"A GEOGRAPHICAL ANALYSIS OF JALYUKTA SHIVAR ABHIYAN WATER CONSERVATION SCHEME IN PARNER TAHSIL OF AHMEDNAGAR DISTRICT (MS)."

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Abstract:

The state government had decided in 2014 to implement a new scheme called 'Jalyukta Shivar Abhiyan' in drought-prone areas of Maharashtra to overcome the water scarcity that occurs every two years due to various reasons. Under this innovative scheme, priority has been given to providing drinking water and water for sustainable agriculture in an integrated manner through comprehensive measures of underwater conservation. It was decided to make the whole of Maharashtra state scarcity-free by 2019 through this scheme. The program aims to alleviate water scarcity in at least 5000 villages in the state every year. The main objective of the present research is to evaluate the village-wise water conservation practices in the 'Jalayukta Shivar' scheme in Parner tahsil. These include Compartment Bunding, Cement Nala Bund (CNB), Percolation Tank, Well Recharge, Farm Pond, Loose Boulder Structure, Continuous Contour Trenches (CCT), Sediment Extraction, Nala Extension, and Deepening Work, Recharge Shaft cum Recharge Trench, K. T. Weirs, Hydro-Fracturing, Earthen Drain Dam, Gabion Structure, Drip Irrigation, and Sprinkler Irrigation. The Geographic Information System platform is used to create a village-level water conservation practices map. This work is represented by Choropleth maps using ArcMap-10.8 software. Many water conservation schemes have been implemented in Parner tahsil under 'Jalyukta Shivar Abhiyan' and they are very useful for local farmers and community. Due to the increase in water storage and infiltration capacity through nallas, storage dams, K. T. weirs, the groundwater level in the area has also increased.

Keywords: Water scarcity, Water conservation, Jalayukta Shivar Abhiyan, Recharge Shaft, Drought

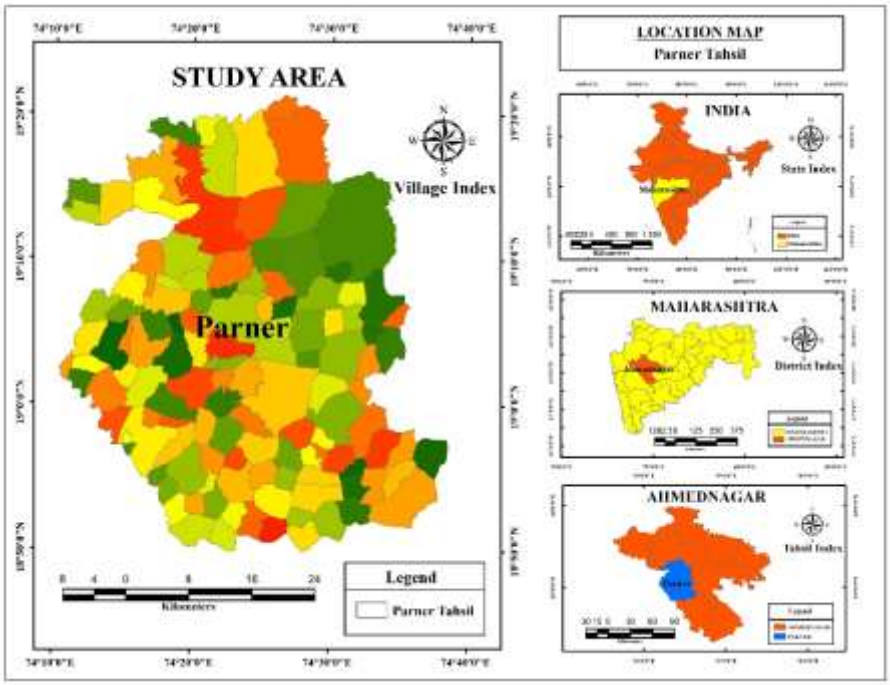
1. Introduction:

