field survey. The collected data were individually processed and analysed in GIS environment. The study indicates that the maximum of dry wells is in Nilokheri block and minimum no of wells in the Karnal block of the district. It was also observed that the all the wells were lined and dried. Surely, all the blocks fall under overexploited category, there a constant decline of water levels over the past years in the major portion of the district. The results was in par with the anecdotal evidence that the wells used for domestic purposes are more susceptible to drying than wells used for agricultural purposes throughout Karnal district of Haryana as domestic wells are shallower as compared to agricultural wells.

Keywords: *Dry wells, Water level, Mobile App, GIS Mapping*

Citation: Kapil Rohilla, *et al*., (2020) GIS Mapping of Dry wells in Karnal, Haryana. International Journal of Agriculture Sciences, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 12, Issue 13, pp.- 10012-10014.

Academic Editor / Reviewer: Argha Ghosh, B. S. Khadda, Mondal Biswajit

Introduction

Unsustainable groundwater pumping, is depleting groundwater aquifers in many parts of Karnal, Haryana, India. The climate change and infiltration are reducing ground water recharge and also affecting groundwater storage. The intensive groundwater withdrawal in excess amount in comparison of natural recharge over the long span of time has affected the ground water level. Water storage has become a severe problem in many parts of India, including semi-arid regions of Southern Haryana. The recharge of ground water is possible through rainfall, low lying areas, canal seepage etc. Although many of undesirable impact associated with depletion of water table and reduction of water recharge has been studied. Mapping of dry wells is essential as it aware drinking water, agricultural and industrial productivity. In Karnal district of Haryana, India, where the maximum groundwater has been pumped. Most wells are during due to decline of the water table. Irrigation in the district is carried out by surface water and ground water. 70% of irrigation in the area are carried out through ground water. An evidence from Karnal concluded that well used for domestic purpose are more suffer from decline water table as compared to wells used for irrigation because the water table of domestic wells is shallow as compared to irrigation wells. Therefore, it is important to conserve ground water precisely for efficient planning and management of agriculture. An extensive survey of dry wells investigation can help in a thorough understanding of the water level scenario of the district. Unfortunately, the dry wells survey is not carried out comprehensively in the Karnal district of Haryana, India. The wells information and water table measurements are the lacuna to assess declining water level. It is observed that characterization of groundwater wells at the state level was published nearly many years ago. However, the spatial density of dry wells and its attributes has not been studied till now.

Therefore, the objectives of the present study are to

(i) Development of an Android based Mobile App for GPS based dry well mapping,
(II) GIS Mapping of Dry wells in Karnal using the mobile based App,
(III) Measurement of Diameter and depth to water table of dry wells, and (iv) Identification of Dry wells (lined or unlined) [1-12].

Material and Methods

Karnal district is located between 29°25'05"to 29°59'20" North latitudes and 76°27'40" to 77°13'08" East longitudes and covering an area of 2520 sq.km as shown in [Fig-1]. The area is covered by district 5.69% area of the state. Eastern boundary of Karnal district is covered by river Yamuna whereas southern and western boundaries are bordered by Panipat and Kaithal districts. Karnal is the district headquarters. The main blocks of Karnal are Indri, Assandh, Chirao, Nilokheri, and Ghauranda. Karnal is a part of the Upper Yamuna Basin. The geographical area of the study is divided into various regions such as Khadar, Bangar and Nardak belt. The major drainage in the study area is through river Yamuna. Irrigation in the Karnal district is carried out using jointly both for surface and ground water. The irrigated area through groundwater is 70% of the total net irrigated area.

Methods

For the fulfilment of the said objectives, A mobile App has been developed. The steps used for development of mobile app for mapping of dry wells such as database, designing, coding, and API (application programming interface).

Development of mobile application

The dry well mapping application has been developed using a database, designing, coding, and API (application programming interface). A flow chart showing the working of Android based Mobile App used for mapping of dry wells is shown in [Fig-2].

