

# Identification of Strengths and Weaknesses of Jalyukt Shivar Abhiyan by Assessment of Works in Tal-Purandar, Dist-Pune



Shivaji G. Patil, Ravindra K. Lad

**Abstract:** Maharashtra is the third largest state in India and nearly 58 % of population lives in the rural area which depends largely on agriculture for their livelihood. Due to various negative externalities of lack of water availability Government of Maharashtra declared a comprehensive water conservation programme named as Jalyukta Shivar Abhiyan (JSA). In this study, the methodology adopted to identify the strengths and weaknesses of JSA by conducting theoretical assessment of various water conservation activities carried out under JSA in three villages in Purandar taluka in Pune district and also few works as per Shirpur pattern in Dhule district, Maharashtra, India. Firstly, it was studied to know whether various activities conducted were based on scientific and engineering principles and the effectiveness of water conservation activities carried out on the village. Secondly, the effect of local community participation in these activities was studied to suggest ways for increase in participation for enhancement in groundwater recharge in the study area. The strengths and weaknesses were identified from assessment of JSA, which include technical gaps observed in planning and actual implementation of these works. It was also seen that public awareness regarding JSA in drought affected villages was poor due to which community participation was also poor. It is concluded that these strengths and weaknesses could be used to make some changes in policy and structure of JSA to improve effectiveness of scheme and also increase local community participation for enhancement groundwater recharge and also to increase effectiveness of water conservation activities under JSA.

**Keywords:** assessment, community participation, groundwater recharge, water conservation

## I. INTRODUCTION

Maharashtra state have 82 % of total area falling under rainfed zone and 52 % area falling under drought prone zone, due to uncertain, insufficient and irregular rainfall pattern, which adversely affects agriculture sector alongwith creates water stress on drinking water supply and other water usages too. Therefore, availability of water became a major challenge for Maharashtra. To overcome this challenge Government of Maharashtra decided to implement Jalyukta Shivar Abhiyan (JSA) to make “Maharashtra Drought Free

by 2019”, in order to permanently overcome drought situation by integration and convergence of the various schemes implemented by various departments using the funds from all resources like Central Government, State Government, NGOs, CSR donations, peoples contribution, etc.. Inconsistency of the rains during the period of crop growth and discontinuity of rains create drought-like situation and agricultural field is heavily impacted. JSA was mainly a programme of watershed development and enhancement in groundwater recharge by implementing various water conservation activities.

The GIS layers, in which various data like soil, geology, geomorphology, land use etc. were available, could be very useful in understanding the nature and causes of water scarcity, water quality problems, impact of water conservation structures etc. Village plans talk about financial convergence between various departments, but this need to be extended to convergence of data, capacities and so on [16]. Theoretical training about the watershed concept was imparted to the local community; which gave them insight to how to plan and implement different collective action and strategies for maintenance and conservation of natural resources like water [4]. Replenishment of groundwater by artificial recharge in the arid and semi-arid regions is essential, as the intensity of normal rainfall is grossly inadequate to produce any moisture surplus under normal infiltration conditions [1]. The global supply of available freshwater is more than adequate to meet all current and foreseeable water demands, its spatial and temporal distributions are not. It is going to require all as a society to identify, through research, develop, through engineering and science and implement, through governance, the technological, economical, political and social measures that will set a course toward the achievement of a desirable and more sustainable and secure future [15]. The successful implementation of potential treatment maps will lead to practicing transparency in scheme execution, generating awareness about water utilisation amongst farmers and absolute increase in groundwater levels that sustain for a long duration [3]. The fundamental point of the investigation is to compute complete water demand of the village, water balance sheet and remaining runoff calculation [6]. In order to create public awareness it is important that along with the JSA promotion-vehicle travelling to the villages, village maps showing all the proposed and existing interventions should be displayed in the village council office and village school [2].