Water is called life because scientific research has shown that the formation, development, and survival of living things depend on water. The distribution of water on the surface of the earth is extremely uneven. About 97% of the world's water is saline in the oceans and only 3% is freshwater. Out of 3% freshwater, 69% is in glaciers, 30% is underground and only 1% is surface water i.e., rivers, streams, lakes, reservoirs, etc. Near about 50% area of Maharashtra is under drought-prone conditions. More than 80% of the population in these drought-prone districts, tahsils, and villages is directly dependent on groundwater for agriculture and drinking water. Considering the physical structure of the region and the amount of rainfall, the 'Jalyukta Shivar Abhiyan' is the most important step taken by the Government of Maharashtra to alleviate the drought in Maharashtra by 2019. It aims to enrich farmers and their land locally in terms of water resources through water conservation methods. The 'Jalyukta Shivar Abhiyan' and the water conservation scheme have become a major movement in the whole of Maharashtra. The 'Integrated Watershed Management Program' is the core and backbone of the 'Jalyukta Shivar Abhiyan'. The 'Jalyukta Shivar Abhiyan' is a unification of various schemes implemented by various departments of the State and Central Government and funds are diverted from all sources like District Planning Committee, Agriculture Department, Accelerated Watershed Development Program, Mahatma Gandhi Jalbhumi Abhiyan, Water Conservation Department, National Micro Irrigation Program Department, Scarcity fund participation, etc. [1].

2. Location of the Study Area:

Parner tehsil is located partly in the upper Godavari valley and partly in the Bhima valley and occupies some central position in the state of Maharashtra. It is extending between 18°49'and 19°21' North latitudes and 74°10' and 74°38' East longitudes. The tahsil is irregular in size, 58 km long and 45 km wide. The adjoining tahsils are Sangamner in the north, Rahuri tahsil in the northeast, East Nagar tahsil, and Shrigonda tahsil in the southeast in Ahmednagar district. Pune district also has two tahsils; Shirur to the south and Junnar to the northwest. The tahsil consists of 131 villages spread over an area of 1933 sq. km. Parner tahsil is one of the 14 tahsils in the Ahmednagar district and is the largest. The area of the tahsil is 11.34 percent of the total area of the district. Ahmednagar city is 41 km east of Parner and Pune city is 95 km southwest. The average annual rainfall in Parner tahsil is 486.9 mm. The southwest monsoon receives about 90 percent rainfall from the second week of June to September and the remaining 10 percent in the non-

monsoon months (retreat monsoon). Except for 27 villages under canal irrigation facility southwest and south of the tahsil, all other villages are dependent on rainfall. Considering the amount of rainfall, frequency of drought, and physical structure, the tahsil needs water conservation works.



3. Aim of the Study:

The main aim of the study is to evaluate and assess the water conservation work done by 'Jalyukta Shivar Abhiyan'.

4. Objective:

To assess village-wise water conservation policies under Jalyukta Shivar Abhiyan.

5. Database and Methodology:

In the present study, secondary information has been used for the analysis of water conservation policy in the study area. This information is gathered from various sources. Such as the Department of Agriculture, the Department of Water Conservation, etc. With the help of ArcGIS-10.8 software based on village-wise information of various water conservation methods, choropleth maps of various schemes of Jalayukta Shivar Abhiyan have been prepared.

6. Discussion and Results:

The present research shows the distribution of village-wise work of 'Jalyukta Shivar Abhiyan' in Parner tahsil of Ahmednagar district. The all-choropleth map represents the village-wise distribution and implementation of all the schemes in Parner tahsil. About sixteen water conservation strategies are used in the study region under 'Jalyukta Shivar Abhiyan'.

6.1. Continuous Contour Trenches (CCT):

Continuous Contour Trenches (CCT) are implemented on wasteland, forest, and hilly lands which are unsuitable for agriculture in the study area. This includes digging 60 cm wide 30 cm deep 60 cm wide and 45 cm deep at 0 to 33% slope level. Such continuous contour trenches, due to lack of depth, sludge is easily absorbed and alternatively does not hold the required water. Therefore, by digging a continuous contour trench 1 m wide and 1 m deep on the fallow land with a slope of 0 to 8%, the water flowing down the hill slope is stored in the pasture and the soil and water are well protected.

