International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 07 | July 2020 www.irjet.net p-ISSN: 2395-0072

PRAPOSED WATERSHED MANAGEMENT OF "BHATANGALI" VILLAGE-CASE STUDY

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Abstract - *Bhatangali is a small village in Latur Taluka & District of Maharashtra state (India). It is located at a distance of 15kms from Latur under Kasarkheda Circle. The average temperature in Latur is 25.9 °C. About 714 mm of precipitation falls annually. This area is in Marathwada region which is in draught condition for most of the years in last decade. Rock pattern in this area made of Deccan Trap Basalt. There no crack & fissures in Deccan trap basalt percolation capacity is very less. This village is facing acute water scarcity problem every year. Rainfall pattern in this region is uneven, due to Deccan trap Basalt water does not seep into ground water table due to uneven rainfall it is not sufficient to meet out the demand of domestic, agricultural demand. Total area of agricultural 1257.5ha but now days it is irrigating about 450ha. To overcome these problems related to such water scarcity implementing the watershed structure like farm pond, storage tank, percolation tank & check dam to store maximum amount of water to meet out the demand of domestic & agricultural. by implementing such structure area of agricultural land will irrigated about 960ha.*

Key Words*: *Water conservation; water Scarcity, Watershed structure

1. INTRODUCTION

Watershed is hydro geological area from which rain water drains through a single outlet. Bhatangali region which face the problem of water drought. total population of Bhatangali is 3200 thousand and about 1257.5 ha agricultural land Average annual rainfall of Bhatangali region is 714mm. it is not possible to fulfill the demand of domestic & agriculture. It required near about 45675 m_3 water. Average annual rainfall which cannot meet out various demand. It required storing maximum amount of surface as well as subsurface water. 90% of Geographical area of Bhatangali village is made of Deccan trap basalt. it quite chances to percolate the water into the ground. Different types of Watershed structure has to implement at Bhatangali region where rock features are Deccan trap basalt, constructing Storage tank, farm pond and where chances of percolation more constructing the percolation tank, check dam. Above proposed watershed structure at Bhatangali region will helpful to solve the problem of various demand at every year.

2. OBJECTIVES

1. To design watershed structure like storage tank, barrages, percolation tank, earthen bunds, concrete nala bandara etc.
2. To collect the rain water (surface runoff) in storage basin.
3. To collect the information regarding topography of proposed watershed site for constructing watershed structure.
4. Identification of suitable sites technical guidance for construction of suitable sites for Earthen bunds, small barrage, widening of nalas, Agricultural pond etc.

3. SCOPE OF WORK

i. Demand of water for Agricultural and Domestic need required through every year in Bhatangali region check if it should fulfill demand obtained from proposed watershed management.
ii. All the calculations regarding the demand, design of structure and Estimate required to be study
iii. Required land for implement proposed watershed structure need to be studied
iv. Study of cost and capacity of proposed watershed structure
v. study of payback period of structure is to be examined.
vi. Determination of storage capacity of watershed structure.

4. LITERATURE SURVEY

1. Wani, et al (2001)- study in Kothapally in Andhra Pradesh is one 6 of such studies that highlight the effective community participation in watershed management. In fact, their study has developed the model for effective participation in watershed management.

2. Deshpande and Reddy (1991), Shah (2001), Joshi (2004) -have reviewed different dimensions of watershed management. These studies while addressing several issues have also focused the positive impact of watershed management on cropping, agricultural productivity, employment generation and increase in income amongst others

3. Kerretal (2002) - noticed that many studies have revealed that watershed management interventions were successful in controlling soil erosion, runoff reduction, etc Author concluded that the successful watersheds have in fact reduced runoff water and recharged ground and surface

water aquifers, improved drinking water supply, increased agricultural intensification and crop.

4. Mahdi Zarghami (15 March 2011)- Effective watershed management Case study of Uremia Lake, Iran who states that Limited water resources with uneven distribution and growing demands are the main challenges of water management in Iran.

This paper conclude watershed techniques system provides key monitoring, decision support and feedback component that will forms the excellent watershed structure for even distribution of water throughout the year.

5. John Kerr (2002)-Watershed projects play an increasingly important role in managing soil and water resources throughout the world. Research is needed to ensure that new projects draw upon lessons from their predecessors experiences. However, the technical and social complexities of watershed projects make evaluation difficult. This paper presents mixed-method approaches for evaluating watershed projects.

