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Sustainability – A Way of Life in Shirpur, Maharashtra, India

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ABSTRACT

Shirpur taluka of Nasik division in Maharashtra is in draught prone area. This area suffered from water shortage before 2018. The present study was conducted to comprehend the current sustainable development in this area and revealed a typical geographical condition of that region. Lateral and vertical percolation of water through the yellow silt layers in the aquifers was scarce prior to the completion of the project-Angioplasty of water in 2018. The soil had an effective porosity to the tune of 2.5 to 3%, yet the aquifers were hardly saturated. The dug wells and bore wells in Deccan Basalt hardly yielded water till December. Water was scarcely available after December for drinking and irrigation. Only Kharif crop was possible. Scarcity of water impacted surface water reserves. More burden was experienced on ground water level. Groundwater beingan important renewable resource requires to be refilled every year by rainfall and through water dripped during irrigation. The structure of rocks, geo-morphological, hydrogeological as also hydrometeorological conditions govern the pore water levels. Suitable measures were needed to augment groundwater resources to make existing groundwater structures sustainable."Angioplasty of water" was implemented to solve water problems. Sustainable use of water was possible in draught prone areas after this project was completed. Industrial and agricultural development followed after this project. Composite Index of Development (CID) as also the levels of development in Shirpur improved considerably as compared to other areas in Dhule district.

Key words: *Shirpur, Angioplasty of water, Sustainability*

Introduction

Shirpur is a well-known city in northern Maharashtra. It is also an important taluka located in Dhule district of Nashik Division of the state. This area receives a meagre rainfall every year. Dhule district belongs to the dry area of Maharashtra. Due to its hydrogeological conditions this area faces severe water shortage, hence adequate water is not available for agricultural and industrial development (Baride *et al.*, 2017).

In order to develop agriculture and industries in this area, water is necessary. Siranappan (1994) studied the prospects of micro-irrigation in India and opined that water management is crucial while intensifying agricultural development. Patil and Dahivelkarin (2017) showed that water should be used judiciously as it is one of the most important natural resources. Their study showed that irrigation makes water available for growing crops. They also pointed out that a critical study of the pattern of land usage by the residents of the area is necessary for sustainable development.

Due to the scarcity of water, there was immense load on surface water reserves in this area. But farmers reaping cash crops such as sugarcane and banana, had to depend on ground water reserves. This had disrupted the accessibility of ground water reserves.

The Case Study

This area suffers from arid weather except during the south-west monsoon season. Four seasons are experienced here consisting of the winter from December to February and summer from March to May. The south-west monsoon season commences from June to September. Post-monsoon season sets in during October and November.

Evapotranspiration is a decisive factor for the quality of water to be utilized by the plants. This phenomenon increases during the plant growth period. This reduces the water required for plants. Shirpur taluka is located at that part of the State where water shortage is severe. These semi-arid tracts in Maharashtra experience rainfall from 750 to 1000 mm and so are dry areas.

Shirpur taluka geographically comprises of an area of 837.39 sq. km. It has an area of farmland spanning 653.77 sq. km,which is 78.07% of the total cultivable area. The forest area here comprises of about 101.09 sq.km. The uncultivable land is 82.53 sq.km. Shirpur taluka receives sparse and inconsistent rain which again is highly erratic. The annual normal rainfall is 617 mm within a time span of 36 days. Surface water resources in the Taluka are unevenly distributed.

To overcome the scarcity of water due to the erratic pattern of rainfall in this area a distinctive method called Angioplasty in Water Conservation was developed. The novelty of this method consisted of the removal of water-resistant layer of the ground. This layer comprised of the large, rigid surface of the land capturing water in deccan basalt and silt in alluvium. This method was implemented and 65 cement plugs of appropriate dimension without gates and wasteweir were constructed. The project was completed in the year 2018.

This area had a typical geological structure which hindered in the process of water percolation in the soil. To change the whole scenario by making perennial water available to this rain-fed area was the main objective of the project.