Table-1 *Spatial distribution of dry wells in Karnal*

District	Block name	No. of Dry wells	Diameter (meters)	Lined / unlined	Height from ground (meters)
Karnal	Nilokheri	132	02-Mar	lined	0.5-1
	Chirao	124			
	Assandh	114			
	Indri	52			
	Gharaunda	51			
	Karnal	41			

Database used

The application is developed by using PostgreSQL (Structured Query Language) relational database management system which provides the effective and modern features like views, transactions, concurrency control and complex queries of SQL.

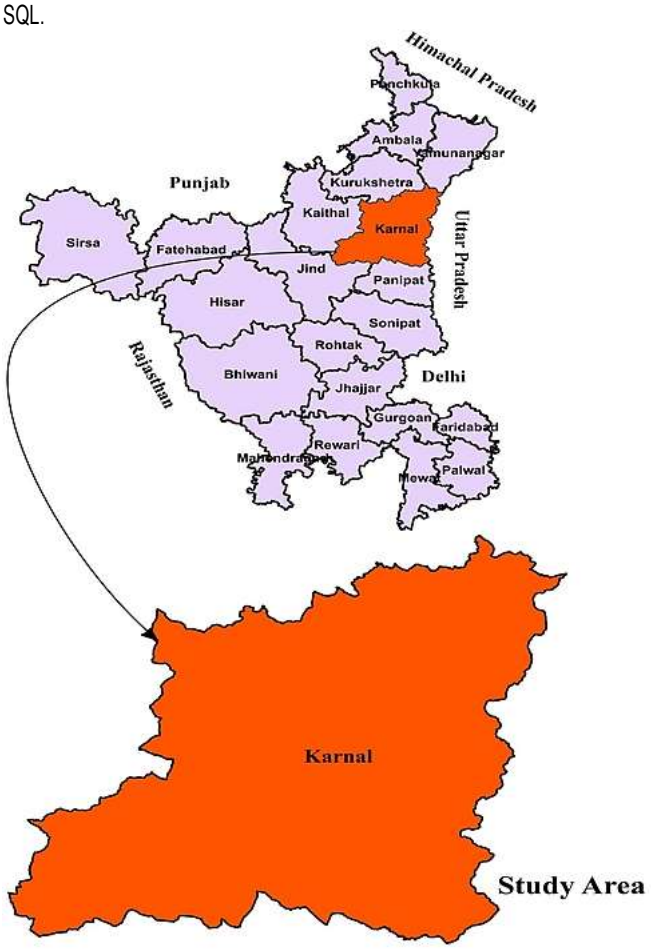

Fig-1 Location map of study area

Application programming Interface

It has been designed by using the Eclipse environment. API acts as a means of communication between the front end (user interface) and backend (database). These APIs are mainly used for the positioning with the help of GPS.

HyperText Markup Language

It is a Markup Language mainly used for the designing purpose. This language is mainly based on the tags which performs different functions. The main reason to use this language is its features like easy to learn and handling.

Java script

It is used for making the services of the application which respond according to the given input. The application consists of various fields which found to be mandatory in order to collect the proper data of the dry wells which are following:

GPS Location
Phone Number
Dry Well Diameter
Water depth
Dry well condition
Height of well from ground
Landmark
Remark
Take photo