According to above literature to adopting watershed management following key is to be consider that means many watershed management techniques around the world have performed poorly because they failed to take into account the needs, constraints, and practices of local people. Participatory watershed management in which users help to define problems, set priorities, select technologies and policies, and monitor and evaluate impacts is expected to improve performance.

5. MATERIAL AND METHODOLOGY

a) AREA UNDERTAKEN FOR STUDY

Fig-1-Location Map of Study Area

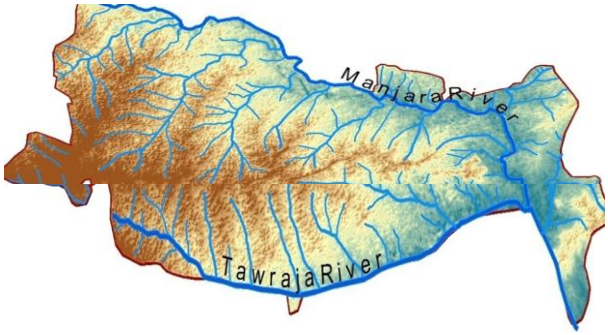

Fig-2-Drainage Pattern Of Study Area

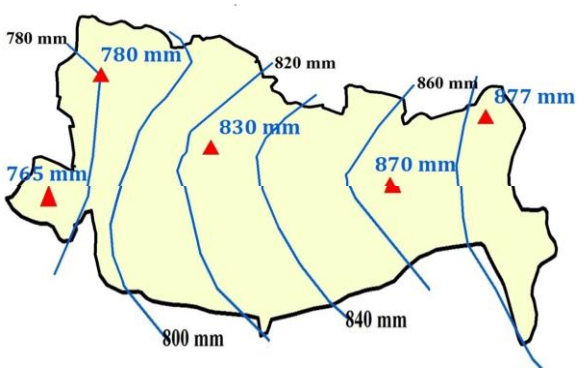

Fig3-Rainfall Pattern of Study Area

b) RAINFALL DATA OF STUDY AREA-BHATANGALI

TABLE- I

Sr. No.	Year	Rainfall(mm)
1	2005	1085
2	2006	858
3	2007	1284
4	2008	782
5	2009	652
6	2010	1006
7	2011	731
8	2012	583
9	2013	724
10	2014	482
11	2015	403.8
12	2016	1010.1
13	2017	751.2
14	2018	408

Average annual Rainfall is 714mm.

c) STUDY AREA DETAILES

TABLE- I

Name of village	Total Geographical Area(Ha)	Area not available for cultivation (Ha)	Net Sown Area(Ha)
Bhatnagali	1797.35	120.68	1676.67

d) LAND USE PATTERN -(Bhatangali)

TABLE-3-Land Use Pattern

Sr. No.	Land Use Pattern	Area(hector)
1	Total Area	1676.67
2	Area under agriculture	1257.5
3	Nonagricultural area	120
	a) Industrial area	12.20
	b) Residential area	6.7
4	Irrigated area	567
5	Non irrigated area	21.4
6	Area under lake	14.45
7	Road area	15.30
8	Govt. acquired area	0.2
9	Forest area	1.8

Crop ranking and crop pattern of study area 2019-20 Ranking of the crop is the real picture of the study area. The Ranking of the crop show the tendency of farmer or cultivator weather the farmer is traditional or market oriented. In this method that crops occupy the highest percentage of the total cultivated area, is chosen as first rank crop.

e) CROP PATTERN OF STUDY AREA

TABLE-4

Location	Crop	Area for crop Sown	Area available for sown (hector)
Bhatangali	Sunflower	40	1676.67
	Sorghum	170	
	Safflower	8	
	Gram	166.9	
	Soya-bean	487.78	
	Wheat	102	
	Vegetables	43	
	Sugarcane	129	
	Groundnut	19	

6. PROBLEMS FACING IN STUDY AREA

i) Low income levels hence low living standards

ii) Very low irrigation

iii) Agricultural production in only one season

iv) Poverty

v) The average rainfall is less

vi) Lack of water supplies in summer season
vii) Farmers adopting tradition method of irrigation.

viii) Black-cotton soil is available at large extent; percolation is less in black cotton soil because of its fine grains soil particles.

