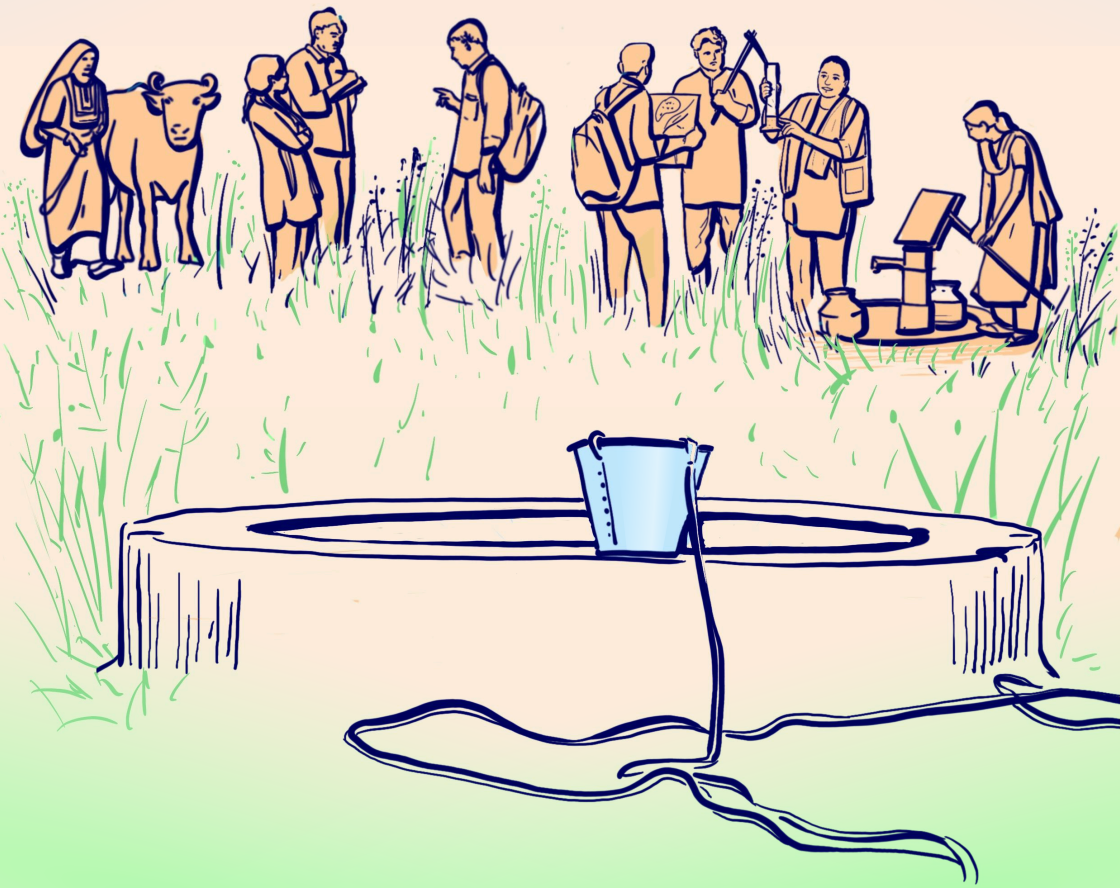
Community-led Water Management

Part 5 - Building Groundwater Recharge Structures



What need does the playbook address?

Large swaths of the country are facing severe water stress, largely due to over-exploitation of groundwater and surface water resources. Lower water availability leads to unequal distribution of water resources, lower crop yields during dry months, and issues of salinity and aridity of the soil. Addressing this issue requires community participation and behavioral change.

Rather than designing top-down schemes for agrarian water use, DSC emphasizes on community planning of water resources. The design of field assessments, community mobilisation, village-level water budgets, water recharge structures, monitoring and the participatory approach to water security planning best exemplify this.

Who can use this playbook?

Practitioners, Trainers, Community Resource Persons, Progressive Farmers, Subject Matter Specialists, Local Governance Representatives

This playbook is designed using the expertise of **Development Support Centre (DSC)**, which works on participatory water management and judicious use of water in Gujarat, Madhya Pradesh, Rajasthan and Maharashtra.

