

## Rainwater Harvesting Structures - A Case Study

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**Abstract:** Feasibility of harvesting water at Konkamthan Village in Ahmednagar District of Maharashtra State is studied using yearly rainfall data. It is said that “**water is life**” because, the water is required from birth to death for human being. In the global picture, India is identified as a country where water scarcity is expected to grow considerably in the coming decades. Further drought condition, climatic variability cause considerable human suffering in many parts of the country in the form of scarcity of water for both satisfaction of drinking needs and irrigation needs. The results of man made crisis be seen as global warming and change in climatic conditions. The rain has become irregular because of disturbance in natural cycle and therefore do not reach when one wants them. “**A Drop Harvested is a Crop Harvested**” dictates upon the importance of rain water harvesting.

The quantity of rainfall is erratic, reduced and uncertain. Hence, need for conservation has been felt much more than ever before. In this study, hydro-meteorological data is obtained from Indian Meteorological Station at Kumbhari, of Kopargaon taluka. To study the profile of ground, survey was carried out with Total Station. Contour sheet was plotted with scale 1” to 160’ at 0.5 m contour interval. The infiltration rate of soil was studied by double ring infiltrometer. Depending upon design requirements different runoff harvesting structures, like contour bunding, compartment bunding, nalah bunding and farm pound has been suggested. The study shows that with the help of harvesting structures 60 to 70 % of rainfall can be harvested.

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**Key words:** Yearly rainfall, Rain water harvesting structures, global warming, Total stations, Profile, Contour, Infiltration, Double ring infiltrometer.

### Introduction

It is well known that, the land pressure is increasing day by day due to population growth, causing the more and more water is required for domestic, agriculture and industrial purposes. At every place there is ground water, but its exploration needs money, as a result it becomes a constraint, however there are other constraints such as rainfall pattern, availability of surface runoff and storage of water. Hence rain water harvesting structures are essential for effective utilization of excess rainfall.

Rainwater harvesting is the intentional collection of rainwater from a surface and its subsequent storage in order to supply water during the time of demand. Rain-water harvesting is essential in view of the fact that rainfall, which is a source of fresh water , occurs in every short spells and runs off as a waste unless arrangements are made for its storing (NIH,1993).

In the present study attempt has been made to study the topography of the area , based on survey work carried out using total stations. Also the rainfall pattern for six years and soil strata has been studied. The rain water harvesting structures were proposed based on topography, rainfall pattern, climatic conditions, and geological features of the study area.

### Site Details

The location of site is at Kokamthan, 03 km away from Kopargaon, District Ahmednagar. The Latitude and Departure of Sanvatsar village are 19° 54’ N and 74° 33’ E respectively. The area under investigation is about 125 acres.

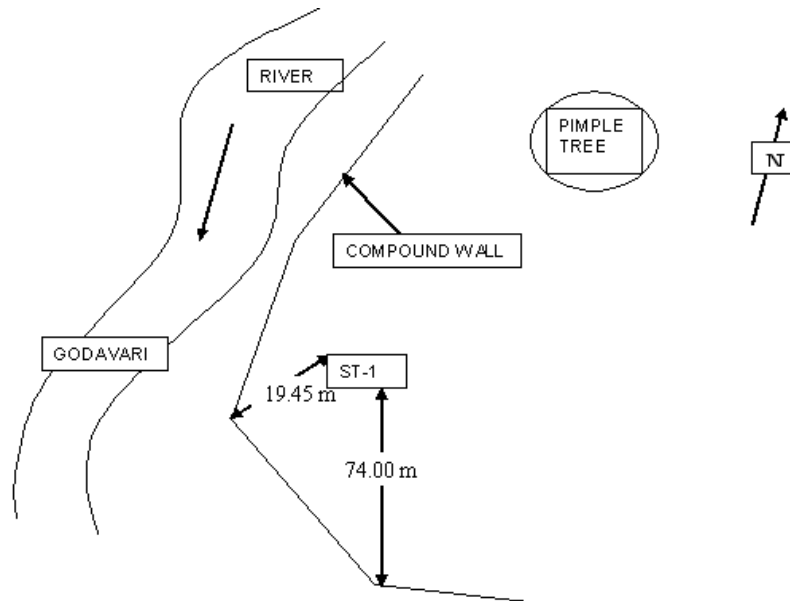


Fig 1 Site Details

**Data Collection**

The data collection part of the area under investigation has been broadly carried out in two parts,

- 1] Topographical studies
- 2] Hydrological studies

**Survey Record**

The survey for the proposed site has been carried out with the help of Total Station **DTM-352** and R.Ls of 405 stations are determined and listed in the table below.