Fig. 1. Bunds dugout in the soil at Shirpur

During the present study it was found that one third portion of Shirpur taluka was covered by Tapi Alluvium and two third portion by Deccan Basalt. Basalt was in alternate layers of weathered basalt and hard massive basalt. In the same manner in Tapi alluvium, layers of yellow muddy sediment, sand and rocks lying one over the other were detected. The effective porosity of sand bed in Tapi Alluvium was about 30%. The sand beds were fully saturated during the post faulting period. The excessive development of multi-aquifer system had affected the availability of ground water. Sustainability of groundwater as main source of drinking water in rural areas has been affected due to the indiscriminate withdrawal of this source. In the absence of any regulatory measures to control groundwater development, the farmers were resorting to incessant groundwater pumping to meet the water requirement. The groundwater-based drinking water schemes were the first casualty of such a development.

This resource was also not dependable due to unreliable precipitation in monsoon. Watering the crops in the taluka spanned only in a tiny region in south eastern part of the dry land. In the entire taluka intensive use of groundwater resulted into critical situations manifesting the challenges such as reduced ground water levels, dearth of water availability, etc. Such a condition needed steps to address the requirement of increasing groundwater resources in the taluka.

Average depth of the dug-wells in this area was 40 meters. Even the tube-wells having depth of about 150 to 200 meters had become dry despite heavy rainfall.

This implied that there was less percolation sideways and upright through the yellow sediment in the artesian basin. The ground had an actual permeability of 2.5 to 3%, yet the aquifers were hardly saturated. That was the reason due to which dug wells and bore wells in Deccan Basalt hardly yielded water till December. There was severe scarcity after December for drinking water as well as water for irrigation. Only Kharif crop was possible.

To overcome this problem, 14 tiny rivulets in the project area were broadened up to 20 to 30 metres and deepened up to 10 to15 metres from its origin in the Basalt and Alluvial land. Additional water of dams was injected into 59 dry dug wells having the depth of 50 metres, directly with proper filtration.

This transformation increased the water levels of both Alluvium and Basalt area to a great extent. In basalt area even dry bore-wells of 150 metres in depth attained water level at a depth of 6 metres below ground level, and in Alluvial area at a depth of 20 metres below the ground level.

Figures 2 and 3 depict the scenario in the study area after completion of the project of angioplasty of water in the year 2018 at Shirpur. The photos show the easy availability of water in this area as a result of successful implementation of this project.

Fig. 2. After Angioplasty in Water Conservation at Shirpur

Analysis and Conclusion

Groundwater is an important renewable resource. This resource is refueled every year through rainfall

Fig. 3. After Angioplasty in Water Conservation at Shirpur

and also through dripping down of water used during watering the farms. Typical geo-morphological structures of rocks posed challenges for the farmers. Therefore, there was an urgent need to check this trend and to take suitable measures to augment groundwater resources to make the existing groundwater structures sustainable.

Presently, the Composite Index of Development (CID) as also the levels of development in Shirpur are good as compared to other less developed areas in Dhule district. Before the irrigation projects the tehsils in this area were less developed as they had poor irrigation facilities as well as less accessibility to technology. Hence in order to develop draught prone areas irrigation projects that give easy access to water were imperative.

Before the completion of this project, this area experienced a severe scarcity of drinking water as well as water for irrigation. The area also witnessed a decrease in water level. Due to this phenomenon, the farmers had to lower the pipes in the borewells as also in the tubewells to draw water from the deeper aquifer.

After completion of this project enough water was available for drinking as also for agriculture and industrial development. The consumption of energy required for suction of water reduced as the low HP pumps could draw water efficiently. Many farmers from this area diversified into fisheries and received financial gains. By using this method in Shirpur, the farmers could also take the second crop.

Considering the benefits of this model it can be said that it was successful. It also developed the area sustainably. The need of the day is to develop cities in a sustainable manner. The Shirpur model of development can be replicated in villages as well as cities located in draught prone areas.

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