In the study area, a continuous contour trench scheme has been implemented in 16 villages in 84 places on an area of 1018 hectares. Astagaon, Daithane Gunjal, Hivare Korda, Gatewadi, Akkalwadi, Babhulwade villages have high forests, fallow and barren land. A large number of continuous contour trenches have been constructed in these villages. Due to the flat terrain, CCT works in the southwest, south, and east are extremely low.

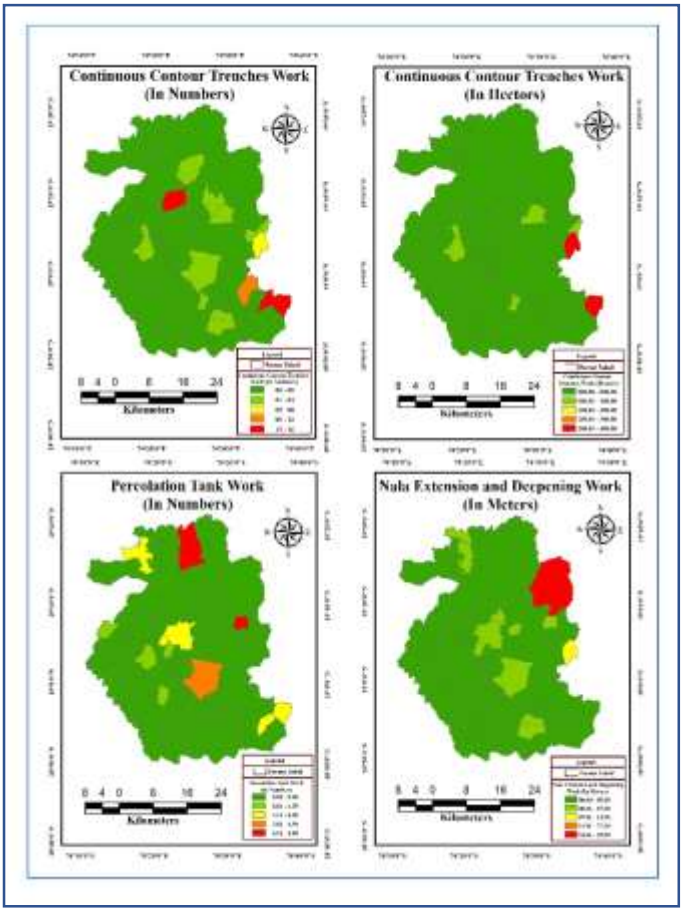
6.2. Percolation Tank:

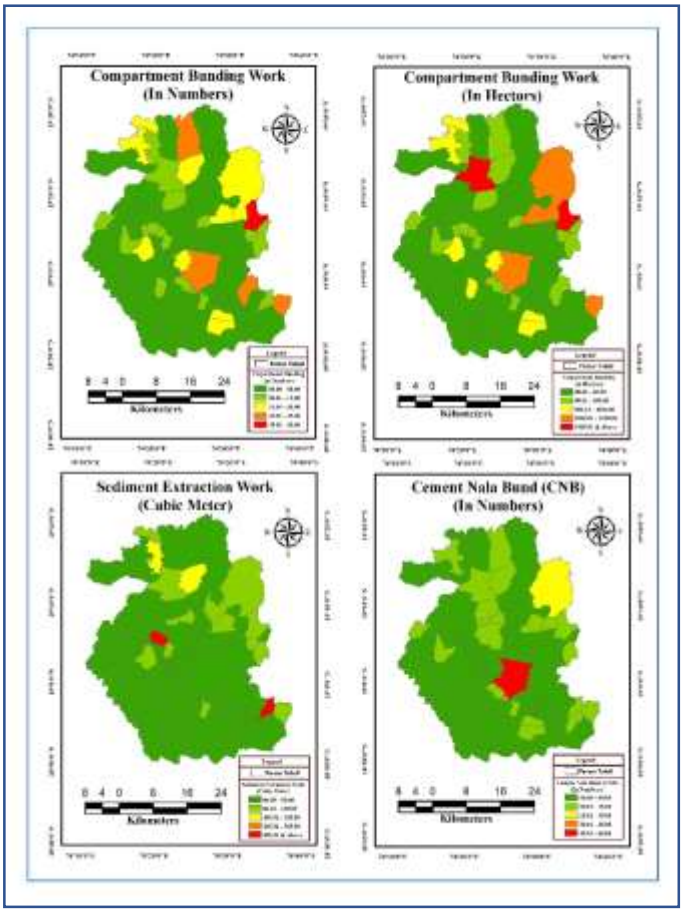
Percolation tanks are an important method of water conservation in low rainfall areas which promotes an increase in groundwater level. A Percolation tank is an artificially created surface reservoir, which submerges highly permeable land in its reservoir, creating a surface flow for infiltration and recharge of groundwater reserves. It is similar to Cement Nala Bund and Cement Dam but has a higher storage capacity. In the study region, 32 percolation tanks have been renovated and constructed under 'Jalayukta Shivar Abhiyan'. The northern, central, and southeastern areas are dominated by percolation tanks. There are low percolation tanks in some parts of the south, northeast, and east.

