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# WATERSHED DEVELOPMENT IN HOTGI VILLAGE

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**ABSTRACT**
Hotgi is a small village in Solapur district of state of Maharashtra. It is facing acute water scarcity problem due to insufficient rainfall every year.Thewatershed area recharging capacity of watershed is about 89.20% of water available forrecharge.Total water to be conserved using Farm pond, Check dam,Vanraibandhara, Rain water harvesting, Nalabunding is 1197344m3 per year.Total cost for all these structures are estimated as61,95,260/-

**KEYWORDS-** Watershed Management, water conservation, rainwater harvesting, check dam.

## 1. INTRODUCTION

Watershed is defined as a geo-hydrological unit draining to a common point by a system of drains. All lands on earth are part of one watershed or other.
Hotgi watershed occupies a place of significance as it is among the first batch of watersheds identified for development in the village. The researchers to study the impact of the program and hence it is selected for the present study. Another important factor that is given weightage in the selection ofHotgi watershed for the study is its Implementation by District Agricultural department. The Hotgi watershed is subjected to a case study. The project details were obtain from the records of the village committee as well as the records and reports of Agri. office. To measure the impact of the program on the area and the people, data were collected from the beneficiaries with the help of Interview, schedules program and derived the resultant benefit have been interviewed.

## 2. OBJECTIVES

The main objective of this study is to develop and design watershed for Hotgi Village. The following objectives are defined in this study:

i) To identify the location of water conservation structure.
ii) To find the water storage capacity of individual and total watershed structure.
iii) To design and estimate the watershed structure.

## 3. PROBLEM IDENTIFICATION

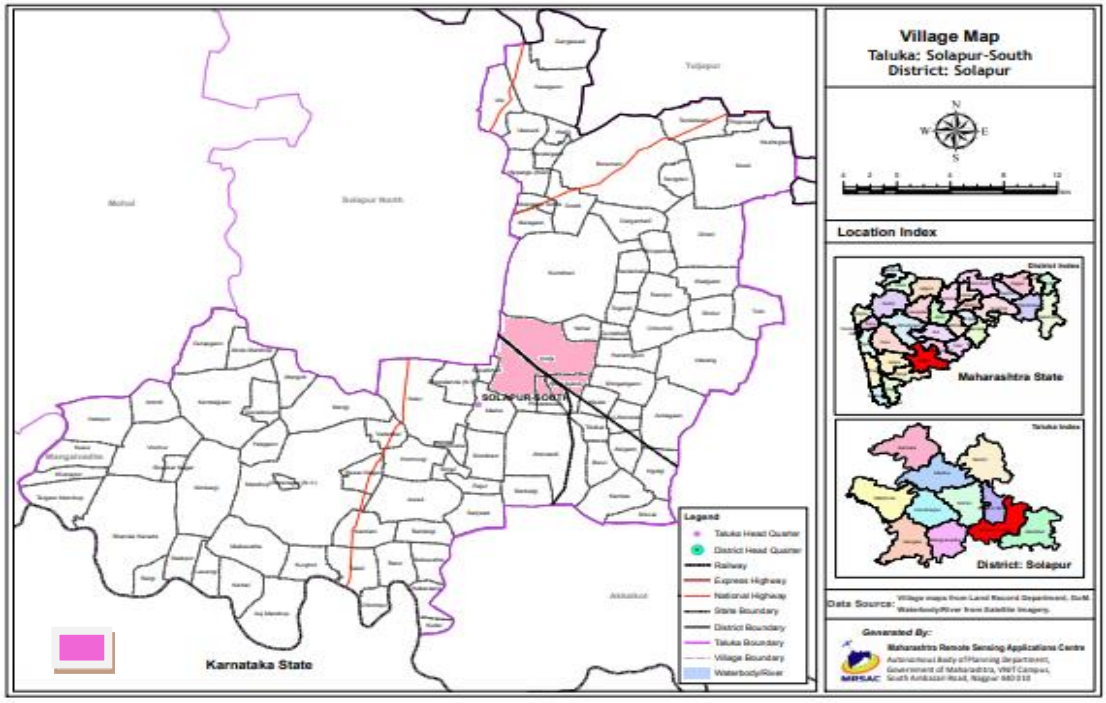
- Hotgiis drought area water availability of this area is less.
- Ground water recharge capacity of land is less.
- Average annual rainfall of Hotgi is very less i.e. 420 mm
- The rainfall fluctuation is very high. i.e. .in the year 2011 rainfall is 330.60 mm and in the year 2014, it is 571 mm for Hotgi. In the year 2015, it is 398.00mm.
- Less rainwater harvesting structures, scarce rainfall and less awareness for conservation of water have caused serious drought conditions at the project place -Hotgi.

## 4. BENEFITS OF WATERSHED MANAGEMENT

(i) Maximum productivity increase per unit area.
(ii) Increasein cropping pattern.
(iii) Proper utilization of marginal or waste lands through alternate land use systems.
(iv) Ensuring ecological balance.
(v) Agro based, dairy farming increase which gives employment to local labour.
(vi) Stabilizing income.