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The most important step in the direction of finding solutions to issues of water and environmental conservation is to change peoples' attitude and habits. Water conservation basically aims at matching demand and supply of water [8]. There is a need for an accurate and reliable water use model that could help water planners in developing both responsive and strategic water conservation programmes to meet both short and long-term water security outcomes [9]. Implementing Jalyukta Shivar Campaign in other parts of country will be helpful to overcome permanently drought and water scarcity problems [12]. Due to Jalyukt Shivar Abhiyan runoff and soil erosion decreased and groundwater recharge is increased alongwith improving productivity and socio-economic condition of farmers [13]. The country still requires continued efforts of the government alongwith external aids especially in the issues of global climate change and consumer awareness on water conservation [5]. The location of cement nalla bund was not selected properly. The slope was not provided properly and some of the cement nalla bunds were located on curves [14]. Due to construction of farm pond, water is available for longer period and hence farmers can produce new crops other than traditional crops [7]. Success of any development programme depends on degree of involvement of the people and at what level of knowledge they have about it [11]. To make water available for assured farming and for drinking, solutions under water conservation if strategically designed and implemented in integrated manner with coordination of all departments, provision for drinking water and protected irrigation for crops can be definitely made [10].

## II. MATERIAL AND METHODOLOGY

### A. Material

Various details about Jalyukt Shivar Abhiyan used in this study were downloaded from the websites of respective Government departments engaged in planning and implementation of JSA, news published in local newspaper and information booklets, guidelines made available by the Government of Maharashtra and its' appointed other consulting agencies .

### B. Methodology

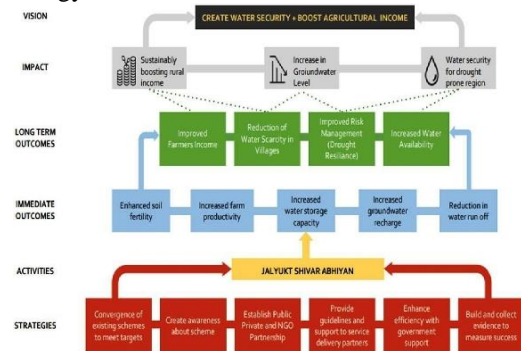
Numerous water conservation works were executed throughout the state of Maharashtra under the aegis of JSA. Main focus of these water conservation works to provide proper solution to the local problems of water scarcity for irrigation, drinking and other purposes. Action plan for water conservation works was prepared at village level for water harvesting and replenishment of groundwater by implementing these works comprehensively through coordination of all the concerned departments and other stakeholders. After completion of the works in the village, it has to undergo a third party assessment for the completed works as per the guidelines prepared by the Indian Institute of Technology (IIT), Mumbai and submit a water compliance report to the District Administration.

In present study, the water conservation works carried out under JSA in three villages in Purandar taluka in Pune district and few works carried on the basis of Shirpur Pattern in Dhule district were assessed for identifying the strengths and weaknesses of JSA and knowing the scale of community participation in these works and appropriate measures are suggested for the shortcomings observed in the planning and

implementation of these works. It was planned to undertake various water conservation woks under one umbrella of JSA with Water Conservation Department as a pilot and comprising of other Government Departments, Voluntary/Non-Govt. Organisations (NGOs) like Paani Foundation, Tata Trust, etc, donations under CSR fund by companies and most important is people's contribution through community participation.

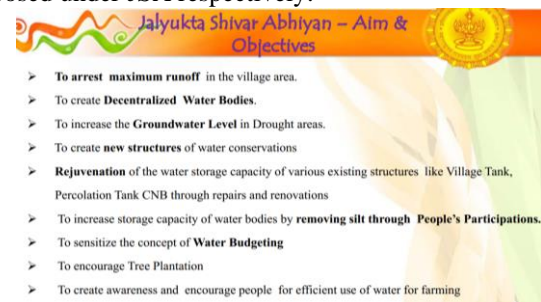
### Brief Details of Jalyukta Shiwar Abhiyan

A chart [Figure 1] is self-explanatory showing overall methodology.

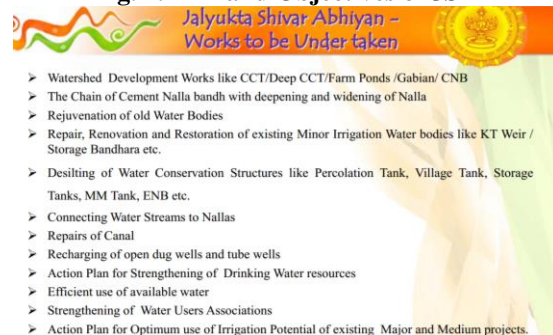


**Fig. 1. Overall methodology of JSA**

Figure [2] and [3] show aim and objectives of JSA and works proposed under JSA respectively.



