Report on

Participatory groundwater management to address water scarcity due to climate variability

Submitted by:
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Aurangabad, Maharashtra, India

To:
India Water Partnership

December 2022

Abbreviations and Acronyms

CCA	Climate Change Adaptation
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
FFS	Farmers Field School
FGD	Focus Group Discussion
GRASP	Grass Roots Action for Social Participation
GWP	Global Water Partnership
ICT	Information and Communication Technology
IWP	India Water Partnership
KVK	Krishi Vigyan Kendra
LEISA	Low External Inputs Sustainable Agriculture
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
NABARD	National Bank for Agriculture and Rural Development
PRA	Participatory Rural Appraisal
SDG	Sustainable Development Goal
SHG	Self Help Group
SWC	Soil and Water Conservation
VWMC	Village Water Management Committee

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Acknowledgement

Grass Roots Action for Social Participation (GRASP) is grateful to India Water Partnership (IWP) and to Global Water Partnership – South Asia, for supporting this endeavour to empower rural communities to manage their own water resources. We would like to place on record our gratitude and appreciation to Dr. Veena Khanduri, Executive Secretary-cum-Country Coordinator, IWP and her team for constant support and guidance in completing the project mandate.

GRASP would like to express gratitude towards the experts and subject matter specialists from Marathwada Sheti Sahayya Mandal's Krishi Vigyan Kendra (Kharpudi, Jalna), Geo-Forum (Aurangabad) and several independent experts who extended their timely support to the project, especially in terms of building capacities of the community and the committees and providing on site guidance on pertinent technical matters.

Internally, GRASP is thankful to Mr Yugandhar Mandavkar, Chairman and Mr Sanjay A Nagesh, Secretary, for their untiring support and guidance at various stages of planning and implementation of the project.

Finally, and most importantly, GRASP is grateful to the community from the project villages for sharing their concerns, aspirations and valuable inputs, without which this project could not have been completed.

Executive Summary

The initiative

Grass-Roots Action for Social participation (GRASP), a Civil Society Organisation, was established in 1992 to empower rural men and women and to professionalise the process of rural development at the grassroots by providing an interactive platform for the stakeholders. Realising the importance of groundwater in balancing the gap between the surplus and deficit across seasons in the hard rock drought prone areas , GRASP initiated this project with a goal of increasing resilience of smallholder farmers against climate variability through participatory groundwater management. As a project supported by India Water Partnership under the "Climate Resilience through Water" initiative, it worked for mobilising community, building awareness on aquifer and groundwater use system and create Village Water Management Committees.

Achievements

The project started in March 2022 and could achieve the following deliverables by the mid-December 2022.

- Ten village youth trained in hydrologic assessment and basic soil water conservation techniques;
- Five Village Water Management Committees (VWMCs) were formed and trained in crop planning based on hydrologic assessment;
- Three VWMCs completed water budgeting and collective crop planning based on assessment of water availability;
- Five to ten open wells were identified in each village and their water levels monitored pre- and post- monsoon; and,
- Agro-ecological measures (esp. organic manuring) taken up for soil moisture improvement.

Future Plans

As an immediate follow up, the project will continue and work towards establishing a basic weather station in a cluster of 5 villages with convergence and follow up of proposals for financing water conservation interventions (source strengthening) from the government (as convergence).

Future Plan – Next two years

Over the next two year, this project will work towards building resilience against climate variability through participatory groundwater management, through aquifer delineation in the five villages with the help of geologists, capacity building of VWMCs on principles and practices of water use and governance, training of the barefoot technologies on advanced aspects of groundwater and climate change adaptation

measures, and for developing comprehensive plans for water augmentation and groundwater recharge.

1. Project Background

1.1 About the organisation

Grass-Roots Action for Social participation (GRASP), a Civil Society Organisation, was established in 1992 to empower rural men and women and to professionalise the process of rural development at the grassroots by providing an interactive platform for the stakeholders. GRASP started working on soil and water conservation as a regional necessity of Marathwada - a drought prone region in central India.

1.2 About the project

Water scarcity in drought prone areas is largely due to climate variability, against which resilience of smallholder farmers can be built by tapping the seasonal surpluses and using it efficiently during scarcity. Role of groundwater is critical in balancing the gap between the surplus and deficit across seasons in the drought prone areas. The proposed project aims building resilience of smallholder farmers through participatory groundwater management. The strategy comprises of awareness raising on groundwater and hydrology so that the farmers can take informed decisions on crop water management in the post-monsoon season, and thereby establish a social mechanism for self-regulation of groundwater use.