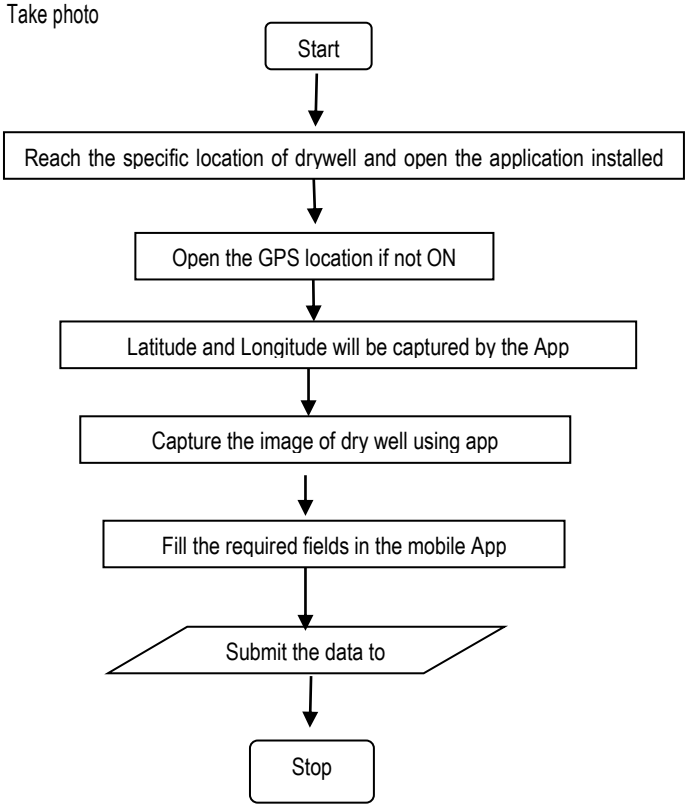

Fig-2 Flow chart showing the working of Android based Mobile App

Results and discussion

Mapping of dry wells

The study has been carried with the help of Android based Mobile App. A team was deployed block wise to map all the dry wells in a village. Android based Mobile app/GPS was used for Mapping of Dry wells in Karnal. Attributes such as Diameter, Depth to water table and type of well (lined or unlined) etc. were also be collected during field survey. All this data collected were individually processed and analysed in GIS environment. Dry wells and its attributes collected block wise during field survey are shown in [Table-1]. During the field survey, the maximum of of dry wells was spotted in Nilokheri block and minimum no of wells in the Karnal block of the district. It was also observed that the all of the wells were lined and dried.

Depth to water level in Karnal district of Haryana

Dry wells were spotted during field survey in blocks of Karnal district. Water wells have been dried due of over pumping of water. It can be seen from [Table-1] that most of water wells have been converted into dry wells. It is to be noted that ground water is declining continuously and is under stress. The ground water level has been reached at critical level at various locations of the district. Locations of dry wells block wise are shown in [Fig-3]. [Fig-4] provides spatial distribution of dry wells along with field photograph. In North Eastern parts and east central parts of Karnal, depth to water level is deeper and in the North Eastern parts, it is shallow.

Therefore, maximum no. of dry wells was spotted in North Eastern parts and minimum no. in North Eastern parts and southwestern parts of Karnal district. Locations of wells along with depth to water level are shown in [Fig-5]. It is observed from [Fig-5], all the blocks have been over exploited. Due to overpumping of water for paddy crop and drinking purposes are main cause of declining water level in the area. These blocks need detailed analysis to conserve water in the district. Only measures should be taken to reduce dependency on ground water and to enhance the ground water recharging resources. The recharging of the ground water is possible through injecting the rain water directly into the ground through dry wells.

Fig-3 Locations of dry wells in Karnal

Fig-4 Spatial distribution of dry wells along with field photograph

Fig-5 Locations of dry wells and depth to water level in Karnal

Conclusion

Locations of dry wells are mostly spotted in rural regions of Karnal district, many of which are used for domestic purposes. The over-exploited blocks lead to continuation declining of water level from long span of time in the major portion of the district. Maximum no. Of dry wells in Nilokheri block and minimum no of dry wells in the Karnal block of the district were spotted, respectively. It is observed that all of the wells were lined and dried. It is noted that reducing groundwater table threaten drinking water and agricultural productivity. Therefore, they have key implications for domestic as well as agricultural water security.

Application of research: Mapping of dry wells

Research Category: Remote Sensing

Acknowledgement / Funding: Authors are thankful to Department of Environment & Climate Change Government of Haryana. Authors are also thankful to Haryana Space Applications Centre (HARSAC), CCS Haryana Agriculture University, Hisar, 125004, Haryana, India

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Institute: Haryana Space Applications Centre (HARSAC), Hisar, 125004, India
Research project name or number: Research station study

Author Contributions: All authors equally contributed

Author statement: All authors read, reviewed, agreed and approved the final manuscript. Note-All authors agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Karnal district, Haryana

Cultivar / Variety / Breed name: Nil

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

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