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These solutions by DSC have been designed and pioneered under the leadership of Anil Shah, founder chairman; Mohan Sharma, executive director; and Sachin Oza, former executive director. These community-empowering participatory technical and social processes in DSC`s 30-year journey led to the evolution of the approach to promoting community-led water security.

In this book you'll learn to

- Understand your village's water needs and resources
- Get involved in water management
- Prepare water budgets
- Plan for water security
- Replenish groundwater by building recharge shafts
- Monitor water resources
- Cooperatively manage irrigation

** This playbook is **Part 5** of a 7-part playbook series on cooperative water management. Find the complete set here: link*

Today we have gathered to talk about the water situation in our village. Let's see how deep is the water.

Did any of you notice that the soil is getting arid because water is saline?

How many of you had lower crop yields in this dry season?

Did some of you feel you received less water than your neighbouring regions?

If we manage our water properly we can solve these problems of irregular water supply and quality

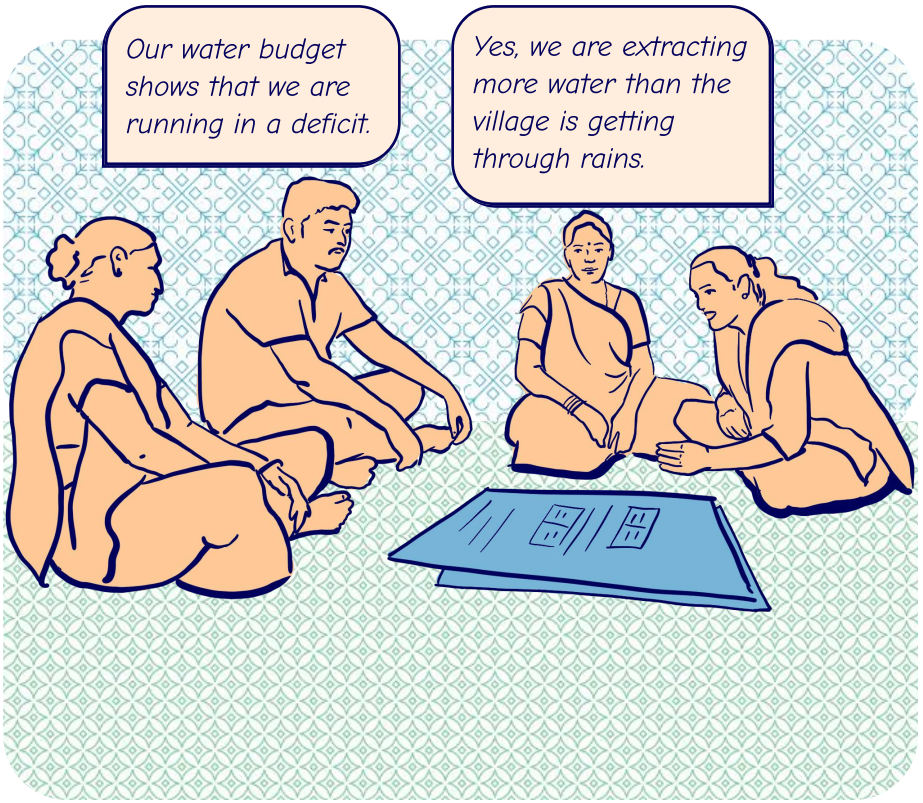
5.

Building Groundwater Recharge Structures

To improve our water security we can build groundwater recharge shafts to direct excess rainfall towards replenishing groundwater levels. This is a climate smart technology.

Why should we build groundwater recharge structures? Let me explain.

- *Groundwater Recharge structures can be a **sustainable way to replenish** falling groundwater levels*
- *It ensures **excess run-off** is directed into the sub-strata where it raises groundwater levels*
- ***Groundwater recharge shaft** is a new technology, which is climate efficient and best suited for community level interventions*


Our water budget shows that we are running in a deficit.
Yes, we are extracting more water than the village is getting through rains.