Under the "Climate Resilience through Water" initiative of the India Water Partnership, GRASP initiated this project with a goal of increasing resilience of smallholder farmers against climate variability through participatory groundwater management. It entailed mobilising community, building awareness on aquifer and groundwater use system and create Village Water Management Committees. It trained youth as barefoot technologist on assessment, monitoring of key hydrologic paraments and using the information for participatory water use planning. The project was implemented in a cluster of five villages in Fulambri Block of District Aurangabad in Maharashtra, falling in drought prone semi-arid tropical zone.

1.3 Project Objectives

The project was taken up with the long term goal of increasing resilience of smallholder farmers against climate variability through participatory groundwater management. Towards this end, the immediate objectives for first year were defined as follows.

- To mobilise community and build their awareness on aquifer and groundwater use system;
- To constitute Village Water Management Committees for participatory water use planning using the hydrologic information
- To train youth as barefoot technologist on assessment and monitoring of key hydrologic parameters

From the second year onwards, the focus would be on strengthening the Village Water Management Committees to undertake the role of water governance and water stewardship, and simultaneously capacitating the youth to anchor and steer these processes. Delineation and mapping of aquifer and its characteristics will be taken up in the second year, which would form the basis for planning scientific adaptation measures, including water augmentation and groundwater recharge.

The progress of the project and its achievements are presented in this report. The next section describes the activities carried out, followed by the results achieved in terms of main outputs and outcomes. It is followed by the conclusions and recommendations for the future.

2. Project Activities and Achievements

2.1 Description of Project Activities

Shallow to deep groundwater contributes to over 85% of irrigated area in the hard rock areas of India, which also is drought prone. While most farmers use water from aquifers feeding on annual recharge, in times of stress they dip into deeper aquifers so save their crops. It often is partly out of the belief that groundwater availability is abundant and partly due to the absence of any realistic method of estimating it. It is, therefore, important for the community to understand the recurrent droughts and water scarcity as a cyclic phenomenon and that a more balanced water budgeting and use aimed at tapping the seasonal surpluses and using it efficiently during scarcity.

Recharge of open well

Women's awareness meeting

These actions are needed at community level as they share the common aquifer, which is a pool of the groundwater. Therefore, it is important to form and strengthen the community organisations for water management and governance. The project worked for mobilising farmers on sustainable water use through awareness and capacity building on sustainable groundwater management based on understanding of hydrology. The community needs local resource persons to support the hydrologic assessment, for which ten local youth were trained in the basics of surface and groundwater development and management, so that they serve as barefoot technologists to provide necessary technical help to the farmers and their committees in rational decision making. The main activities undertaken during the first year include the following :

- Participatory Rural Appraisal of water resources
- Youth training on hydrology
- Hands-on training of Village Water Management Committees
- Collective crop planning
- Documentation of best practices and its dissemination

2.2 Implementation and Results

The project "Participatory groundwater management to address water scarcity due to climate variability" was implemented by Grass Roots Action for Social Participation (GRASP) with the support from Global Water Partnership, South Asia and India Water Partnership from March 2022 to December 2022. The project was implemented in five villages of Adgaon, Murshidabad Wadi, Ranjangaon, Sultanwadi and Vitthalwadi, belonging to Fulabri Block of District Aurangabad in Maharashtra. The progress of implementation and the results are described in the following pages.

2.2.1 Participatory Rural Appraisal of Water Resources

Participatory Rural Appraisal (PRA) is an effective approach to understand the rural reality, and in the process, make the rural community aware of their situation, problems and prospects of development. Thematic PRA is about using the selective tools of PRA focussed on one or a few themes like land, water, agriculture, health, etc. Thematic PRA focussed on water resources and agriculture was conducted in the five project villages to understand the present situation of water, agriculture and socio-economic conditions of the rural families.