**Fig. 2. Aim and Objectives of JSA**



**Fig. 3. Works to be undertaken in JSA**

In JSA all the villages has to undergo the assessment exercise after completion of the planned water conservation works. For this assessment Technology and Development Solutions Cell, Centre for Technology Alternatives for Rural Areas, IIT, Mumbai has drafted guidelines; which comprises of three components viz. (1) Rapid assessment of village plans, (2) Structure level assessment and (3) Village level assessment.



Steps of assessment were consisting of data procurement, desk assessment of JSA plan, preparation for assessment, field visit assessment, post-visit analysis and report writing. This assessment was to be done by third party and was supposed to be looked after by the District Collector. However, at different places different third party agencies has prepared reports after assessment, which are of varying content and quality. It is significant that village action plan requires approval of Gramsabha of respective village. Three cases for participation of the local community in the water conservation works was considered and the information of local community participation was studied for identifying the strength and weaknesses from this study so as to arrive at certain clues so as to decide the strategy for improvement in the implementation of JSA works. In the JSA, initially potential treatment plan was prepared after analysing various inputs from different resources and depending on this plan, an action plan was prepared, which ultimately includes the approval of the *Gramsabha (General Meeting of the Villagers)* for finalisation of the implementation of entire water conservation works under JSA.

Assessment of water conservation works executed in three villages in Purandar taluka in Pune district, Maharashtra, India was carried out as under.

### C. Case Studies from villages in Tal-Purandar and Dhule district

#### 1) Village Pingori, Tal-Purandar

Various water conservation works carried out in Pingori village during the implementation of JSA were mapped as shown in Figure [4] to [9], which show comprehensive efforts were put in by the Government Departments, NGOs, and local community for succeeding in this public interest campaign.



Fig. 4. Satellite Image of Pingori

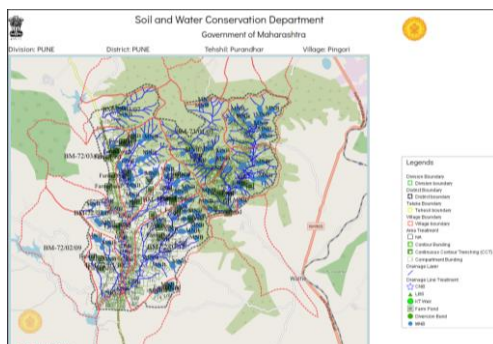


Fig. 5. Various features of water conservation in Pingori

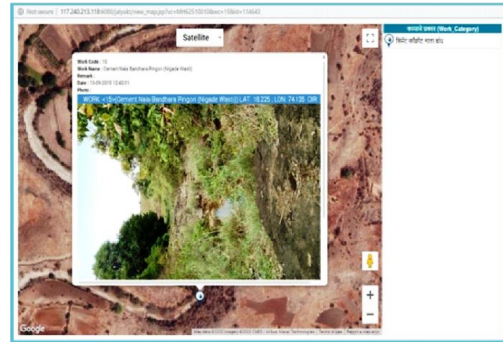


Fig. 6. Cement Concrete Nalla Bund in Pingori



Fig. 7. Continuous Contour Trench (CCT) work

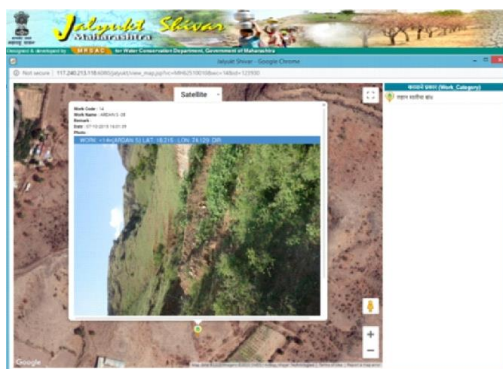


Fig. 8. Earthen Bund in Pingori

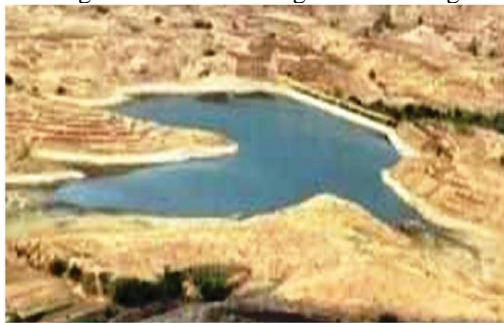


Fig. 9. Gabion Bund in Pingori

In addition to above cited mapped water conservation works, more unmapped works were also carried out in Pingori such as nalla deepening, silt removing from existing lakes, ponds, tanks, etc. In this village there was a mere one percolation tank in existence [Figure 10], which was constructed during the severe drought period in the year 1972, having spread over on nearly 16 hectares of land.



