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Rainwater Harvesting: An Effective Tool for Ground Water Recharge in Jalna District

Dr. A.I. Khan Research Guide & Associate professor, Department of Geography, Govt. College of Arts & Science, Aurangabad.

Adv. Patekar Gautam Uttamrao Research Student, Department of Geography, Govt. College of Arts & Science, Aurangabad.

ABSTRACT

Now a days rainfall of monsoon became erratic in nature. Precipitation is not regular in monsoon period. There are large gaps in rainfall during monsoon period as well as there is change in intensity and duration in rainfall, which is create cumulative effect on recharge in hard rock areas.

This article captures the major objectives pursued by the governments of Jalna in their rainwater development policies and programmes, and points to the growing significance of rainwater harvesting in their development agendas.

KEYWORDS : Ground Water Recharge, Rain Water Harvesting, Rainfall

Introduction:-

Rainwater harvesting defined as the process of collecting and storing rain for later productive use."

Water is prime natural resources, a basic human need, basic component and a precious national asset. It is needed in all aspects of life and health, for producing food, industrial activities, energy generation and maintenance of environment for sustenance of life and development.

An old technology is gaining popularity in new way. Rainwater harvesting is enjoying a renaissance of sorts but it traces its history to biblical times. Extensive rainwater harvesting apparatus existed 4000 years ago in the Negev desert. In ancient Rome, residences were built with individual cisterns and paved courtyards to capture rainwater to augment water from the city's aqueducts. Rainwater is the primary water source on many ranches. Rainwater offers advantages in water quality for both irrigation and domestic use. Cost of rainwater harvesting system is comparable to that of a drilled well and pumps. The primary expense is the storage tank. Operating costs can be less than those of a well. Since rainwater eliminates the need for water softening treatments.

Ground water levels in some areas are falling at the rate of one meter per year and rising in some other areas at the same rate. You can capture and recharge 56000 liters of rain water in Jalna from 100 square meter size roof-top and meet drinking and domestic water requirements of a family of four for 160m days. Central ground water board implemented the first water harvesting and recharge project in 1976 in Haryana, 1980 in Gujrat and 1988 in Kerala. In India, rainwater harvesting goes back centuries, collecting and storing rainwater for future use has been one way that forts, for example, have managed to survive the sieges laid on them. The tradition possibly evolved in the drier states of Rajasthan and Gujrat where rivers barely flow and groundwater is nonexistent. Here, collected rainwater in storage tanks called tankas provided drinking water. Rainwater nourishes the soil and helps crops grow; rainwater in the aquifers helps recharge and keep wells alive. In Bhavnagar, Gujrat, beautiful copper-lined and covered tanks used to harvest rain on the roof-top of house. The tanks were uncovered only after the first rains, which carries silt and dust. Subsequent rains would then fill up the underground tank. The copper lining acted as a bacteria-killer, keeping the water potable.

In 2001, in Chennai, rainwater harvesting took off in a big way. A severe water scarcity had dogged the city for years and alternative sources for water had to be seriously examined. With the city getting an average rainfall of more than 1000 mm in a year, rainwater harvesting was made compulsory for all houses. Today, Chennai has the largest number of rainwater harvesting systems for any city in the world with over 500000 installations. The practice has become popular in Delhi, Mumbai, Banglore and Jaipur. With over 4.5 million open wells, Kerala has the largest density of open wells in the world. A programme named Mazhapolima began in 2008.

Importance of water:-

Water is basic component and plays vital role in the development any activity in the area. Thus, the availability of surface and groundwater governs the process of planning and development. Groundwater is the sole source of drinking water for nearly 85% of the rural and around 40% urban in the state. Demand of water is increasing day by day. The population growth has been more and more stress on water. The accelerated development of agriculture and allied activities is based on the extension of irrigation, effective ground water management and effective use of modern science and technology.

Description of the study area:-

The district is the part of Marathwada region of Maharashtra and lies between 19^0 15′ N to 20^0 32′ N latitudes and 75^0 36′ E to 76^0 45′ E longitudes covering an area of about 7718 sq. km. it is surrounded by Aurangabad, Bir,Buldana and Parbhani district in north, south, east and west respectively. At present there are eight tahsils in the district, namely Jalna,Badnapur, Bhokardan,Jafrabad Ambad, Ghansawangi, Partur and Mantha with Jalna town as district headquarters. The district is part of the Deccan plateau comprising of flat topped hills and undulating plains, the slope of which is toward east and southeast. There are two main drainage systems in the district, namely (a) Godavari (b) Purna-Dudhana rivers. Godavari forms southern boundary of the district. It is one of the most important rivers of the Deccan plateau.