PRA Exercise of Resource Map

PRA Exercise of Social Map

Various exercises of Timeline, Social Mapping, Resource Mapping, Transect Walk, Seasonality Analysis and Matrix Ranking. Timeline was useful in identifying current and future movements of water availability and rainfall. Social Map, a visual tool, was used to provide a sound qualitative picture of the situation of various households in the village. Resource Mapping, another visual tool, was used in a focussed manner to depict the water resource distribution, use and access, together with its link with the cropping and vegetation. Transect Walk was conducted specifically for surface water bodies, wells, and farms with various land use. Seasonality analysis was conducted for rainfall, water

availability in wells and cropping. Table 1 below gives the details of PRA conducted in the 5 project villages.

Table 1 : Details of Thematic PRA conducted

S No	Project Village	No. of participants		Tools used
		Men	Women	
1	Adgaon	40	0	Timeline, Social Map, Resource Map, Transect Walk, and Seasonality
2	Murshidabad Wadi	25	5	Social Map, Resource Map, Transect Walk, and Matrix Ranking
3	Ranjangaon	25	5	Timeline, Social Map, Resource Map, Transect, and Seasonality
4	Sultanwadi	35	8	Social Map, Resource Map, Transect, and Seasonality
5	Vitthalwadi	25	0	Social Map, Resource Map, and Transect Walk
Total		**150**	**18**	-

The thematic PRA was useful in making the community understand the behaviour of various surface and groundwater sources and how their seasonal variation is linked to the performance of crops and other vegetation.

2.2.2 Youth Training on Hydrology

GRASP trained and mentored a group of ten youth on basic hydrology and soil water conservation techniques in drought prone areas with a view to help the village community in planning and implementing development works in the context of climate change. The objective was to create a cadre of trained rural youth a
barefoot technologists to help the villagers and their committees in planning and implementation of various development interventions in future.

The training was conducted in a multi-module manner, splitting the main topics into short modules of two-three days each. Each training had a substantial component of practical exercises together with the basic concepts. For example, in the module on well inventory, the participants spent nearly three-fourth of their time on measurement of wells, recording of well water levels and its analysis.

Demonstrating use of raingauge

Measuring open wells for well inventory

They carried out compilation and monitoring of hydrologic data like rainfall, well water levels and use it in participatory micro-planning exercises in the five villages. They also helped the farmers and Village Water Management Committees.

2.2.3 Hands on training of Village Water Management Committees

Community led water management is acknowledged as a sustainable and democratic way of planning water use and management. The project laid emphasis on increasing resilience of smallholder farmers against climate variability through participatory groundwater management. This requires strong and vibrant community organisations, and therefore, the project formed the community organisations for water management and governance and worked on their awareness and capacity building for sustainable groundwater management based on understanding of hydrology.

Table 2 : Details of VWMCs Meetings conducted

S No	Project Village	Members present		No. of meetings conducted
		Men	Women	
1	Adgaon	5	2	7
2	Murshidabad Wadi	4	3	4
3	Ranjangaon	5	2	4
4	Sultanwadi	5	2	5
5	Vitthalwadi	3	2	4
Total		**22**	**11**	**24**

The Village Water Management Committees (VWMCs) were trained using a series of inputs like training programmes, exposure visits, interactive sessions and guided planning exercises. The focus was on local planning, strongly based on demystifying the science of hydrology and how it affects the water availability. There were two types of trainings, firstly, short sessions or exercises conducted in the village, and secondly, common events like trainings at central locations, outside institutions and exposure visits.

Recording well water levels

Awareness meeting for women

Village wise exercises : Various sessions conducted at the village level were related to analysis of the situation in particular village related to water and agriculture and using this understanding for planning water use and other interventions. These sessions were guided by the external experts and subject matter specialists as follows:

Analysis of PRA findings : The findings of the thematic PRA were discussed in each village to build a collective understanding of the main land and water resources in the village and potential for its development.

Analysis of hydrologic data : The hydrologic data collected and compiled by the barefoot technologists was presented in the committee meetings and its implications for water availability and agriculture were demonstrated. This was an important input to Water Budgeting exercise.

Follow up at household level

Studying the RWH structures

Soil water conservation : A training session of basic techniques of soil and water conservation was conducted in each village. It generated considerable interest, and also resulted in improving the soil health for increasing the soil moisture availability. These sessions led to planning and conducting training programmes and demonstrations of soil

improvement measures like manuring, composting and use of organic formulations, which was not envisaged in the beginning.

Water Budgeting : This was the most important exercise conducted by the Village Water Management Committee in each village at the end of rainy season. These sessions were facilitated by water resources experts. It used the analysis of hydrologic data and well water levels in the month of October-November, to work out the availability of water for the winter season. This information was used for collective crop planning.