In Pingori, initially villagers tried to de-silt this percolation tank at their own, however unable to do it due to non-availability of funds and poor community participation. However, villagers got helping hand from one NGO by receiving financial aid of INR 40 Lakhs. This financial help boosted the enthusiasm of the villagers and they actively involved with bigger community participation and completed the work of silt removal from this percolation tank and during immediate monsoon percolation tank was filled with the water [Figure 11]. Then villagers also participated in the Jalyukta Shiwar Abhiyan and obtained second prize of INR 35 Lakhs by actively participating and implementing effectively water conservation works under JSA. Now this village is not required a single water tanker even during summer season and fulfils their water demand from the water resources developed by them. The villagers here have shown tremendous and spontaneous support to this movement and made it peoples' movement, which paid them a very good reward in the form of raised groundwater table alongwith big increase in vegetation cover throughout the village.



**Fig. 10. Percolation Tank prior to desiltation in Pingori**

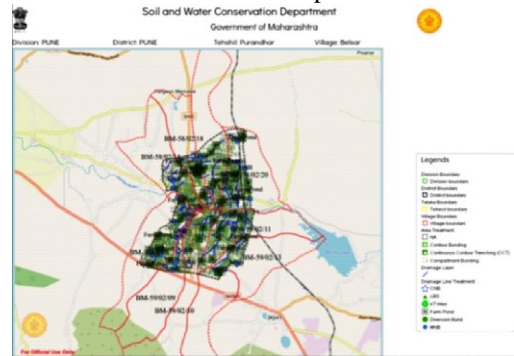


**Fig. 11. Percolation Tank after desiltation in Pingori**

## 2) Village Belsar, Tal-Purandar

The village Belsar in Purandar taluka of Pune district has very less rainfall (average annual rainfall of below 600 mm) and subsequently had very little water conservation till the implementation of JSA in this village [Figure 12]. Though there was poor participation of local community in JSA works due to the big number of villagers are now migrated to the nearest town/city which hampered the active local participation. However, the efforts were taken by the villagers to cope with this gap of community participation; the attempt was made to increase community by inviting the migrants with their likeminded friends in a group to bridge the gap as stated above. To overcome the jinx of scarcity of water, after arranging awareness programme, the villagers of Belsar took active participation in the water conservation works under JSA and executed various works such as continuous contour trenches, nalla bunds, removal of silt, farm ponds, storage bund, compartment bunding, etc. as shown in Figure [14] to [15]. In the beginning, nalla

deepening and continuous contour trench works were taken in hand with the help of local villagers and the volunteers. It was observed that there was little response of local community, may be due to absence of proper awareness amongst the villagers and also poor communication between them and the implementing authorities of JSA. Hence it was observed that it is necessary to impart awareness training to the local community regarding the water conservation activities so as to increase the awareness amongst local villagers and also to bridge the gap of communication to increase the effectiveness of the implementation of JSA.



**Fig. 12. Various features of water conservation in Belsar**



**Fig. 13. Registration of Volunteers in Belsar**



**Fig. 14. CCT work by Volunteers in Belsar**



**Fig. 15. CCT work by Volunteers in Belsar**

### 3) Village Ambale, Tal-Purandar

While implementing JSA, initially action plan was prepared [Figure 16] and implemented in a planned manner in which numbers of water conservation structures were constructed [Figure 17], which have delivered very good results to the villagers, due to which area under cultivation has been increased and during summer season the villagers were free from water scarcity situation and not to run for water tankers for drinking water. In this village active participation of the volunteers from other places was significant and these volunteers has completed more than 1200 m long continuous contour trench at their own and the villagers carried out works such as deepening of nallas, farm ponds, concrete bunds, etc. with the help of some social organisations and Government administration [Figure 18].