One way of lowering this deficit is to tap the rainwater run-off.

Right now, it is flowing out of the village, but we have to find a way to conserve water on surface or underground appropriately.

The area near the village pond always floods over in the monsoons, but borewells in the region dry up a few months after that.

We could build a recharge shaft there for underground recharge.

Yes, Recharge Shafts can be a sustainable way to replenish falling groundwater with many other benefits:

Direct excess rainfall towards recharging subsurface groundwater

Control inundation and water-logging in surrounding farms

Defunct wells nearby can also be replenished

Provide sufficient soil moisture and augments well and borewell levels during summer months, allowing farmers to reliably harvest crop even in other seasons

Improve the overall quality of water being extracted from bore-wells in the vicinity, leading to better crop yields and better soil health

We need to form a committee to build the recharge shafts. They will be responsible for the following tasks:

- *Finding suitable sites in the village*
- *Convincing other villagers to help*
- *Following-up with Gram Panchayat for execution*

We are excited to be part of the committee and steer the process of building recharge shafts in our village

SITE SELECTION

Finding a suitable recharge shaft site

JOINT SURVEY

Conduct a joint survey with geo-hydrologists, engineers, water committee members, farmers, water department officials, local NGOs working in the area.

IDENTIFY PLACES

Identify places where water accumulates during the rains: this could be ponds, big check dams or big depressions.

CHECK WATER AVAILABILITY

Amount of water and duration of water stored in a pond and check dams can be found through informal surveys with community members. Only ponds or check dams where water is typically available for atleast 6 months are considered to be ideal sites for recharge shaft.