Table 3 : Exposure Visit on Water Budgeting

S No	Project Village	VWMC Members		Other participants	
		Men	Women	Men	Women
1	Adgaon	5	2	15	0
2	Murshidabad Wadi	4	3	15	8
3	Ranjangaon	4	2	16	2
4	Sultanwadi	2	2	28	6
5	Vitthalwadi	3	2	12	3
Total		**18**	**11**	**86**	**19**

All these exercises were useful in enabling the Village Water Management Committees to understand the water availability situation and using it for planning water use. It gave them confidence about their analytical and planning skills. Due to good monsoon this year, and some late rains in October and November, the well water levels were higher than the normal. That, too, boosted the morale of the farmers and the VWMCs.

2.2.4 Collective Crop Planning

The culmination of all the above achievement was in form of collective crop planning exercise. Based on the assessment of water availability at the end of the water budgeting exercise, the VWMCs conducted collective crop planning for the Rabi season in their respective villages. Owing to higher rainfall this year, the water availability in the wells was found to be higher than the normal. This led to planning for more area under winter crop. The VWMCs also felt that they will be able to take some summer crop, too.

Table 4 : Participants of Exposure Visit Before Crop Planning

S No	Project Village	VWMC Members		Other participants	
		Men	Women	Men	Women
1	Adgaon	5	2	2	22
2	Murshidabad Wadi	4	3	4	12
3	Ranjangaon	4	2	6	18
4	Sultanwadi	2	2	3	23
5	Vitthalwadi	3	2	14	18
Total		**18**	**11**	**29**	**93**

3. Outputs and Outcomes

The project results have been satisfactory in terms of the outputs and outcomes expected and planned in case of the main interventions.

3.1 Project Outputs

The following outputs were defined at the time of planning the project. The achievement on these planned outputs are as follow:

- **Training of village youth :** It was planned to train ten youth on basic soil water conservation and hydrology. The project trained ten youth through a series of training programmes and practices sessions or exercises. All these ten youth are working as barefoot technologists and helping farmers and the VWMCs with hydrologic analysis and guidance on simple soil water conservations measures.

- **Weather station :** It was planned to established a basic weather station in a cluster of 5 villages by convergence in form of a donation from a CSR firm. A small plot has been identified on which this station will be established. The youth have been trained on recording the data and on upkeep and maintenance of the rain gauge and thermometers. However, the instruments have not yet been received from the concerned donor. Follow-up for procuring the instruments is being done.

- **Village Water Management Committees (VWMCs) :** It was planned to form five VWMCs and to build their capacities on various aspects of water management and governance. Five VWMCs have been established, one each in all the five project villages, and their members were trained on a variety of water management aspects as detailed in the previous section (Please see 2.2.3 above). These VWMCs have conducted water budgeting in their respective villages and have guided farmers on water saving and soil water conservation measures.

Table 5 : Participants of initial Exposure Visit on Groundwater Management

S No	Village	VWMC Members		Others
		Men	Women	Men
1	Adgaon	5	1	1
2	Murshidabad Wadi	5	3	1
3	Ranjangaon	4	2	2
4	Sultanwadi	2	2	2
5	Vitthalwadi	3	2	14
Total		**19**	**10**	**20**

- **Collective crop planning :** It was proposed to conduct collective crop planning exercises in each project village based on the assessment of water availability and in accordance with the village level water budget prepared by the VWMC. Collective crop planning exercises were conducted in all five project villages.

Training on water budgeting

Water budgeting exercise

- **Well water level monitoring :** It was proposed to identify 30 open wells and measure their water levels pre- and post- monsoon. All 38 open wells were identified in the five project villages and marked for regular monitoring. The pre-monsoon (May-June) and post-monsoon (October-November) levels were measured in these wells and the record is maintained by the VWMC.
- **Soil water conservation :** It was proposed to identify at least one soil-water conservation intervention in each village and seek financing from the State Government for its implementation. Three drinking water wells were identified by the VWMCs in three project villages and the proposal for groundwater recharge of these wells have been submitted to the respective Gram Panchayats. In addition, in order to increase the water storage and groundwater recharge, de-silting of nalla (water channel) beds has been proposed in the other two villages. It is expected that the Gram Panchayats will take- it up in their next budget, which is expected in March 2023.