Soil of the district comprises of clay and loam mixture and alkaline in nature, basically derived from the basaltic lava flows. Three types of soils such as medium, shallow and black are found in the district. These soils are less fertile except those found over plains of lower elevation and also in the river basins.The climate of Jalna are generally dry except short period of southwest monsoon. The average rainfall is 700 mm. the rainfall decreases southwest to northeast. The mean minimum temperature is 25^0 c while the maximum temperature is 41^0c, January is the coldest month in this area. There are 967 villages, including 09 uninhabited villages, and four urban centres. The total population of the district is 1959046. The sex ratio comes to 937 females per 1000 males. Education facilities are available from primary to college level. Besides these educational institutes, there is also an Industrial Training Institute (ITI) in the district.

The economy of this district is based on agriculture engaging 77.3 percent of the total workers. They cultivate 1598300 ha of land and grow jowar, bajra, wheat as food crops and cotton, oilseeds, groundnut and pulses are commercial crops. Major part of the district is unirrigated. However, tanks and canals are primary sources of irrigation.

The availability of groundwater in Jalna district is governed by its rock

formation which is basaltic in nature. A few areas are covered by alluvium, where potentiality of groundwater is rich.

The district is industrially backward and agriculturally developed but last five years agricultural production decrease due to erratic rainfall. There is no large scale industry at all. However, some medium and small scale industries are functioning such as mini steel plant, sugar factories oil and cotton mills, rolling mills, fertilizer factories and ball bearing, Bidi making is important household industry. Other small scale industries are leather works, spinning and weaving etc. All revenue villages are electrified. The district is also poor in mineral resources. Only building materials are found in the district.

MAJOR GROUND WATER PROBLEMS AND ISSUES

Although a modest area in Jalna district is under canal command of various irrigation projects and the area is showing declining trend of ground water levels due to exploitation of ground water for irrigation and other purposes at a faster rate. There is much scope for conjunctive use in such areas. The conjunctive use of water is recommended in this area.Ground water quality is adversely affected at many places due to high concentration of some parameters specially nitrate. Adequate sanitary protection to the wells may be provided to control the nitrate contamination. Ground water exploration in the district has been taken up in different phases in hard rock areas occupied by Deccan Trap Basalt. A total of 30 Exploratory Wells (EW) have been drilled by outsourcing till March 2011 as given in table 1.

Table 1: Salient Features of Ground Water Exploration, Jalna District.

Taluka	Formation	Wells EW OW	Depth (mbgl	SWL (mbgl)	Discharge (lps)
Jalna	Basalt	7 0	200.2-200.85	35.4-50.00	0.14-1.37
Bhokardan	Basalt	5 0	200.2	50	0.38
Jafrabad	Basalt	4 0	195.65-200.2	50	0.14
Badnapur	Basalt	2 0	200.2	17.95	0.78
Ambad	Basalt	2 0	200.2	-	-
Ghansawangi	Basalt	3 0	200.2	50	0.85
Partur	Basalt	4 0	145.6-200.2	50	1.37
Mantha	Basalt	3 0	195.65-200.2	50	0.38
Jalna District Total=30		30 00	145.65-200.2	17.95-50.00	0.14-1.37

In Basalt, 30 exploratory wells were drilled through outsourcing in Jalna district and their depth ranged from 145.65 to 200.2 metres below ground level (m bgl). The discharge from these wells varied from 0.14 to 1.37 litres per second (lps). Static water levels ranged from 17.95 to 50.00 m bgl.

Factors responsible for water crisis in Jalna:-

1. Rough use of precious water treating it as an open and endless commodity.
2. Lack of awareness among societies about need and deed of ground water.
3. Excessive draws of ground water without having appropriate mechanism for recharge.
4. Meeting demand for irrigation, industrial domestic and other purposes.
5. Over-exploitation without continuing recharge.
6. Lack of scientific inputs and managements tools.
7. Less or no electricity tariff for agricultural and industrial operation.

Save Water for another Day:-

Why you want to harvest rainwater determines the method. It can be to recharge ground water and store for reuse. Costs depend on the quantity one wants to store or recharge and the type of material used. If you are storing water in underground or over ground tanks, it will cost you between Rs.2/litre and Rs.3.5/litre. If you choose Ferro-cement tank, costs will range between Rs.12430 for 5000 litre and Rs. 15800for 10000ltr tanks. Installing the water harvest system can cost between Rs. 2,000 and Rs. 3.000 For buildings of about 300 sqm, depending upon the city you're in. this estimate is for an existing building, it's cheaper when done at the construction stage. If you harvest rain in 1sqm of roof area, with every 1 mm of rain, 1 litre is saved. Care for ground water Before It Becomes Rare.

