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Shirpur pattern as effective techniques of groundwater recharge to conserve and sustainability of water resources: A case study of some technique adopted villages in Maharashtra state

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Abstract
According to many, the availability of water resources is the most serious problem at a global level. Water is a physical substance with which all persons are familiar. In a water poor area, water represents day-to-day survival and all activities revolve around water supply and usage. Given such drastic differences in the importance and role of water in society from one location to the next, an understanding of the contribution of geography to sustainable water resource management is imperative. In India around 83% of available fresh water is used for agriculture. Rainfall being the primary source of fresh water, the concept behind conserving water is to harvest it when it falls and wherever it falls. The importance of storing rainwater through different techniques can be understood by an example of the Drought prone area in Maharashtra State. "Shirpur model", is being projected as a "miracle cure" for drought. "Shirpur model", angioplasty in water conservation for its proponent Suresh Khanapurkar. The present paper is based on the basic research for water conservation at some techniques adopted villages in Maharashtra state. The basic concept of Shirpur Pattern is divided into two section. 1) Shirpur Pattern is the construction of check dams on every streams whether it may be small or big and should be with gate and west weir to augment huge storage. We have to follow the water following principal of Ridge to Valley. It also focused on deepening the stream up to 15 to 20 mt. and widening up to 30 mt. 2) The project stresses on artificial recharge of water through the dry dug wells around the Surface water Steams and cascade type of cement bunds.

Keywords: water resources, drought prone area, water conservation, shirpur pattern

Introduction

Maharashtra has already witnessed massive impacts of uncontrolled groundwater abstraction, plummeting groundwater levels across the state, especially Marathwada have been one of the main reasons behind drinking water crisis.

Watershed development encompasses an elegant set of ideas: village residents actively manage soil, water and vegetation. Simple structures and techniques are built, which allow rainwater to seep into the earth rather than flowing away, taking topsoil with it. Vegetation is allowed to regenerate; soil moisture and groundwater are recharged. In this way, villages without access to irrigation from dams and canals can, in theory, ride out the natural ebbs and flows of the rain. Vibrant agricultural landscapes can emerge.

This is the basic insight of rainwater harvesting. You capture enough water to last for the next twelve months. Unfortunately due to climate change, we have cycles of two years of droughts followed by mega floods. So our rainwater storage has to last for 2 or 3 years. Such a miracle is possible and has been demonstrated in Shirpur taluka of Dhule district. Under the joint initiative and leadership of geologist Suresh Khanapurkar and former MLA Amrish Patel, people have created the Shirpur pattern. A former drought-affected region has now been transformed so much, that farmers can reap three crops per year. The water table which had sunk to 800 feet deep, is now barely 80 feet. Last year most bore wells could supply water without a pump, even during summer months. This success story has now been formalized into a Government Resolution as the Shirpur Pattern, and all districts are urged to adopt it. Jalna has already adopted and succeeded. Success needs at least five years. But this dream can be realised.

Aims and Objectives

The present research work deals with the study of effective techniques of water resource conservation. There is a rapid decrease in the water resources so the future problems of groundwater are analyzed and planning of water resource is considered.

Hypothesis

Shirpur pattern is a one of the effective remedy to conservation of water for sustainable development of drought prone area in Maharashtra state.

Scope of The Study

Groundwater is a dynamic renewable resource. This resource is replenished annually through precipitation and also through seepage of water applied for irrigation. Its occurrence and availability are controlled by structure of the rock formation.

Geomorphological and hydrological set up and hydrometerological conditions. Due to increased demand for domestic, industrial and agricultural needs and limited surface water resources, there was rapid exploitation of groundwater resources.

This intensive development had led to critical situation result in manifestation of problems like decline groundwater levels shortage of water supply etc. therefore, there was an urgent needs to check this trend and to take suitable measures to augment groundwater resources to make the existing groundwater structures sustainable.

Impact of Widening Deepening of Riverbed on Groundwater

According to Senior Hydrogeologist Himanshu Kulkarni, also a signatory of the Dec 2014 submission, a stream channel in basalt strata represents a groundwater discharge zone. This is the lowest hydraulic head for the aquifer and "locus of various lowest points of the cross section of the watershed". This is not a natural groundwater recharge zone. Some recharge into aquifers can happen from here only seasonally. Moreover, aquifers are "The last remaining vestige of the 'natural state' of many aquifers, clearly indicating that the limits of exploitation will clearly be breached in the absence of any forward linkage to a demand management component of groundwater from these huge 'wells' excavated under this much touted model."

Basic theme of Shirpur Pattern

Deccan basalt rock lies below the top soil. This rocky layer is impermeable and not much water percolates down. Below this layer lies Murrum (red gravel), which holds water and this can be drawn from wells and borewells. Basic theme of pattern is to remove the rocky layer, so that water percolates into murrum. "The nullahs were also widened as more the volume of water, more is the pressure it exerts on soil. After the rocky layer was removed, the streams were deepened by at least 20 feet. Small 'door-less' concrete dams were constructed. The weirs (water blocking walls on streams) do not have gates, so the water flows downstream only after the dam is full. "The volume of water that percolates down in this method is eight times the storage capacity of a check dam. This is like angioplasty of streams, as it recharges the groundwater by removing obstructions through pressure. The geologist stressed that the old methods of water conservation won't work because of the change in rainfall pattern.