Table 1 Sample Record of observations

Obs. No.	Northing	Easting	R.Ls	Description
1	0	0	100	ST1
2	-70.6743	-24.8749	98.5763	WC
3	-63.305	-35.5295	98.5771	RC1
4	-34.5137	-58.375	98.6694	RVC1
5	-27.3761	-34.3426	98.5275	RC2
6	-26.4177	-21.1967	98.363	WC2

Based on total station observations, the Contour map has been prepared with a contour interval of 0.5m., as shown in figure-3. It is observed that the elevational difference in the surveyed area in two ends is about 2m.

**Rainfall Data** - The rainfall data of last 20 years was obtained from the Irrigation Department and Indian Meteorological Department, Jeur Kumbhari. The data is tabulated as below and rainfall trend has been observed as shown in figure-2.

Table2 20 Year Rainfall Data

Year	Rainfall (mm)
1987-88	520.4
1988-89	610.8
1989-90	715.6
1990-91	680.5
1991-92	500.4
1992-93	560.1
1993-94	180.4
1994-95	270.2
1995-96	165.8
1996-97	650.9
1997-98	353.6
1998-99	501.3
1999-00	311.5
2000-01	504.8
2001-02	477.2
2002-03	531.3
2003-04	376.6
2004-05	455.2
2005-06	484.4
2006-07	761.9