6.3. Nala Extension and Deepening:

Nala Extension and Deepening in the study area is an Eco-friendly water conservation structure designed to store rainwater below ground level in local streams and nalas. Nala deepening and widening means removing silt from the base of the Nala and streams to flood level and creating space for water storage. The Nala is getting 1 to 3 meters deep but it depends on the size and shape of the Nala, physical climate, and local hydrogeological conditions. Every village in the study area has nallas, which need to be widened and deepened. After the completion of this work, the farmers are benefiting from the rising water level of the wells. This policy effectively solved the problem of drinking water in the study region.

Nallas have been widened and deepened in Parner tahsil, but it is varying from village to village. In only 13 villages in the study area, a total area of 67 cubic meters of nallas has been widened and deepened in the study area. The red color on the northeast side indicates high Nala widening and deepening up to 28 cubic meters. Yellow color predominates in the east direction: shows 14 to 21 cubic meters (medium) Nala deepening and widening. In some parts of the north, west, and south, the work of Nala expansion and deepening is less visible. It all depends on the existence of local level nallas, dams, lakes.





6.4. Compartment Bunding:

The land on which crops are grown has compartments built on all sides. This is called compartment bunding. Compartment bunding is made using the previous bund on the field. The compartment bunding water conservation policy is used everywhere in the agricultural sector under the state's 'Jalyukta Shivar Abhiyan. Compartment bunding promotes water infiltration into the soil and helps retain soil moisture. This is very beneficial for soils with a low penetration rate and medium to high clay in the study area. Some compartment bunding causes rainwater to be carried away and depleted, destroying soil and soil nutrients. The compartment bunding method is very simple and has been adopted by farmers in different parts of the tahsil.

Compartment bunding scheme was implemented in the tahsil under 'Jalayukta Shivar Abhiyan'. In 32 villages of Parner tahsil, the Government of Maharashtra has carried out compartment bunding in 561 places covering an area of 24705 hectares. The yellow color is light, the orange color is medium and the red color indicates high performance of compartment bunding in the villages. The scheme was started in Bhalawani, Astagaon, Palashi, Supa, Parner, Palwe Kh., Palwe Bk., Dhavalpuri, Wadgaon Sawtal, Deswade, Hivare Korda, Malkup, Babhulwade, Pokhari, Punewadi, etc. villages of Parner tahsil. The western, southwestern, southern and somewhat northern parts of the study area express less work of compartment bunding.