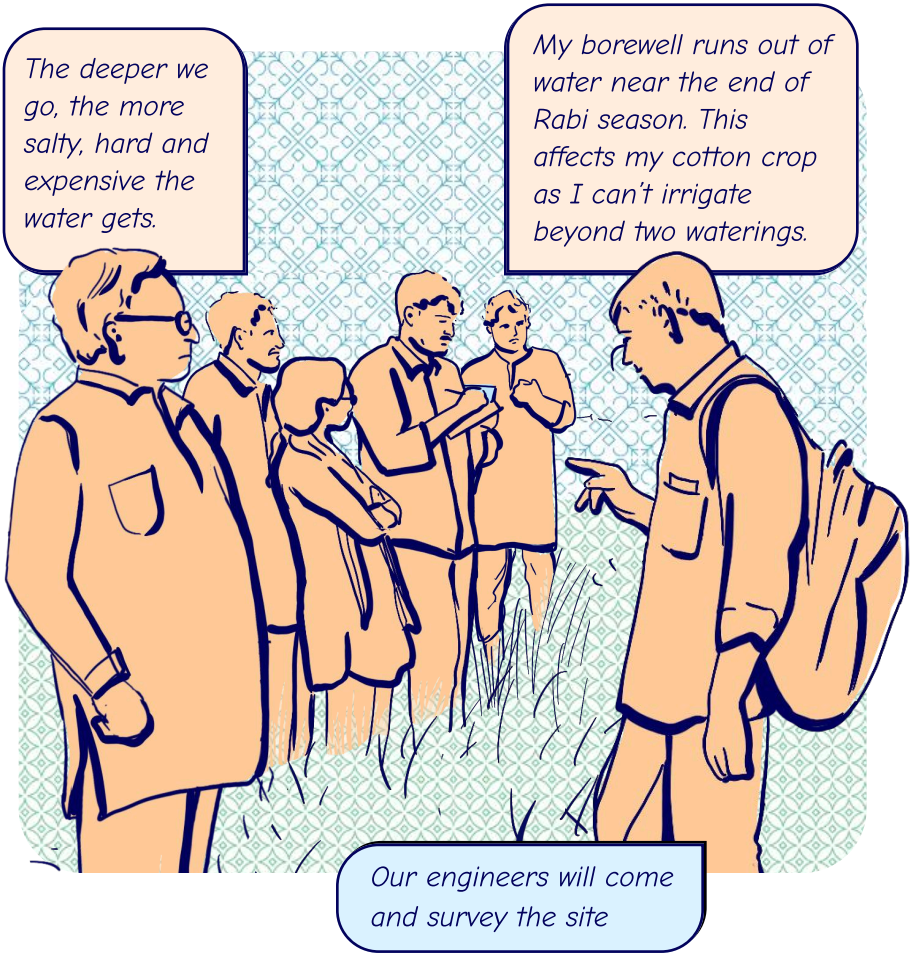
OPTIMISE FOR BENEFITS

If multiple places are chosen, then conduct a survey to find out how many borewells are within 1km radius. The place with the most number of borewells (defunct and active) and most farmers nearby will be ideal

Farmers can also be asked if their defunct borewell can be converted to a recharge shaft. This is low-cost and can be done in multiple places.

Where NOT to build a recharge shaft

- In ponds or tanks which are used for drinking water for villagers or livestock. The recharge shaft may cause this source of surface water to dwindle
- In places where water runs off quickly and does not stay stored there for long periods
- Close to oil wells or polluting industries
- In hilly areas or places where hard rock prevents deep tube well drilling


The deeper we go, the more salty, hard and expensive the water gets.
My borewell runs out of water near the end of Rabi season. This affects my cotton crop as I can't irrigate beyond two waterings.
Our engineers will come and survey the site

Technical analysis of recharge shaft site

There are numerous aspects for engineers and hydrologists to focus on when studying a field site:

METEOROLOGICAL CONDITIONS

HOW DOES WATER ENTER THE RECHARGE SITE?

- Rainfall pattern (Indian Meteorological Department data or state meteorological department)
- Evaporation losses from the area
- Surface (canal) network in the region (if any)
- Municipal or industrial wastewater flow to the village (if any)
- Chemical quality of water that will potentially enter the recharge site (includes a survey of nearby farms on the amount of fertiliser and pesticide used that could come in the run-off)

SOIL CONDITIONS

DOES THE SOIL/GEOLOGY ALLOW FOR RECHARGE?

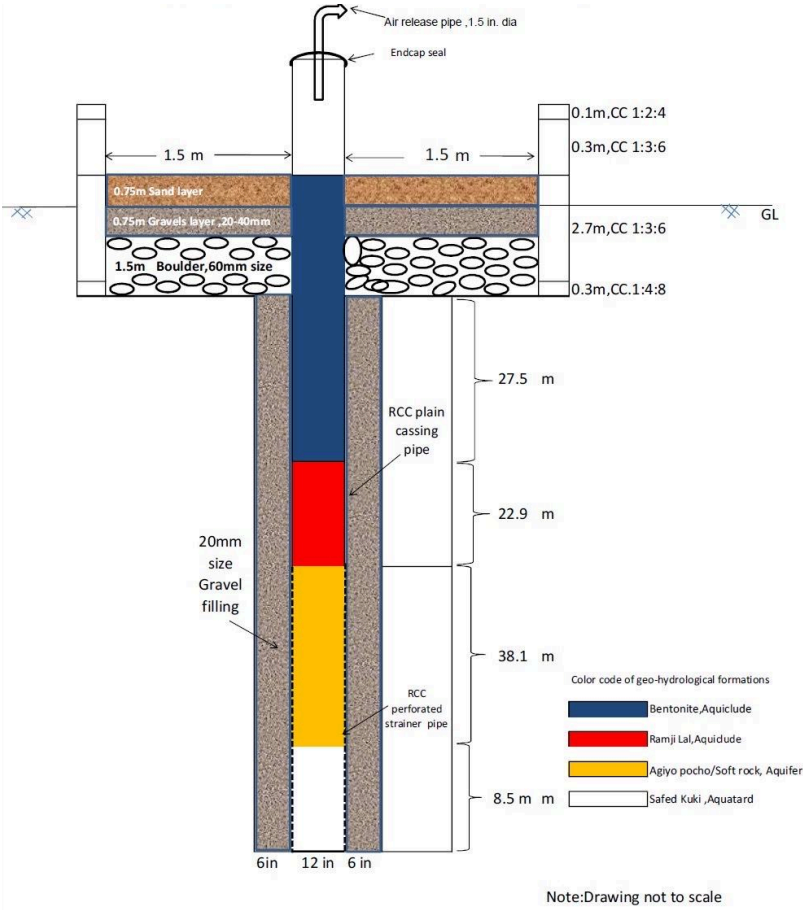
- Rate of soil infiltration (determined through cylinder or flood infiltrometers)
- Relation to the changes in the soil structure and the biological phenomena which take place when infiltration begins