7. STRUCTURE UNDER PRAPOSED WATERSHED MANAGEMENT

1. FARM POND

Fig-4-Farm pond of Bhatangali watershed (30m × 25m × 8m)

2. STORAGE TANK

Fig-5-proposed site for storage tank [30m x 12m x 6m]

3. PERCOLATION TANK

Fig-6-Progress of work on Site for-Percolation tank

4. CHECK DAM

Fig-7-Under repairing of check dam situated on nala of Bhatangali watershed

8. DESIGN CALCULATIONS OF PRAPOSED WATERSHED STRUCTURES

TABLE-8

Sr. No.	Name of structures	No	Size of structures			Seepage Rate mm/day	Free Board (m)
			L	B	H		
1	Farm Pond	2	30	25	8	9.24	0.5
2	Storage Tank	5	30	12	6	5.47	0.5
3	Percolation Tank	2	30	30	6	10	1
4	Check Dam	1	56	25	10	1	1

9. COST AND CAPACITY

a) COST OF WATERSHED TECHNIQUES FOR PRAPOSED WATERSHED

TABLE-8

Sr. No	Type of structures	No	Cost of structures in Rupees	Total cost
1	Farm Pond	2	Rs.160000	Rs.480000
2	Storage Tank	5	Rs. 132445	Rs.662225
3	Percolation Tank	2	Rs. 395599	Rs.791198
4	Check Dam	1	Rs. 769000	Rs.769000

Total cost of watershed techniques

= 480000 + 662225 + 791198 + 769000

= Rs. 2702423

b) CAPACITY OF WATERSHED STRUCTURE

TABLE-7

Sr. No	Name of structures	No	Capacity (Liters)	Total Capacity =no of quantity X Capacity
1	Check Dam	1	14000000	= 1 x 14000000 = 14000000
2	Percolation Tank	2	5400000	= 2 x5400000 = 10800000
3	Storage Tank	5	2160000	= 5 x 2160000 = 10800000
4	Farm Pond	2	6000000	= 2 x 6000000 = 12000000

Total Capacity of Proposed Watershed structures

= 47600000 Liters

=47600m^3

c) ANNUAL WATER REQUIREMENT FOR DEMAND OF DOMESTIC AND AGRICULTURE

Domestic requirement = 8409m3 = 840600 Liters

Agriculture requirement = 37240m3 = 37240000 Liters

Total Requirement = 45649.6m3 / year

=45649600 Liters

d) COST OF WATER PER LITERS

Total Capacity of Proposed watershed structures

= 47600m^3 (47600000 Liters)

Total cost of watershed techniques = Rs 2702423

Cost of water per liters =2702423 / 47600000

Cost of water per liters = Rs. 0.57 / liters

Payback Period = (water demand required / Annual Inflow)

= 45649600 / 47600000

= 0.959 say 1

= 1

e) Ground water Level in unconfined and semi confined aquifers and Seasonal Water level Fluctuation for the Specified Period of all Ground Water Monitoring Wells of Study Area

TABLE-8a

Aquifer Type	Water Level			
	May 2015	Aug 2015	Nov 2015	Jan 2016
	(mbgl)	(mbgl)	(mbgl)	(mbgl)
Unconfined	13.96	9.40	8.00	15.30

10. CONCLUSIONS

1. After the rainy season around the month of February up to month of May of each year the water scarcity starts in the Bhatangali village and water demand increases

2. Now a day's area under agriculture is about 1257.5ha but due to water scarcity and uneven rainfall this region was not irrigated this area, only 450ha area is irrigated.

3. By implementing watershed structure, near about 960ha area of agricultural land will come under irrigation of Bhatangali watershed.

4. Need for domestic and agricultural is about 45649.6m3 / yearly and by proposing watershed techniques in future plenty of water will available throughout year. Quantity of water will available near about 47600m^3 / year

5. For constructing the proposed watershed structures in the Bhatangali region, total Rs 2702423 are required as fund.

6. For watershed management project runoff is very important factor. It is easy to make rise in water table

7. Check to the flow of water or runoff. Runoff occurs in nallas.

8. These type of watershed management programs can effectively solve problem of agriculture and Domestic water demand.

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