6.5. Sediment Extraction:

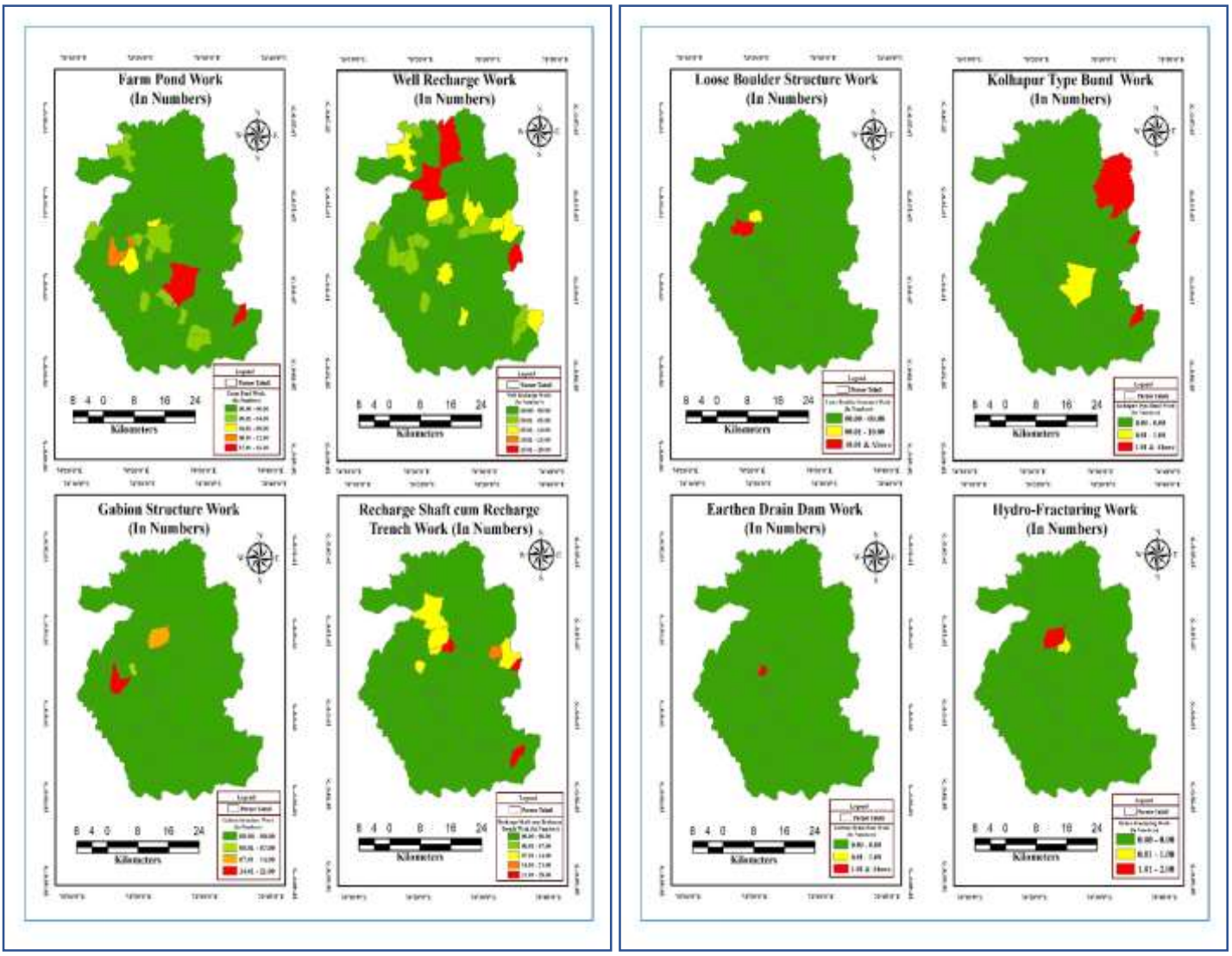
The silt that accumulates in rainwater runoff in lakes, ponds, dams, and rivers is used in agriculture where soil quality is low. The storage capacity of dams, rivers, and lakes is increased due to water conservation policy after removal of silt under 'Jalayukta Shivar Abhiyan'.