SUB-SURFACE CONDITIONS

HOW DEEP SHOULD THE RECHARGE SHAFT BE?

- Regional hydro-geological maps, including water table contours if necessary
- Sub-surface hydro-geological units, their thickness and depth of occurrence (Geological Survey of India; Central Groundwater board data)
- Depths to the water table (DTW) for the periods of the maximum, minimum and mean annual position. This can be found by consulting with farmers and villagers who have borewells near the potential recharge site.

DESIGNING THE RECHARGE SHAFT



Design Diagram of Recharge Shaft in MALAI pond of village Dedhrota
Image source: Development Support Center

Depth of the recharge shaft can be estimated by surveying depths of nearby borewells and consultation with farmers on the type of rock where groundwater baseflow occurs. Depth of the shaft should penetrate the overlying low permeable layer. It is not necessary to reach the fissures that contain groundwater flow.

Above ground

CONCRETE WALL WITH MESH FENCING

This prevents trash from entering the recharge shaft. It also stops livestock, wild animals from entering and dirtying the recharge shaft.

FILTERING MEDIA

A series of layers of sand, grit and rock filter the water before it enters the recharge shaft. All materials should be locally sourced.

LAYERS

The first layer should be grit, followed by small rocks and then larger rocks in the final layer.

Layers can be 3 or more. The thickness and number of layers is determined by the silt in the incoming water. The muddier the water, the thicker the filtering medium

Below ground

RECHARGE SHAFT

Shallow shafts can be manually dug, with a maximum diameter of 2m.

If the soil caves in (that is, it is porous and unstable), then a lining should be made while digging it in.

For deeper aquifers, shafts can be drilled by direct rotary or reverse circulation method (just like normal tubewells). Diameter should not be more than 1m.

LINING

If manually dug or digging in soil that does not cave in, lining can be boulders/ cobble stone.

For deeper aquifers, the shaft is lined with RCC casing: plain casing at the top, and perforated casing in the bottom of the shaft to allow for water to trickle into the aquifer.

COMMUNITY INVOLVEMENT IN CONSTRUCTION AND MAINTENANCE

Village Water Management Committee

- The water management committee in the village supervises the construction of the recharge shaft.
- Water committee can allocate labour from within the village for construction of filter media and concrete wall.
- They should undertakes periodic cleaning of the lake, particularly removal of excess silt that may clog the recharge shaft

Beneficiary farmers

- A sub-committee of beneficiary farmers, who have borewells within 1km from the recharge site, is formed.
- A plan to take contributions from them for the construction of the recharge shaft can be made. For instance, on an average for the dimensions of 300mm diameter, depth of 200 ft - 450 ft (Varies with regional geography) and 10ft diameter, building a recharge shaft can cost anywhere between Rs. 2.5-4.5 Lakhs. In this case contributions from the 60-70 farmers around this site can be a total of Rs. 25,000.
- The sub-committee should also ensure the surroundings of the recharge is periodically cleaned.
- The filter media is to be removed and periodically cleaned before the rainy season. Organic mass (like moss or fungi or small plants) growing in it should be removed, the material soaked and cleaned in clean water and then replaced.

Bhujal Jaankar/ Jal Saathi

- Regular monitoring of water levels, Ph levels, TDS and Electrical conductivity in borewells from near the recharge shaft.
- Monitor and record increases in crop productivity, availability of water in lean season can be recorded through surveys of farmers. Success of the recharge shaft can be communicated to the wider community.
- A formal or informal agreement must be executed among the farmers for post construction equitable use and maintenance.

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