Causes of fall in ground water levels

- Over- exploitation or excessive pumpage either locally or over large areas to meet increasing water demands.
- Non-availability of other sources of water. Therefore, sole dependence is on ground water.
- Unreliability of municipal water supplies both in terms of quantity and timings, driving people to their own sources.
- Disuse of ancient means of water conservation like village ponds, baolis, percolation tanks and therefore, higher pressure on ground water development.
- Over-exploitation of ground water resources- Effects
- Drastic fall in water levels in some areas.
- Drying up of wells/ borewells.
- Enhanced use of energy.
- Deterioration in ground water quality.
- Ingress of sea water in coastal areas.

Methods and techniques of rain water harvesting:-

- Roof-top rain water harvesting and its recharge to underground through existing wells or bore wells or by constructing new wells, borewells, shafts or spreading basins.
- Capturing and recharging city storm water run-off through wells, shafts, spreading basins, storm water drains.
- Harnessing run-off in the catchments by constructing structures such as gabions, check dams. Bandaras, percolation trenches, sub-surface dykes etc.
- Impounding surplus run-off in the village catchments and watersheds in village ponds and percolation tanks.
- Recharging treated urban and industrial effluents underground by using it for direct irrigation or through other recharge ponds, basins or wells, etc.

Objectives:-

- Improve physical and chemical quality of ground water.
- With minor scientific modification sand redesigning, convert the traditional water harvesting structures into groundwater recharge facilities.
- To implement developmental works through the rain water harvesting approach, for ground water recharge.
- Restore supplies from the aquifers depleted due to over-exploitation.
- Store excess water for use at subsequent times.

Methodology:-

Data was collected through primary and secondary sources. Maximum data collected through secondary sources. Data collected through following parameters:-

1. Rainfall- a) total rainfall(mm), b)Rainfall pattern (no. of days and when), c) Intensity of rainfall (mm/hour), d) Average rainfall for 35 years, e) 95% probable rainfall

2. Drainage system- a) down water pipes, b) storm water pipes, C) cisterns, d) tap water.

3. Catchment- a) collection surface, b) roof area, c) land area, d) paved and unpaved area, e) slope characteristics (contours).

As the above mentioned parameters used in collection of data phase and data analyzed through following formulas-

Collection of area (sq.ft) x rainfall (in/year)/ 12 (in/ft) = cubic feet of water/year

Cubic feet / year x 7.43 (gallons/cubic feet)= gallons/year.

Expected benefits of rain water harvesting:-

- Rise in ground water levels in wells.
- Prevent decline in water levels.
- Reduction in flood hazard and soil erosion.

- Increased availability of water from wells.
- Benefitting in the water quality.
- Arresting sea water ingress.
- Reduction in the use of energy for pumping water and consequently the costs.
- Upgradation of social and environment status, etc.
- Assuring sustainability of the ground water abstraction sources and consequently the village and town water supply systems.
- Mitigating the effects of droughts and achieving the drought proofing.
- Reviving the dying traditional water harvesting structures and their rehabilitation as recharge structures.

Proposed policy: measures

- Provide at least one roof-top rain water harvesting structure for every 200 square meter plots in urban areas.
- Revive / rehabilitate all village ponds.
- Provide all drinking water wells with recharge structures.
- Ban construction of irrigation wells/ tube wells within a distance of 200 m or less (depending on scientific criteria) of the drinking water supply wells.
- Subject to technical feasibility, provide at least one check dam/ KT weir/sub-surface dyke in each streamlet with a catchment of 1 to 3 sq.km.
- Provide information and education services for water users.
- Development of water reuse/conservation systems like soil treatments and sprinkler.
- Provide adequate water measurement and accounting.

Conclusions:-

As water scarcity becomes a visible threat in different parts of Jalna; the rainwater harvesting movement is very useful this area. Ground water being a major source of irrigation in dry areas of Jalna, its management assumes crucial importance. We can add millions of hectares to irrigated land without building a single new dam. In Jalna we need to adopt a different method of managing the Ground water. Water has been important for the development of cultural complexity in human society and to their benefit. Before, water became the direct reason of IIIrd world war and is necessary to preserve and safe conservation when and where it falls. The improvements in the scientific and enhanced technological procedure such as Digital Elevation Models(DEMs) would aid in quantifying how much rainwater could also be collected on the different land area for the recharge.

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