Sludge removal from water sources is an important method of water conservation that promotes the reduction of artificial recharge by increasing water storage capacity. Rayatale, Pimpri Pathar, Wadgaon Darya lakes, dams, and rivers or small streams extracted sediment up to 300 cubic meters of the total watershed, and Wadgaon Sawtal, Waranwadi extracted sediment up to 200 cubic meters on average. Also, at Astagaon, Daithane Gunjal, Dhavalpuri, Wasunde, Babhulwade, Hivare Korda, Kaknewadi, Deswade an average of 100 cubic meters of sludge is extracted. Tanks and lakes are found in large numbers in the catchment area. A total of 10037 cubic meters of sludge was removed from 183 lakes, dams, and rivers or small streams in 32 villages in the study area, which is the future storage capacity of water tanks in Parner tahsil.

6.6. Cement Nala Bund (CNB):

The minimum catchment area for construction of Cement Nala Bund is 40 ha to 1000 ha. The height of the bottom of the nallah should not be less than 5 m and not more than 50 m and the slope of the bottom should not be more than 3%. The Nala should have clear depth and clear edges on both sides and the minimum depth from the edge to the bottom of the Nala should be 2 meters. It mainly depends on the width of the river or Nala flow and the excess water.

Under the scheme of Jalayukta Shivar Abhiyan, a large number of cement Nala bunds have been constructed on the nallas and small streams in the central, northern, northeastern, eastern, and southeastern regions of the study area. Most of the CNBs are built in the Manakarnika River and its tributaries around Parner town. Cement Nala Bund structures have also been built in large numbers in Dhavalpuri, Pokhari, Kalas, Siddeshwarwadi, Bhalawani, Astagaon villages. A total of 175 cement Nala bunds have been constructed in 23 villages in the study region under ‘Jalayukta Shivar Abhiyan’.



6.7. Loose Boulder Structure:

In the hilly areas of the tahsil, loose boulders are used for water conservation. There are small nallas and streams. Loose Boulder Structure reduced the bank's incense by which they controlled the flow rate. LBS is mainly formed in forests as well as in hilly areas, it is a small obstruction in the flow of ducts that are constructed using rocks, boulders, discs, and rectangular-shaped stones. Parner tehsil has a loose bold structure in the mid-west.

In the area from Korthan Khandoba Akkalwadi to Wadgaon Darya, due to the hills, 87% of the mounds have been formed in this area. The Mandohal River originates in this area, most of the tributaries and streams of the Mandohal River originate in this area and join the main river. The Mandohal river basin area is covered with loose rock formations. LBS was not found on the other side of the study region. A total of 46 loose boulder structures have been constructed under 'Jalayukta Shivar Abhiyan'.

6.8. Hydro-Fracturing:

Hydro-fracturing plays an important role in the development of groundwater levels of borewells in the hard rock terrain of the study area. The hydro-fracturing technique is used to widen and clean the cracks and fissures in the rock using high-pressure injected water under the borewell. This technique is first used to increase gas and oil [2]. A practical based hydrofracturing method is used in only 3 villages to recharge borewells. The villages of Takali Dhokeshwar and Kaknewadi in the central part of Parner tahsil have used this structure to improve the groundwater level of the borewell. However, awareness about this technique is very low in society, so this technique is used very little in the villages of the tahsil.

6.9. Kolhapur Type Bund (K. T. Weirs):

K. T. (Kolhapur-type) weirs, also known as bridge-cum-dam, derive their name from the district of Kolhapur. It serves the dual purpose of storing or trapping rainwater as well as bridge water. This helps in smoothing the flow of traffic and meeting the demand for water in the vicinity.

In the study area, this structure creates a reservoir in the upstream area. Under the ‘Jalyukta Shivar Abhiyan’, only 3 Kolhapur Type Weir structures have been constructed on the river, nallas in the eastern, central, and southeastern parts of Parner tahsil. The villages of Dhavalpuri, Rayatale, Wadgaon Amli, and Parner have 1 to 3 Kolhapur type wear structures. Other villages in the study area did not have Kolhapur type weir structures under 'Jalyukta Shivar Abhiyan'.