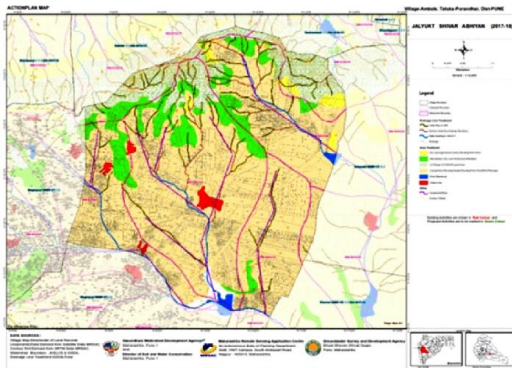


Fig. 16. Action Plan for water Conservation in Belsar

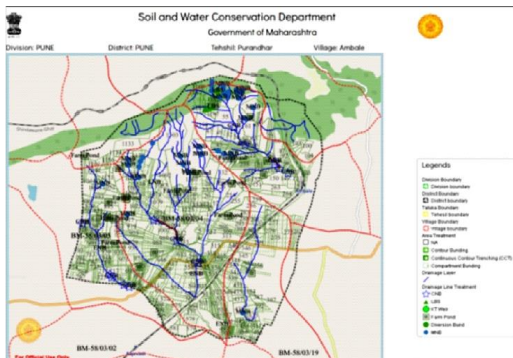


Fig. 17. Various features of water conservation in Ambale



Fig. 18. CCT work by Volunteers in Ambale

Area under cultivation, number of cattles, open dug wells and bore wells were increased as a result of additional available water due to the efforts taken by the villagers and Government administration together during implementation of water conservation works of JSA. Farmers in the village got the training on how to manage the available water for the crops and allied activities so as to make them water sufficient

in their own village and thereby make their village drought free.

### 4) Works carried as per Shirpur Pattern under JSA

Due to low, erratic and poorly distributed rainfall, the availability of water resources in Dhule district is low. Moreover major part of the district is covered by hard rock like Deccan basalts. It has low primary porosity. Hence the groundwater potential is dependent on the thickness of weathering. Deposition of alluvium is restricted to the both banks of Tapi River and the lower reaches of her tributaries. All above geographical, geological and climatic conditions are unfavourable for availability of surface and groundwater. Therefore, it is very difficult to fulfill the household, irrigation, industrial and livestock water needs of the study area. The rivers and streams become dry immediately after monsoon season. Dug wells hardly yield up to November to January and during summer season the situation becomes worst. Shirpur Pattern is based on the construction of check dams on every stream whether it may be small or big and should be with gate and weir to augment huge storage. Mr. Khanapurkar, who worked as a Geologist in Groundwater Surveys and Development Agency, experimented with the soil, its conservation and its structure geologically. This project was spread over 100 Sq. Km. area around the catchment of river Arunavati and Tapi. As per texture and structure of soil they manage to remove upper layer of soil that is known as alluvial. But the problem with next layer, i. e. yellow silt, it cannot help to percolate water. So it was also removed vertically up to 15 to 20 m as per the geological structure of soil. The surplus water of dam was injected into 59 dry dug wells having the depth of 50 m directly with proper filtration. This process helps both in alluvium and basalt area to increase those greater levels even dry bore wells 150 m deep. To overcome these issues, various works for water conservation at Arunavati and Tapi River & at the southern footage in Shirpur taluka in Dhule district were undertaken by Mr. Khanapurkar, initially with the support and financial aid from few renowned local industrialists. The main vision of the project was to recharging the groundwater by using different techniques like dry dug well near the river bank. Deepening, widening and even straightening of Rivers and nalla courses was mainly undertaken through this pattern, which is known as Shirpur Pattern.

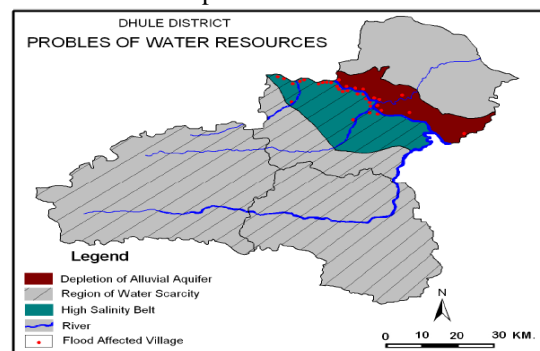


Fig. 19. Map showing problems in Dhule district



Then Shirpur pattern was implemented over an area nearly 200 sq km area, 35 villages, 59 dug wells and 36 km small streams with the cost of Rs. 15 Crores in Dhule district. The Shirpur pattern addresses the immediate but its impact on the long-term could be even more important to contemplate. The *Shirpur pattern*, as propagated by Mr. Khanapurkar, has been widely criticised but also accepted by many villages in Maharashtra. The Shirpur pattern addresses the immediate but its impact on the long-term could be even more important to contemplate.