Fig 1: A water conservation system in Shirpur

Fig 2: Geologist Suresh Khanapurkar

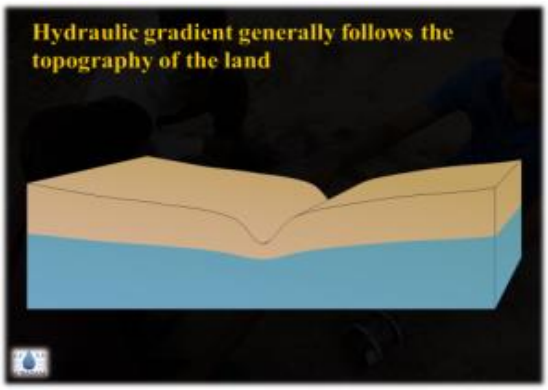

Fig 3

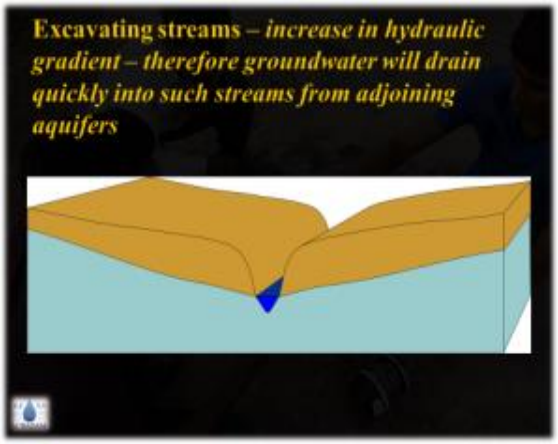

Fig 4

Study Area

A. Case Study of Two Villages who adopt the shirpur pattern

The Shirpur pattern propogated by Suresh Khanapurkar has been widely criticised but also accepted by many villages in Maharashtra. A local organisation called Jan Kalyan Samiti operates in the area of Latur-Beed and has implemented Shirpur pattern structures through Gram Panchayats of several villages in the area. Daityanandur, Eknath Wadi are such villages.

Village 1-Daityanandur

Daityanandur has more than 400 wells across 840 hectares of land. Water scarcity was prevalent at the onset of summer forcing

the villagers to migrate to cities for better jobs since the crop productivity was restricted to one crop a year. But after building a Shirpur structure in 2012-13, they now grow two crops a year and people prefer staying in the village than going to nearby towns and cities for work.

Village 2-Eknath Wadi

Eknath Wadi's story is similar. It faced severe water problems and was spending a whopping Rs. 20,000 per day at the onset of summer for 4 tankers which would supply just drinking water. To do away with this financial burden, the villagers decided to create a common fund and make their own water structure. The estimated cost of constructing the Shirpur structure through government channels was about Rs. 18 lakhs while building it on their own would cost around a half of that. They didn't need any more convincing on the direction they should take.

Today, the oldest well in the village which used to be dry until 2013, is still filled with water. With the investment coming in directly from farmers, the Gram Panchayat became a nodal agency to monitor the work that was being carried out. In less than a month, the task at hand was completed. While several farmers did not agree to give land for the Shirpur structure, they gave in once they were convinced that it would work.

Both the villages of Daityanandur and Eknath Wadi have recharged their wells and are self-dependent for drinking water and irrigation needs. Villagers say that they get 10 times more water than they used to get all thanks to the Shirpur structure but it's more likely that all this happened because of abundant rainfall recieved in 2013. In addition to the improvement in their water situation, the silt that is being excavated during the construction of the Shirpur structure is also being used to make *kachcha* (temporary) roads for farmers to be able to transport their goods to the nearby towns.

Fig 5: The Shirpur structure in Daitynandur

Fig 6: Drinking water well at Daityanandur

B. Case study of villegers from shirpur Tshshil of Dhule District

Shirpur which was otherwise an obscure town has become a case study now. While most places in Marathwada have parched lands and dry water taps, farmers in Shirpur boast of cultivating not one, but three to four crops in a year. During April-May, cultivating cotton is considered to be a risk as it requires a lot of water, but in Shirpur, the story is different. The farmers start sowing cotton seeds towards end of April, even before the arrival of monsoon. Like most places in Marathwada, Shirpur too is not unfamiliar with water shortage. The area receives an average rainfall of around 650mm with most of the rainwater draining into Tapi River. Groundwater which was found 500 to 700 feet deep is now just 100 feet away. Most farmers in Shirpur testified to the fact that their income has increased significantly because of this model.

1. Suman Dhonde, a farmer from Godi village near Shirpur, told after a check dam was built, there has been a two-fold increase in his income. The groundwater level in borewell increased. I can plant the second crop even when rainfall was not adequate.
2. Another farmer from Shirpur, Vijay Patil considers himself lucky. "Four months after he purchased the farm, they dug up the nearby nullah and water level in the borewell went up. Unfortunately, two years of below average rainfall has dried up the nullah or could have gone for the third crop," he said.
3. Shantisagar Jadhav, a farmer from Bhatpura village and his joint family has a 15-acre land. His share is six acres. “Thanks to the Shirpur Pattern, I have cultivated three crops – cotton, wheat and lady finger. Now, himself-employed and his annual income is around Rs 5 lakh.

Conclusion

Prior to the project there was sever scarcity of drinking water and water for irrigation. Day by day the water level was depleting and the farmers used to lower the pipes in the bore well and tube wells to draw water from the deeper aquifer. Near about 85% of the study area was non is rainfed and non-commanded. After the implementation of shirpur pattern sufficient water for irrigation, drinking and domestic use is available in summer (Dry) season also.

The project implemented was proved to be successful. Such type of project with the Angioplasty in Water conservation if taken on small streams in all the mini and micro watershed of the entire Maharashtra there will be not be tanker fed village and for all villages in rainfed and non-command area water will be available for second crop. Total eradication of flood and scarcity is possible maximum within ten years.

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