

WATERSHED DEVELOPMENT IN HOTGI VILLAGE

MS. S.M. PAWAR

PG Student, S.T.B.C.E, Tuljapur (M.S.), India
Email: shitalpawar2205@gmail.com

PROF. P.A. HANGARGEKAR

Head of Department, Civil Engineering, S.T.B.C.E, Tuljapur (M.S.), India
Email: pradeeppah@gmail.com

PROF. S.C. WADANE

Assistant professor, Civil Engineering, S.T.B.C.E, Tuljapur (M.S.), India
Email: wadnes@gmail.com

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. The watershed area recharging capacity of watershed is about 89.20% of water available for recharge. 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 as 61,95,260/-

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 of Hotgi watershed for the study is its Implementation by District Agricultural department. The Hotgi watershed is subjected to a case study. The project details were obtained 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

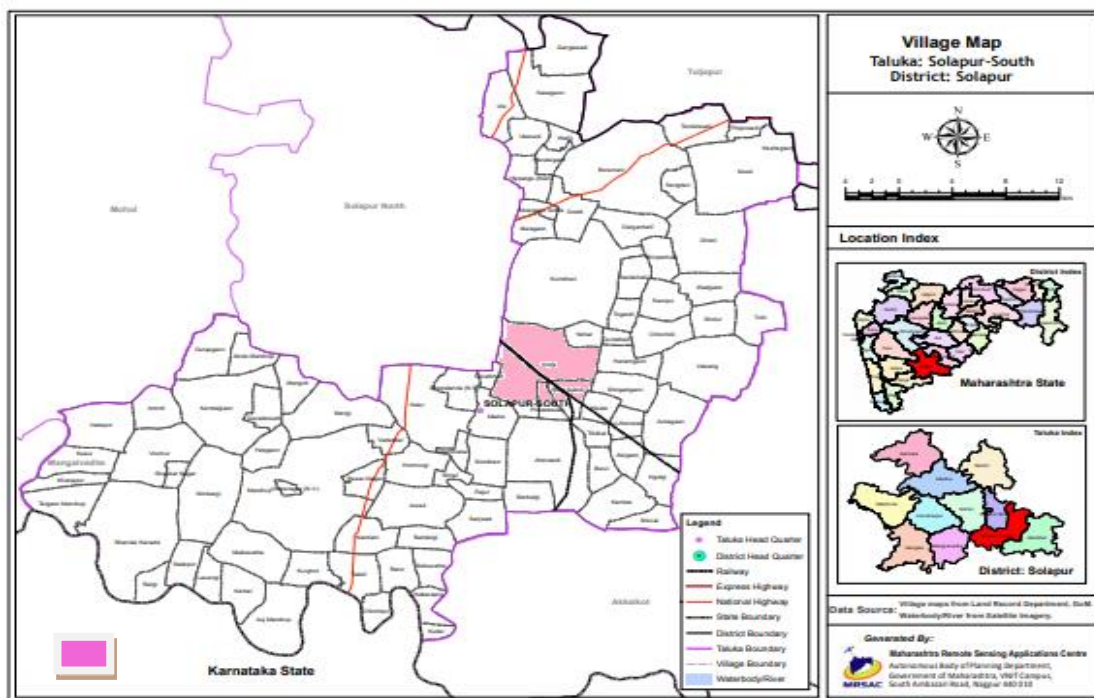
- Hotgi is drought area water availability of this area is less.
- Ground water recharge capacity of land is less.
- Average annual rainfall of Hotgi is very less i.e. 420 mm
- The rainfall fluctuation is very high. i.e. in the year 2011 rainfall is 330.60 mm and in the year 2014, it is 571 mm for Hotgi. 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) Increase in 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 12 kms 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 of Hotgi, 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:

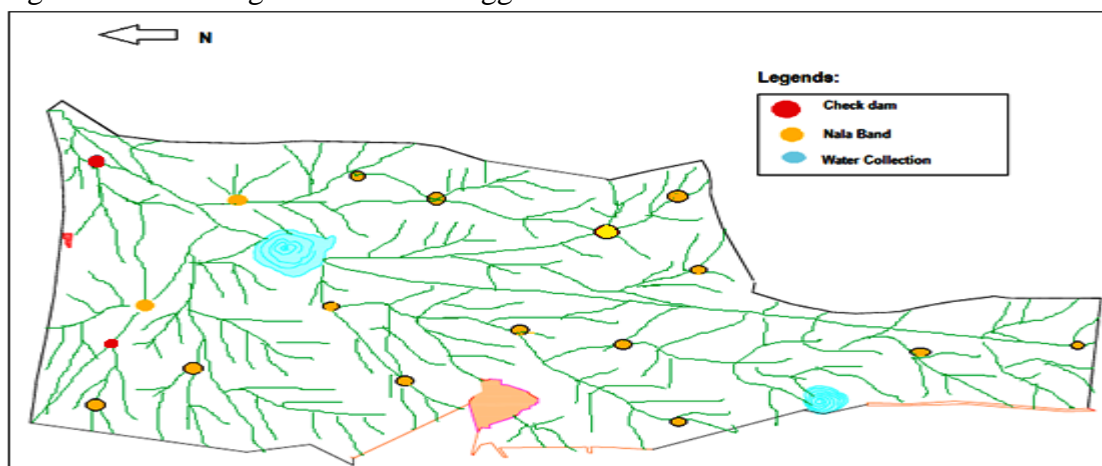


Fig.1: Proposed water harvesting structures for Hotgi watershed

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 m³

b) Animal= 9344m³per 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= 367354m³per year

Supply = 242500 m³per year

Additional water requirement = 367354–242500 = 124854m³per year

Water available for artificial recharge for watershed development= **1342200m³**

9. RESULTS

a) Water to be stored in watershed:

Table No.5 Proposed watershed structure

Sr.no.	Type of structure	No. of structures	Water to be stored (m ³)	Total water Available (m ³)
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 m³ 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.6 Proposed cost 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 into consideration average annual rainfall and hydrology of area. Water conservation capacity of each structure is different. Total water to be recharged depends on precipitation in the watershed area recharging capacity of watershed is about **89.20%** of water available for recharge. Total water to be conserved using Farm pond, Check dam, Vanraibandhara, Rain water harvesting, Nalabunding is **1197344m³** per year. Cost of each structure varies according to material 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 of waste water, People's participation are necessary and important elements for success of this program.

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