### III. RESULTS AND DISCUSSIONS

During the study of the abovementioned works under JSA at three villages and works as Shirpur pattern in Dhule district, some observations are made, based on the information received from various Government Departments and news published in local newspapers. Due to low, erratic and unevenly distributed rainfall, the availability of water resources in the study region is on lower side and major part of the study area is covered by Deccan basalts which causes low primary porosity. Hence the groundwater potential is dependent on the thickness of weathering, as deposition of alluvium is restricted in the region. All above geographical, geological and climatic conditions are not conducive for availability of surface and groundwater. Therefore, it is very difficult to fulfill the household, irrigation, industrial and livestock water needs of the study area easily. Dug wells hardly yield up to November to January and during summer season the situation becomes worst. From the study conducted, the strengths and weaknesses were identified and are discussed as below.

#### (a) Strengths

- JSA has been designed by considering various aspects such as geological, hydrological, meteorological, agricultural, community participation, remote sensing and GIS, water resources, topographical, etc.
- Structured programs are designed by I.I.T., Mumbai for proper and efficient functioning of JSA, irrespective of the different settings at different locations of the projects.
- All the Government Departments and NGOs working under one roof for achieving various objects set for JSA

#### (b) Weaknesses

- JSA was designed based on the certain scientific and engineering criteria, however it is observed that which was not properly followed during the implementation of JSA works by various agencies, organisations and workers to the full extent, which causes irregularities in execution of the project
- Manner in which various works carried out were not monitored by the field experts during the execution and as such timely corrective action/s for rectification required could not be taken, if any.
- There were mismatching as regard to the knowledge about various terms of works and actual implementation of works, creating gaps in planning and execution causing conflicting situation in regard to effectiveness in utility of JSA.
- Due to lack of proper pre-feasibility study the activities for each location were not fixed as per site conditions, but

were carried out at all the locations on the similar lines causing undesired results at some locations.

- There was outcry of some environmental and hydrogeological experts in regard to the execution of specific works at certain places such as deepening and straightening of nallas and rivers and according to these experts ecological balance is disturbing due to execution of such activities and may have adverse effect on surrounding ecology, geo-hydrology and geomorphology. This is big concern having great adverse impact on ecological and geo-hydrological settings of the region and this may be considered as major adverse factor.
- JSA was mix of number of schemes of different government departments and therefore the JSA schemes were mostly not executed on the scientific basis; due to which desired results in regard to enhancement of groundwater recharge from the schemes, as planned, were not achieved.

#### (c) Community participation

- Community participation was more where awareness programmes regarding importance of water conservation activities under JSA were arranged well before commencement of the activities under JSA.
- Also, due to lack of proper coordination, especially for the works carried out with large scale community participation without supervision, leads to generate unwarranted things such as excessive or un-required excavation, improper disposal of the excavated stuff, backfilling of nallas due to fall of excavated stuff back in nalla course causing choking of nallas in short time.
- Participation of local community is enthusiastic in some part and less in other parts, which needs to be addressed by adopting suitable measures.

### IV. CONCLUSIONS

From the study following conclusions are drawn:

- 1) Though the various water conservation works considered under JSA were belonging to the category of artificial recharge structures, proper study for identifying each of the appropriate recharge structures and its proper location considering the local topographical, geological, geomorphological, hydrological, slope and soil conditions was not done. All these factors shall be taken into consideration while deciding the water conservation structure and its location using Geospatial tools and available data of the region.
- 2) Village was considered as unit for JSA works, which shall be got tested on various norms of influential factors of water conservation and if necessary this unit shall be changed to watershed or mini watershed so as to make each work under JSA sustainable and efficient.
- 3) Participation of local community needs to be increased by prompting them for their active participation by various means such as offering some incentives to the community members in the form of concession in property tax, priority in government scheme benefits, etc.



4) Also, local community shall be imparted with training regarding technicality of the influential factors of water conservation so as to make them aware about the best inputs and best output from these works and getting more benefits by them from JSA works.

### FUTURE SCOPE OF STUDY

The research carried out in this study will address the impact of scientific and engineering basis in water conservation on village scale. Though this study is carried out on Indian region, it is important to acquire information on water conservation globally.

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