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Water Conservation through Continuous Contour Trenching, Loose Boulder Structure, and Water Absorbent Trench at Wadzire Village in Sinner Taluka, Nasik, Maharashtra, India

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Abstract Water Drought has hit many parts of the world; as a result many villages in India preferred Continuous Contour Trenching (CCT), Loose Boulder Structure (LBS), and Water Absorbent Trench (WAT) for water conservation. The government of India as well as NGOs like Pani Foundation is implementing various measures for water conservation. CCT, WAT and LBS built on the basis of voluntary work in the village Wadzire, Tal. Sinner in Nashik district of Maharashtra state of India has increased water level by 70, 00000 -75, 00,000 liters annually.

Keywords: *CCT, LBS, WAT, Pani Foundation, water scarcity, rain water, water conservation, Wadzire Village, climate*

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1. Introduction

It has been seen that due to urbanization and deforestation an imbalance of climate becomes a serious problem which ultimately leads to soil erosion, global warming, and as a result scarcity of water and food security in the country in future. Water scarcity is a man-made crisis of the 21st century and has become a global concern. According to the World Economic Forum, 78,855 million people do not have access to safe water and 4 million people depend on surface water to meet their basic needs. Due to lack of water, 2 billion people are deprived of improved sanitation [1]. Growing global population, improving living standards, changing the way we use water and moreover, expanding the agricultural sector for irrigation are the major driving forces in increasing global water demand [2,3].

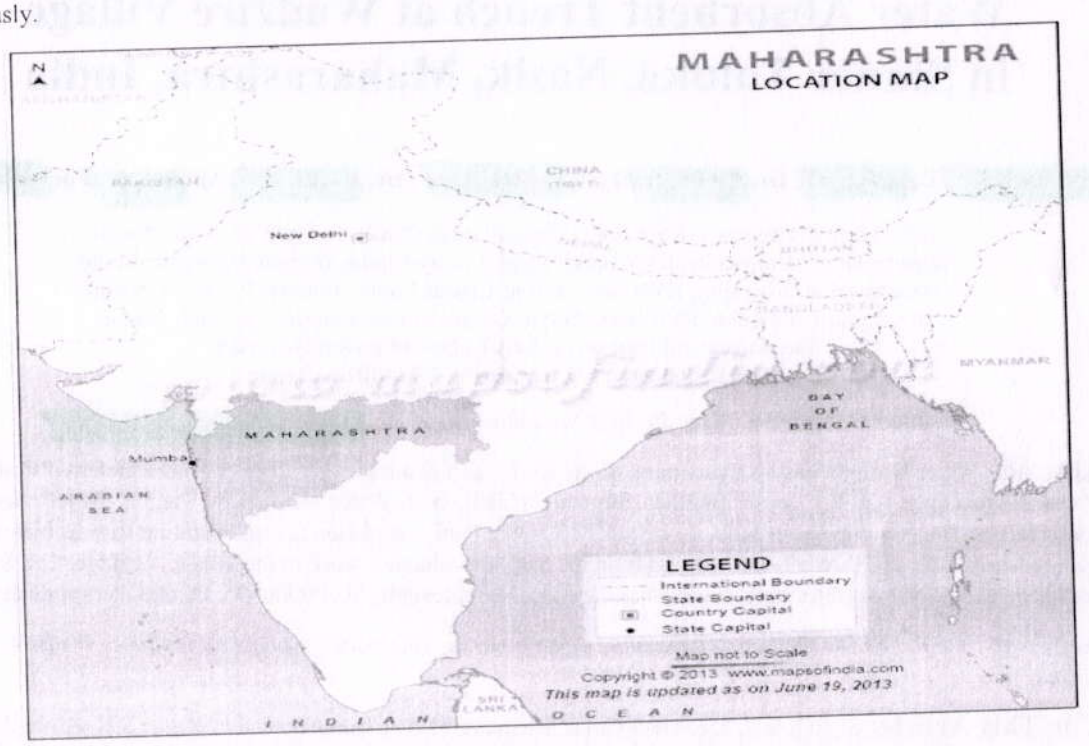
It has also been observed that deforestation has changed the climate pattern, inadequate supply of natural water resources and growing population, greenhouse gas and wasted water consumption, water scarcity is common in different parts of the world at certain times of the year [4].