6.10. Earthen Drain Dam:

An earthen embankment in the upper basin of a river or tributaries is a raised closed structure made of compacted soil. The purpose of earthen embankments is to limit and divert the flow of stormwater. It can also be used to increase infiltration, detention, and holding facilities. Earthen dams are generally trapezoidal and are the simplest and most economical. They are mainly composed of clay, sand, and rock; hence they are also called earth filling dams or earthen dams.

Under the ‘Jalyukta Shivar Abhiyan’, only 2 Earthen Drain Dams have been constructed in Pimpri Pathar village in the central part of the study area. Earthen Drain Dam has not yet been constructed in the rest of the tahsil under this campaign.

6.11. Farm Pond:

A farm pond is an excavated structure that has a definite shape and size with suitable inlet and outlet structures for collecting surface flows flowing through the field area. This is one of the most important rainwaters harvesting structures built in the lowest part of the farm area. Then the stored water is used for long-term farming in the study area. In the tahsil this method is used to collect excess flow in monsoon or rainy season and also the stored water can be used for the crop in case of drought or water shortage.

Under the JYA scheme, 76 farm ponds have been constructed in 17 villages in the study region. These include Rayatale, Parner, Akkalwadi, Randhe, Bhondre, Babhulwade, Pokhari, Wadgaon Amli, Wesdare villages. No farm ponds have been created in the northeastern, eastern, western, southwestern, and southern border areas of the tahsil under the 'Jalyukta Shivar Abhiyan'.

6.12. Well Recharge:

A total of 161 wells have been rejuvenated in 25 villages in the study area under ‘Jalayukta Shivar Abhiyan’ yojana. Open wells were rejuvenated in Palashi, Daithane Gunjal, Wasunde, Astagaon, Pokhari, Dhotre Bk., Takali Dhokeshwar, Punewadi, Gatewadi, Malkup, Bhalawani, Kaknewadi, Bhondre, Akkalwadi, Randhe, Rayatale. Under this scheme, about 20% of the study area rejuvenated open wells in villages.

6.13. Gabion Structure:

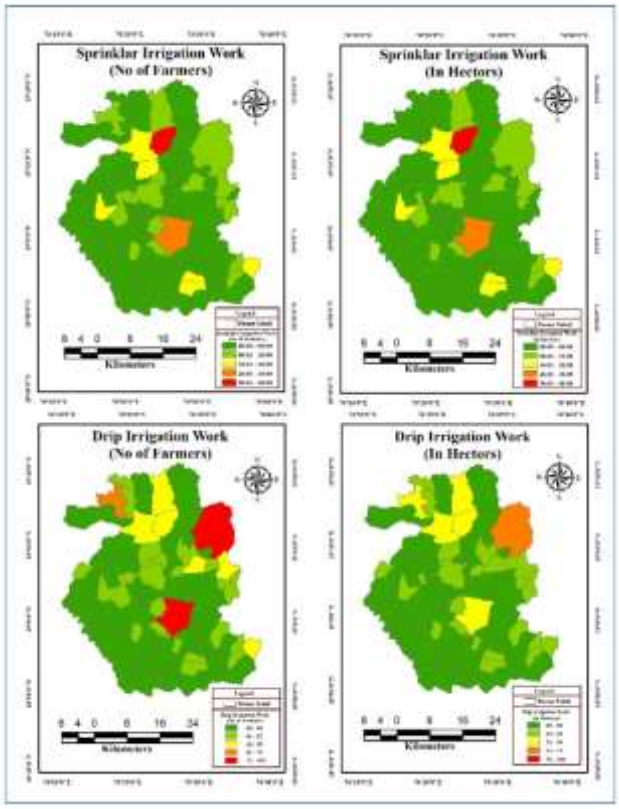
The gabion structure is commonly used in states like Maharashtra, Andhra Pradesh, and Madhya Pradesh. It is made using locally available boulders, the stones are stored in a steel wire mesh and they are thrown in the form of rectangular blocks beyond the natural flow [2]. As a small dam in the channel, this structure is used in the channel which is 10 to 15 meters wide and 0.5 meters high.