From the above discussions, it is clear that the project could achieve all its outputs planned with the project grant support from IWP. Two components, which were planned with convergence with government schemes or funds from other donors, have not yet been implemented, but are likely to be taken up in the next work season.

3.2 Expected Outcomes

The main outcomes expected of the project by the end of the first year were achieved to the following extent:

- **Public display of weather data :** It was expected that the village community will become aware of the rainfall and water resources situation in the cluster using public displayed weather data. However, this outcome was could not be achieved.
- **Crop planning :** The farmers collectively prepared a crop plan and water use allocation for winter crop, based on the assessment of water availability in wells and surface water bodies.
- **Convergence :** Each of the 5 VWMCs submitted a proposal for a soil-water conservation intervention to the Gram Panchayat (local government) for support.

3. 3 Other benefits

In addition to the planned outcomes, the project resulted in considerable awareness on managing soil moisture and improving soil health. Being an agricultural community, the villagers sought advice on farm level water management and on improving soil health. This led to several demonstrations on appropriate techniques with the help of the local Agriculture Department and Krishi Vigyan Kendra, Jalna District, Maharashtra.

Use of pheromone traps

Flexible vermi-compost bed

Preparing organic formulations

Preparing organic formulations

3.4 Number of People Benefitted

The number of people benefitted can be classified into direct beneficiaries and indirect beneficiaries. The direct beneficiaries include those men and women who were the benefitted from the various project activities in form of increase in knowledge, skills, and capacities or in terms of material benefits. The material benefits were limited to the setting up of demonstration units on their farms. The indirect beneficiaries include the people who could develop their knowledge and skills by virtue of being part of some awareness programmes, some participatory exercises like water budgeting and crop planning. The crop planning exercise is also likely to benefit a large number of farmers in form of providing guidance or advice that would help protect their crop against climate variability and/or prevent damages due to drought or water scarcity, especially in winter season.

Table 7 : Direct and Indirect Beneficiaries

S No	Project Village	Direct Beneficiaries		Indirect Beneficiaries	
		Men	Women	Men	Women
1	Adgaon	5	2	2	22
2	Murshidabad Wadi	4	3	4	12
3	Ranjangaon	4	2	6	18
4	Sultanwadi	2	2	3	23
5	Vitthalwadi	3	2	14	18
Total		**18**	**11**	**29**	**93**

4. Conclusions and Recommendation

During the last one year the project could create substantial awareness on groundwater and hydrology using simple methods, and thereby preparing farmers for crop water management in the post-monsoon season. GRASP has also worked towards establishing a social mechanism for self-regulation of groundwater use based on observations of rainfall, its distribution, availability of surface and groundwater and analysing this information to plan water use across the crop growing seasons. Village level farmers groups have been formed for sustainable agriculture and water use, which will take over the role of VWMCs. A team of ten village youth has been formed and trained on basic concepts and practices of hydrology and water management.

The community and GRASP are interested in building upon the achievements of this year, and take forward the process towards more comprehensive water management in 2023 and subsequent years on aquifer level with the help of India Water Partnership under the theme "Supporting integrated resilience planning, including in water infrastructure" for climate resilience through water.

As an immediate follow up, the project will continue and work towards:

- Establishing a fully operational Basic Weather Station in a cluster of 5 villages with convergence; and
- Follow up of proposals for financing water conservation interventions (source strengthening) from the Government (as convergence).

It is proposed to take this project forward in the next two years, for "building resilience against climate variability through participatory groundwater management". In the long run, it will lead to community driven management for a water secure future in drought prone areas. The focal actions include:

- Aquifer delineation in the five villages with the help of geologists;
- Capacity building of VWMCs on principles and practices of water use and governance;
- Training of village youth on various aspects of hydrology, groundwater and climate change adaptation measures;
- Each VWMC to develop a comprehensive plans for water augmentation and groundwater recharge.

These proposed measures will lead to aware village community working consciously towards building resilience against climate variability through participatory groundwater management. It will form strong and capable VWMCs for managing their water resources. The project will result in youth in form of barefoot technologists capable of assessing and planning surface and groundwater resources, and capable of assisting the VWMCs and village councils on groundwater resources. In the long run, these will pave the path for community driven management of water towards a water secure future in drought prone areas.

In addition, the processes adopted in the project and its documentation will give useful insights to the practitioners in India and in similar context on guiding community driven water management initiatives.