Water conservation includes the policies, strategies and activities that are managed sustainably to increase the level of natural resource of fresh water. We witnessed various measures and formulation of policies to conserve water globally. One of the strategy that received much attention is rain water harvesting. Processes such as digging pond, lakes, canals or expanding the water reservoir and installing rain water catching ducts and filtration system at homes are different methods of harvesting rain water. However, such water harvested at our home can be used for toilets, home gardening, lawn irrigation and small scale agriculture. But water harvested from such source can be contaminated easily. It can be contaminated through storage tanks, septic system, uncontrolled hazardous waste, landfills, atmospheric contamination, chemicals and road salts etc [5]. As an effect the contamination of groundwater decreases the replenishment of available freshwater. Hence, taking preventative measures by protecting groundwater resources from contamination is an important aspect of water conservation [6,7,8]. In 2050, the population of India would reach to 150 crore and if proper water management is not done, then severe water crisis would be observed, where approximately 30 crore people would have to face water scarcity. In a year there are 8760 hours, out of which we avail rains for only 200

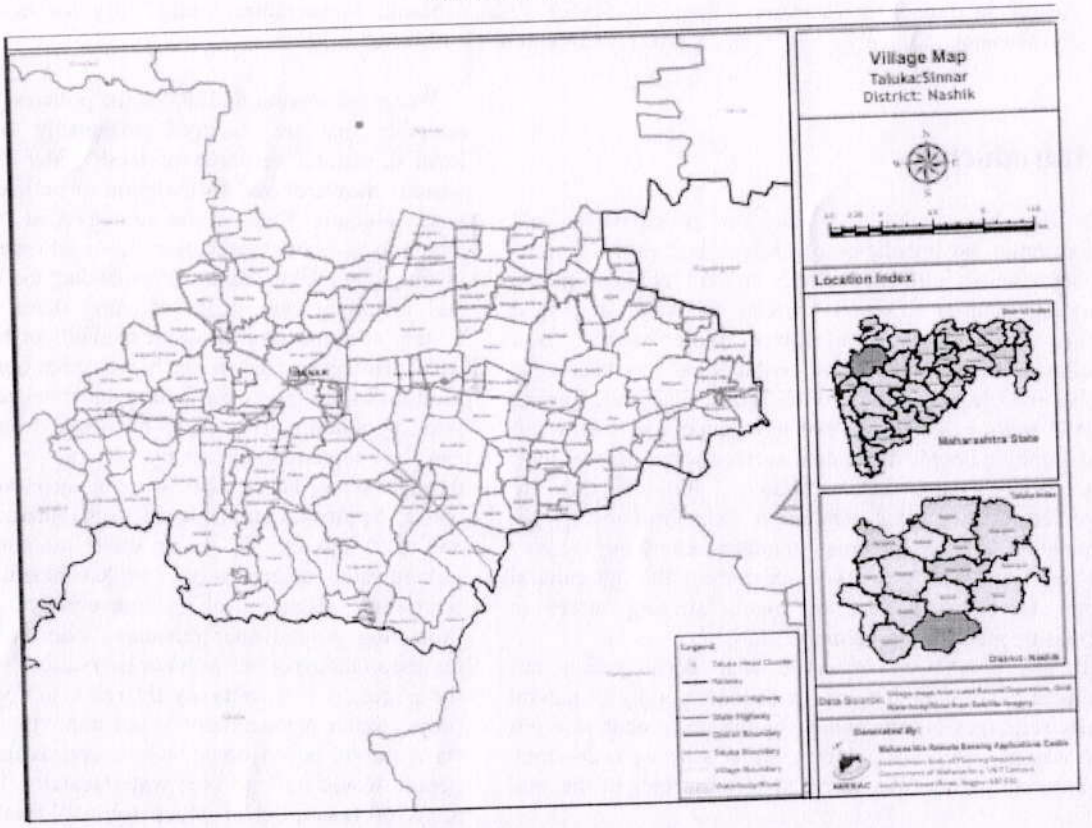
hours. Water conservation has become the need of the time. In that connection, CCT, WAT, LBS are being implemented in India. The government, as well as NGOs like Pani Foundation is implementing various measures for water conservation. The following methods are being implemented in various villages in India, especially in the state of Maharashtra, since 2016, through the Pani Foundation. This is causing the ground water level to rise continuously.

2. Locations / Study Area

The geographical location of Site is 19°, 50-36 altitude from north and 74° 2-20" long altitude from east and at an altitude of 624 meters above mean Sea-level. Climate: The climate of Sinner is pleasant & conducive throughout the year. Sinner is nearest town to Wadzire which is approximately 15 km away.



Map of Maharashtra State



Map of Sinnar, Nashik District

Wadzire is a large village located in Sinner Taluka of Nashik district, Maharashtra with total 1418 families residing. As per Population Census 2011 Wadzire village has population of 2435 of which 1266 are males while 1169 are females. Statistically, 1327 were engaged in work activities in Wadzire village out of total population. 95.25 % of workers describe their work as Main Work (Employment or Earning more than 6 Months) while 4.75 % were involved in Marginal activity providing livelihood for less than 6 months. Of 1327 workers engaged in Main Work, 750 were cultivators (owner or co-owner) while 258 was Agricultural laborer. It clearly indicates the fact that the main earning source for this village is agriculture.