The gabion structure is found on the west side of Parner tahsil. There are 2 to 17 gabion structures at Randhe, Takali Dhokeshwar, Akkalwadi. The rest of Parner tahsil has no gabion structure under the 'Jalayukta Shivar Abhiyan'. A total of 29 gabion structures have been constructed in the study area under this scheme.

6.14. Drip Irrigation:

Groundwater level decreases due to traditional irrigation methods and over-exploitation in the study region. Groundwater levels can be increased in drought-prone tahsils through various artificial recharge methods. In such regions, open wells play an important role in the artificial recharge of groundwater. If the Well recharge method is used, the water will be returned when the well dries up. Drip irrigation is the most powerful water supplying and saving mechanism for crop growth.

Drip irrigation system saves 80% of water compared to other irrigation systems. In a drip irrigation system, each plant is given a small amount of water continuously by the dripper separately. In the field of study, implementation of drip irrigation schemes at the village level is very low, 35 villages benefit from this technique under 'Jalyukta Shivar Abhiyan'. A total area of 739 ha is covered by a drip irrigation system that is used for pomiculture farming. The drip irrigation system is most used in Dhavalpuri, Parner, Pokhari, Wadgaon Sawtal, Wasunde, Palashi, Bhalwani, Astagaon, Hivare Korda, Waranwadi, Malkup, and Randhe.



6.15. Sprinkler Irrigation:

In drought-prone and water shortage regions, ‘Jalyukta Shivar Abhiyan’ includes a sprinkler micro-irrigation system. The method of sprinkling water is similar to that of natural rain. Awareness about sprinkler micro-irrigation systems is very low. This method is not suitable for all crops and is the only beneficial tree crop. The sprinkler irrigation system is used in only 32 villages in the study area. Sprinkler irrigation system covers an area of only 195 hectares. Its quantity is less than the drip irrigation system in the tahsil. Its quantity is less than the drip irrigation system in the tahsil. Sprinkler technique is widely used in Wadgaon Sawtal, Parner, Wasunde, Randhe, Astagaon, Takli Dhokeshwar, Palwe Kh., and Palwe Bk.

6.16. Recharge Shaft cum Recharge Trench:

The technology of recharge shafts cum recharge trench used in drought-prone areas is a new and simple design and can be applied even when support flow is available for a limited period. Recharge with this method is fast and gives immediate benefits. In highly permeable formations, recharge shafts can be compared to percolation tanks. Recharge shaft technology has been used in 136 locations in 9 villages in the north, east, and southeast of the study area. These include Pimpri Gawali, Wadgaon Amli, Kaknewadi, Malkup, Wasunde, Takali Dhokeshwar, Bhondre, Wadgaon Darya, and Bhalawani. This technology is not developed in other parts of the tahsil as it is new.

6.17. Conclusion

Many water conservation schemes have been adopted for the last decade mainly through Jalayukta Shivar Abhiyan. This helps in the restoration of rainwater and decentralization of water storage sections in the drought-prone Parner tahsil and increases the groundwater level for use in agriculture for irrigation. This helps in the restoration of rainwater in drought-prone Parner tahsil decentralization of water storage compartments and increases groundwater level for use in agriculture for irrigation. For the implementation of Jalayukta Shivar Abhiyan, there is a great deal of support from various organizations and individuals who are contributing labor. Sixteen methods have been introduced in the field of study under JSA. Under the 'Jalayukta Shivar Abhiyan', 37 villages in the study area have created their water capacity, which is very beneficial for local farmers for drinking and irrigation.

The study area is located in drought-prone areas as per Fact-Finding Committee 1972 and Irrigation Commission Report 1972. The groundwater level has increased after the work under JSA and about 90% of the area has come under cultivation in the villages under the scheme. The groundwater level has increased after the work under 'Jalayukta Shivar Abhiyan' and about 80% of the area has come under cultivation in the villages under the scheme. Due to the geographical structure and climate of Parner tahsil, there is a lot of scope for crop diversity. After the 'Jalyukta Shivar Abhiyan' campaign, farmers will turn to dynamic agriculture like Pomiculture. Such relative schemes are useful for overcoming permanent water scarcity and drought conditions.

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