## 5. STUDY AREA

Hotgi is a small village in Taluka, south Solapur,Solapur District of Maharashtra state (India). It is located at from Solapur& 12kms from District place Solapur. Hotgi is located in N18 03.638 Latitude & E76 02.476 Longitude with an average elevation of 1862–2166 ft. from mean sea level 8 kms from the north of Solapur tehsil of Solapur district the climate of this region is cool and pleasant as compare to another region of the district. The average rainfall of the village is 420mm.




**Map-1: Village Map µ: Taluka: Solapur-South District: Solapur**
- **Indicates the location of Hotgi in South Solapur District**

The salient features of the study area are given below in tabular form as project at a glance

**Table 1-Salient Features of the Study Area**

| Sr. No. | Particulars | Information |
|---|---|---|
| 1 | Name of the State | Maharashtra |
| 2 | Name of the District | Solapur |
| 3 | Name of the project | W S D – / 2017-18 (SA-38A) |
| 4 | Names of the Blocks | Solapur |
| 5 | Name of Gram Panchayat | Hotgi |
| 6 | Names & Census Code of Villages covered | Hotgi -562733 |
| 7 | Four major reasons for selection of watershed | 1) Partially Cover2)Drinking water 3) Poverty 4) Small Marginal Farmers |
| 8 | Name, Address | Taluka Agriculture Office, Solapur |
| 9 | Total Geographical Area(ha) | **4639.18** |
| 10 | Area proposed for treatment (ha) | **3392.46** |
| 11 | Per hector Cost Norm | **12000** |
| 12 | Project duration | **2017-2018** |

## 6. BASIC DETAILS OF HOTGI

Watershed development needs basic information about the area like geographical area, population, average rainfall, land under cultivation, Pond and canal, Irrigation facility etc.

**Table No.2: Basic details of Hotgi**

| Details | Quantity |
|---|---|
| Geographical area | 32.1 sq.km |
| Population | 6539 |
| Average rainfall | 420 mm |
| Irrigation facility | Bore-well &dug wells, lake |

**Table No.3: Existing ground water structures in watershed (Tentative Data)**

| Particulars | Ponds | Wells | Bore wells |
|---|---|---|---|
| No. of structures | 1 | 156 | 255 |
| Use limit | - | Private | Private |
| Use for drinking purpose | - | Yes | Yes |
| Use for irrigation purpose | 40% | Yes | Yes |
| Availability of water for drinking purpose (approximately) | - | Till Nov-Dec | Till Nov-Dec |
| Availability of water for irrigation purpose (approximately) | - | Till Jan | Till Feb |

Source: Data collected from HotgiGrampanchayat

**Table No.4: Proposed water harvesting structures for Hotgi watershed**

| Sr.no. | Type of structure |
|---|---|
| 1 | Farm pond |
| 2 | Check dam |
| 3 | Vanraibandhara |
| 4 | Rain water harvesting |

In hotgi watershed rainwater harvesting, Farm pond, Contour bunds, Contour trenches, Check dams, Vanraibandhara structures do not exist. These are proposed in development of hotgi watershed.

## 7. SUITABLE SITES FOR WATER SHED STRUCTURES:

The suitable sites for water harvesting structures are identified with the application of remote sensing and GIS. The contour map, watershed boundary map, drainage map, land use map, soil map, DEM are prepared using satellite imagery and SOI Top sheet of Hotgi watershed. The overlay operation of land use map, hydrological soil group map is carried out for selecting suitable sites for water harvesting structures and presented through site suitability map. According to morphometric analysis and terrain analysis the following water harvesting structures are suggested:

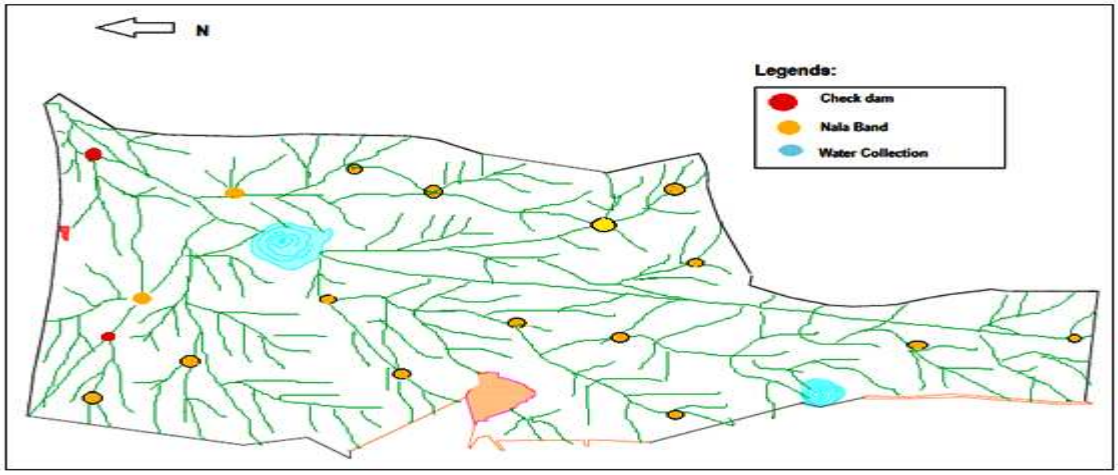



**Fig.1: Proposed water harvesting structures for Hotgi watershed**

## 8. TYPES OF PROPOSED WATERSHED MEASURES:

**a] Roof top rainwater harvesting:**

Size of storage tank (in litres) = 4320 lit say 5000 lit

**b]Vanraibandhara:**

Design details:

a) Available land slope = 5-10(%)
b) Height of Vanraibandhara = 0.8-1.2 m
**c)** Length of the bandhara = 6 m up to 25 m.
e) Breadth of the bandhara = 2 m to 2.5 m.

**c] Farm pond:**

Design details:

1) Excavation details:
a) Top dimensions of pond = 15m x 15m,
b) Bottom dimensions of pond = 9m x 9m
c) Depth of pond = 3m,
d) Side slope to excavation = 1:1
2) Side earthen bund details:
a) Top width= 0.9m,
b) Height= 1.0m
c) Side slope= 2.1

**d] Check dams:**

Design details:

- Available land slope = 0-15(%)
- Horizontal interval (Spacing between two bunds) = depends on site conditions
- Dimensions of the Check dams
  a) Top Width = 1.0 m,

b) Base width = 2.0m,
c) Height = 3.0m above ground
d) Depth of foundation = 1.0m,
e) Length of check dam = depends on site conditions
f) Freeboard = 0.50m

**Inglis formula for calculating yield:**

Based on studies carried out for catchments in Western Ghat and plains of Maharashtra,
C.C. Inglis gave the following relation:
For Non Ghat (Hilly)area with Rainfall P less than 200cm.
Run off = [P (P-17.78)] /254 Where 'P' is precipitation expressed in cm.

**Total water requirement for domestic use and for animals:**

a) Domestic= 358010250litre =358010 $m^3$

b) Animal= 9344$m^3$per year

**Relation of demand and supply**:

For Hotgivillage water supply is from Bhima river scheme. Capacity of city reservoirs is not sufficient and water demand is increasing day by day.
Hence Hotgivillage depends upon Bhima river scheme for water supply.

**Demand= 367354$m^3$per year**
**Supply = 242500 $m^3$per year**

Additional water requirement = 367354–242500 = 124854$m^3$per year

Water available for artificial recharge for watershed development**= 1342200m$^3$**

## 9. RESULTS

### a) Water to be stored in watershed:

**Table No.5Proposed watershed structure**

| Sr.no. | Type of structure | No. of structures | Water to be stored (m3 ) | Total water Available (m3 ) |
|---|---|---|---|---|
| 1 | Farm pond | 4 | 1836 | 11,97,344 |
| 2 | Check dam | 2 | 3,00,000 | |
| 3 | Vanraibandhara | 3 | 30,000 | |
| 4 | Rain water harvesting | 200 | 12419 | |
| 5 | Nalabunding | 10 | 50000 | |
| **Total =11,97,344 m$^3$ per year** | | | | |

Hence we can conserve up to 89.20**%**of water available for artificial recharge for watershed development.

### b) Cost for water shed structures:

**Table No.6Proposedcost of watershed techniques for Hotgi watershed**

| Sr.no. | Type of structure | No. of Structures | Cost of structure | Total cost in Rs. |
|---|---|---|---|---|
| 1. | Farm pond | 4 | 53000.00 | 2,12,000.00 |
| 2. | Check dam | 2 | 107500.00 | 2,15,000.00 |
| 3. | Vanraibandhara | 3 | 18420.00 | 55,260.00 |
| 4. | Rain water harvesting | 200 | 25815.00 | 51,63,000.00 |
| 5. | Nalabunding | 10 | 55000 | 5,50,000.00 |
| | | | **Total cost** | **61,95,260.00** |

## 10.CONCLUSION

In Hotgi watershed area different water conservation structures are suggested taking intoconsideration average annual rainfall and hydrology of area. Water conservationcapacity of each structure is different. Total water to be recharged depends on precipitation in thewatershed area recharging capacity of watershed is about **89.20%** of water available forrecharge. Total water to be conserved using Farm pond, Check dam,Vanraibandhara, Rain waterharvesting, Nalabunding is **1197344m3** per year. Cost of each structure varies according tomaterial used, construction procedure and labor charges etc. Total cost for all these measures is**Rs.61,95,260/-** Further it is suggested that silt removal from lakes and wells,forestation, reuse ofwaste water, People's participation are necessary and important elements for success of thisprogram.

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