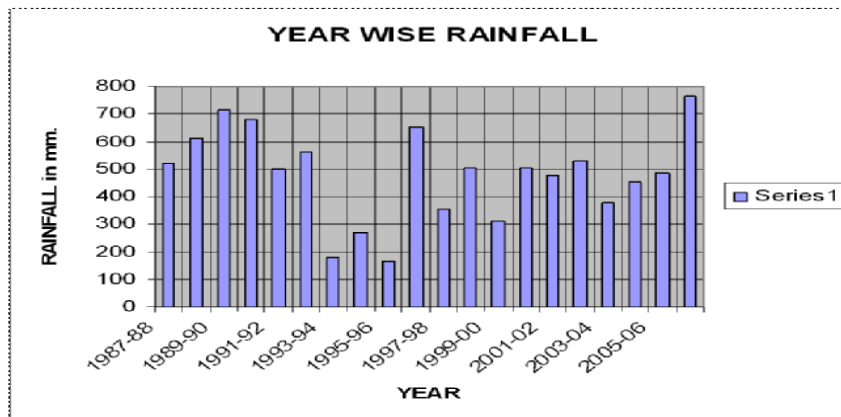


Fig 2 Rainfall Pattern

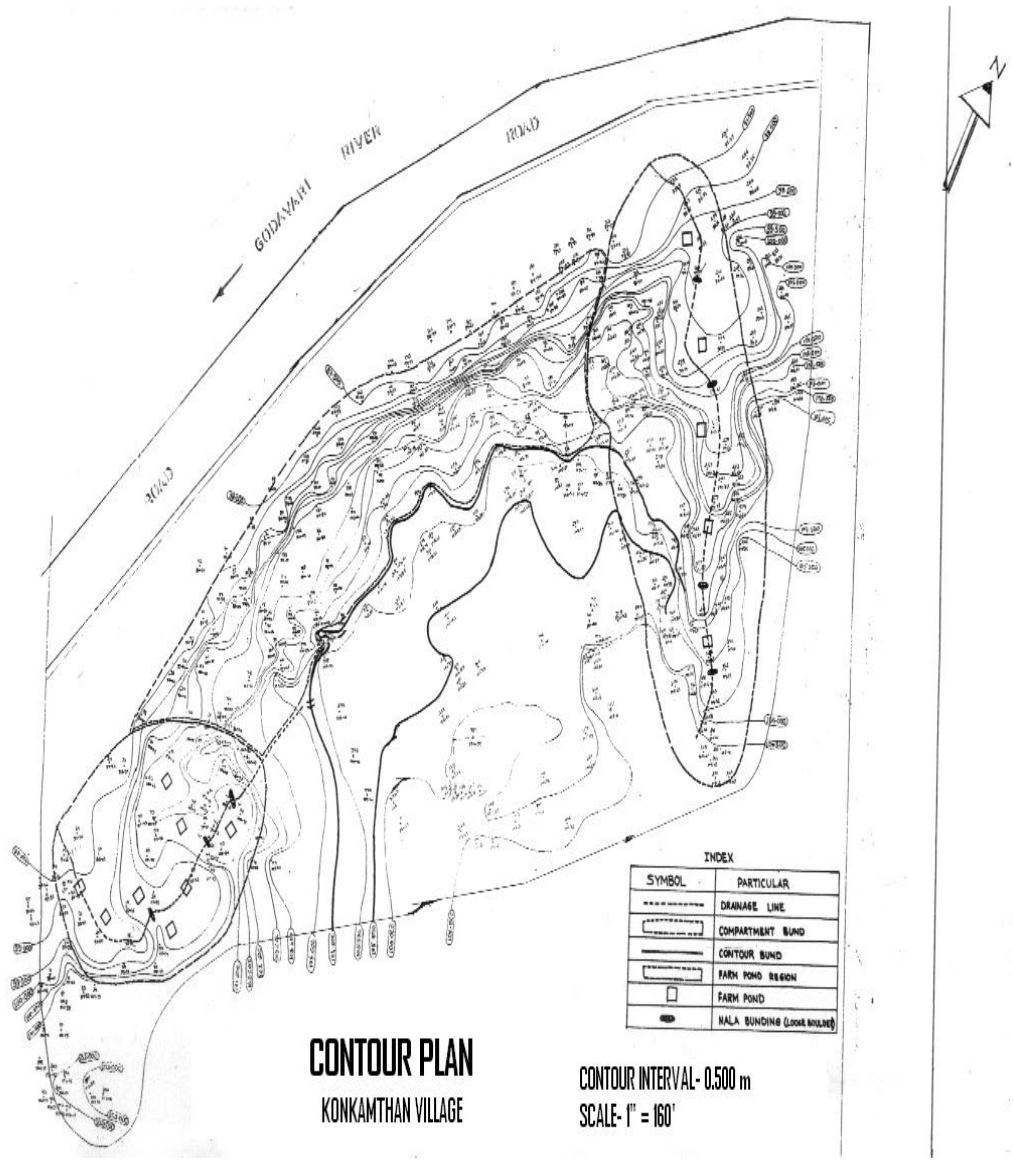


Fig 3 Contour Plan showing RWH Structures

**Proposed Action Plan**

To design the rain water harvesting structures, the rainfall, runoff, evaporation and seepage data are essentially required but these are generally not available for most of the sites, however if these are available, the cost of an extensive hydrologic investigation is seldom justified. However, based on few main factors affecting the design, a general guideline has been followed to design the contour bund, compartment bund and nalah bund.

Water harvesting and runoff recycling has four distinct components , viz., collection (harvesting) of excess rainfall, efficient storage of harvest water, water application (including lifting and conveyance) and optimum utilization of applied water for maximum benefits.

Based on the catchment area, rainfall, land slope and runoff volume, the suitability requirements of the farm pond has been proposed to construct on both right and left side of the investigation area.

## **Conclusion**

The basic thinking behind rainwater harvesting is that the rainfall in India is highly seasonal, with most of the precipitation occurring within a few months of the year and within that period the intensity, being concentrated within a few weeks, that precipitation is also highly variable between different parts of the country and from year to year, that's why it is necessary to store rainwater with various structures suitable for that area.

The principal concern in undertaking this project is to recharge the ground water, meet the industrial demand, protecting agriculture from the vagaries of the monsoon, and fulfill the domestic need and to control the floods to a certain extent.

The detailed contour survey of area under investigation at Sanvatsar was carried out with the help of total Station and contour sheet was plotted. By studying the soil characteristics, metrological factors, infiltration rate and land slope of the area under investigation, we have suggested the contour bunding, compartment bunding, farm pond and nalah bunding as the rain water harvesting structures suitable for that area. Looking into the different losses and other factors it can also be concluded that about 70% of the rain falling in that area can be harvested.

Looking into the scarcity of water and high energy input for water supply scheme, it should be made mandatory to implement such rain water harvesting techniques so that the problem of water scarcity can be minimized.

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