Agriculture needs maximum amount of water, Wadzire is a large village located in Sinner Taluka of Nashik district, Maharashtra with total 418 families residing. The Wadzire village has population of 2435 of which 1266 are males while 1169 are females as per Population Census 2011. The Percolation tank was built at the outskirts of the village so that people living in the field and people living in the village, both can be benefited. Through the Percolation tank around 80 lacks of liters water has been saved and harvested, which in turn percolated in the surrounding field and increased the ground water level of the wells in the farms.

3. Definition

1. **Continuous Contour trenching (CCT):-** It is an agricultural technique that can be easily applied in arid sub-Sahara areas to allow for water, and soil conservation, and to increase agricultural production. Trenches can be artificially dug along the continuous contour lines. Water flowing down the hill is retained by the trench, and is infiltrating the soil below. Due to CCT, the rain water does not immediately run off the hill, Water does not evaporate uselessly, the water balance is enhanced. Crops do not suffer later on from water shortage. Fertile soil particles are not lost by water and wind erosion. When the sun shines on the water, light and heat are reflected onto plants on the northern shore of the trench, this effect and the increased humidity create micro climates in the area. These micro climates can support plants from different hardiness zones [9,10].

2. **Loose Boulder Structure (LBS):-** It is similar to that of gully plugs but they are larger than gully plugs.

3. **Water Absorbent Trench (WAT):-** WAT are shallow excavation design along contour slopes of the site. They create temporary sub-surface storage of storm water runoff, thereby enhancing the natural capacity ground to store and drain water. All these technique are helpful to increase the ground water level and quality of soil.

The Water Foundation has been organizing Water Cup competition for water conservation in the drought stricken villages of Maharashtra from April to May every year since 2016. Many drought stricken villages participate in this competition.

4. Objectives

1. To study CCT, LBS, and WAT.
2. To find information about Water Conservation resources in Wadzire village.
3. To review the study CCT, LBS, and WAT progress of Water Conservation development in Wadzire Village

5. Research Methodology

This research paper is descriptive type and based on the secondary source of data. The secondary data is collected from journals, magazines, research papers and internet. Wadzire village has a rugged topography and basaltic geological formation. So there is limitation on the canal as well as irrigation. It has been proved that old traditional methods of water conservation are not sufficient to survive in today's life and hence in order to increase the storage of water. NGO like Paani Foundation have taken an initiative by organizing a competition between villages in April and May. NSS team of KVN Naik Arts, Commerce & Science College affiliated to the Savitribai Phule Pune University Pune in collaboration with Paani Foundation had organized eight days Camp from 12th May 2018 to 19th May 2018 in the village Wadzire. In this camp hundred volunteers participated, they were oriented towards CCT, LBS and WAT In this camp, 81 CCT, 3 LBS and 1 WAT were built which had the water capacity of holding approximately 70-75 lac's liter per year. The process of various techniques are as follows.

1, Continues Contour Trench (CCT)

1. Slope area of hill part near Wadzire village was selected.
2. By using Hydro marker equipment contour line was drawn.
3. The slope of Hill was 10%, the distance between the trenches was 6 meters.
4. The length of groove was made of 20 meters and width was 3 meters.
5. Such type of grooves were made in every contour trenches.
6. A rectangular pit was made with elimination length 5 meter, width 0.6 meter and depth 0.6 meter.
7. Due to flow of water through trenches slight deviation of the trench from contour lines can create a gully to avoid such situation continuity is broken by providing ribs of 0.3m width in the trenches at an interval of 3 to 4 meter.
8. The capacity of one CCT is 1000 liters per rain .If the village had rainfall 40 times then the water storage capacity of CCT would be approximately 40,000 liters.

2. LOOSE BOULDER STRUCTURE (LBS):

Construction steps

1. Started construction from ridge to valley.
2. Bottom area of hill part near Wadzire village, Sinner, Nashik was selected. The site cleared by removing boulders and debris.
3. Marked the bottom width and length of structure by lime and excavate trench with uniform Depth of 45 cm across the gully. Normal depth is 30.0 cm,
4. The center of the proposed site for LBS till it reached on over the bed on nala, if Embankment is less than1.5m embankment only.
5. From this line, drawled two parallel lines at 20 cm. at both the u/s and d/s end up to the embankment

(These two lines are the boundaries of crest, if top width is 40 cm.)

6. Suppose upstream slope is 1:1 and downstream slope is 1:3 (a) Marked at 1.0 m perpendicular to u/s crest line (b) mark at 3.0 m distance perpendicular to downstream crest line. (These points are upstream end and downstream end of the LBS respectively and draw lines at both the sides)

7. The LBS was raised in horizontal layers.

8. Using larger size stones laying in layer with proper interlocking fill up trench. Care was taken so that last layer of the stone in trench is half inside the trench and half above the ground level.

9. Used smaller stones to fill up the gaps in layers and use hammer or boulder to fix small stones for better stability of the structure.

10. The upper portion was completed in the similar manner keeping the side slope in view.

11. The one layer of stone was interlocked with another layer of stone.

12. The structure was keyed (extended) minimum of 1.5 ft into both side of the gully bank.

13. Larger boulder was placed outer sides (especially in downstream side).

14. Maintained both the slopes during rising of layers. As per guidelines of government LBS was implemented on the hill.

6. Water Absorbent Trench (WAT)

A rectangular pit of length 11.5 meters and width of 9 meters and depth 1 meter was dug and this pit was divided into two parts by placing heap of 1 meter of soil.

7. Result and Discussion

The Maharashtra government in India has launched a water management program named Jalyukta Shivar Abhiyan to make Maharashtra state drought free state by 2019.The project was launched on 26 January 2016.The program aims to make 5000 villages free from water shortage every year. Under this program, the micro irrigation systems would be encouraged for proficient use of water, hence increasing the irrigated land. Several parts of Maharashtra are still facing the shortage of water problem. The project involves deepening and widening of streams, construction of cement and earthen stop dams, works on nallahs and digging of farm ponds. The scheme has objective to store and manage water resources and use them on those areas where farmers suffering from low rainfall and irrigation problem [10]. Camps were organized in many villages by Pani Foundation. The following work was done in the camp conducted in Wadzire village.

1. Total 81 CCT were made of each CCT having volume of 1.8 meter cube.
2. Water Storage Capacity of one CCT per rain (3hrs) is 1000 liters approximately.
3. Water Storage Capacity of one CCT per year is 40,000 liters due to 40 rain approximately.
4. Capacity of one LBS per rain (3hrs) is 1,000 liters approximately.
5. Water Storage Capacity of one LBS per year is 40,000 liters approximately due to 40 rain.
6. One WAT = 50 CCT, therefore Capacity of one WAT per rain (3hrs) is 50,000 liters approximately.
7. Water Storage Capacity of one WAT per year is 20, 00,000 liters approximately due to 40 rain.

Table 1. Water Storage Capacity of technique

Sr.No	Name of technique	Total Constructed [A]	Water Storage Capacity in liter per technique per rain (Considered 3 hrs per rain) [B]	Water Storage Capacity IN liter per year According to 40 avail rain(3hrs per rain) [C] = A × B × 40
1	CCT	81	1000	32,40,000
2	LBS	03	1000	1,20,000
3	WAT	02	50,000	40,000,00
Approximately Total Water Storage per Year				73,60,000litre.

There are no doubt, the water storage capacity depends on types of soil also, but due to construction of CCT, LBS and WAT, since last two years Wadzire village has free of water scarcity.

8. Conclusion

* Water conservation capacity of Wadzire village, Sinner, Nashik is increased by 70, 00,000 to 75, 00,000 liter per annul.

* Construction of CCT helps in increasing the ground water level in nearby well situated at downhill where CCT was constructed.

* Likewise LBS & WAT have also contributed for the cause; farmers are able to take crops other than traditional.

* All these techniques are economically favorable and long lasting. So these techniques can be implemented largely in various villages.

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References

[1] "Global risks report 2019". World Economic Forum. Retrieved 25 March 2019.

[2] C. J. Vörösmarty, P. Green, J. Salisbury, R. B. Lammers, Global water resources: Vulnerability from climate change and population growth. Science 289, 284-288 (2000).

[3] A. E. Ercin, A. Y. Hoekstra, Water footprint scenarios for 2050: A global analysis. Environment International 64, 71-82 (2014).

[4] "How do we prevent today's water crisis becoming tomorrow's catastrophe?" World Economic Forum. 23 March 2017. Retrieved 30 December 2017.

[5] Elena Humphreys; Andrea van der Kerk; Catarina Fonseca. Public finance for water infrastructure development and its practical challenges for small towns 2018, Water Policy (2018) 20 (S1): 100-111.

[6] Verinder Kaur, Ritu Mahajan, Water Crisis: Towards a Way to Improve the Situation 2016.Volume 3, Issue 6.

[7] Senthil Kumar Kurunthachalam* Water Conservation and Sustainability: An Utmost Importance 2014. Hydrology Current Research.

[8] Benjamin H.D, Christaian S. A, Assessing Green and Efficient Remediation at Waste Sites 2018.Worcester Polytechnic Institute

[9] Pande Vinod C. Kurothe R.S Implications of optimal groundwater extraction for sustainable groundwater use in Indian semi-arid tropical watershed 2015.Vol. no. PP, 1-8.

[10] A Water Conservation Technique: Continuous Contour Trenches VJER-Vishwakarma Journal of Engineering Research, Volume 2 Issue 4, December 2018.