



IDP-NAHEP and College of Technology, GBPUAT, Pantnagar in association with WSU, Australia

presents

International Webinar on the occasion of WORLD ENVIRONMENT DAY

"Managing the India's Invisible Resource-The Role of Participatory Groundwater Monitoring and Management at the Village Level"



Prof. Basant Maheshwari Faculty of Water, Environment and Sustainability Western Sydney University, Australia

Inaugral Address



Introductory Remarks



Dr. Tej Partap Vice Chancellor, GBPUA&T



Dr. S. K. Kashyap Dean, College of Agriculture



Dr. Alaknanda Ashok Dean, College of Technology



Prof. H. I. Shiva Prasad Department of Civil Engg +91-8449859593 h.j.s.prasad@gmail.com **College of Technology**



संवाद न्यूज एजेंसी

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पंतनगर। राष्टीय कषि उच्च शिक्षा परियोजना (नाहेप) के सहयोग एवं विवि कलपति की अध्यक्षता में शक्रवार को पंतनगर क्रीक एखं प्रौद्योगिकी विश्वविद्यालय के प्रौद्योगिकी महाविद्यालय में विश्व पर्यावरण दिवस पर अंतरराष्ट्रीय वेथिनार हआ। मख्य वयता वेस्टर्न सिडनी युनिवसिंटी आस्ट्रेलिया के प्रो. बसंत माहेश्वरी ने भूजल संरक्षण एवं संवर्धन पर जोर देते हए इसे ग्रामीण स्तर पर विस्तारित किए जाने एवं ग्रामीणों को इसके लिए प्रशिक्षित करते हुए जागरूक बनाने पर जोर दिया

कुलपति डॉ. तेज प्रताप ने पर्यावरण एवं मनुष्य जीवन के संबंधों सहित पर्वावरण संरक्षण पर जोर दिया। उन्होंने जल अधिषठाता



पंतनगर कृषि एवं प्रौद्योगिकी विवि में हआ अंतरराष्ट्रीय वेबिनार



वेबीनार में विचार रखते कुलपति डॉ. तेज्ध्रताप सिंह।

पर्वावरण संरक्षण एवं जल संरक्षण में किए जा रहे कार्यों से अवगत कराते हुए इसके महत्व एवं मानव जीवन पर इसके प्रभावों का उल्लेख किया। कार्यक्रम का संचालन वेविनार संरक्षण, वन संरक्षण, प्रदेषण में समन्वयक डॉ. ज्योति प्रसाद एवं कमी आदि पर जोर देते हुए कहा 🛛 डॉ. शिखा प्रसाद ने वेब मॉडरेशन कि पर्यावरण की शद्धता हमारे किया। नाहेप के नोडल लिए बहुत महत्त्वपूर्ण है। अधिकारी डॉ. एसके गुरु के साथ प्रौधोगिको ही वेबिनार में विशेषज्ञों सहित महाविद्यालय डॉ. अलकनंदा करीब 300 प्रतिभागियों ने अशोक ने महाविद्यालय स्तर पर ऑनलाइन प्रतिभाग किया।



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Note:

Open for all faculty members as well as students For Registration the link is as: https://forms.gle/PVRnFnnCgK11uoub7 The meeting IDs will be mailed to registered participants

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Contact Us:

College of Technology

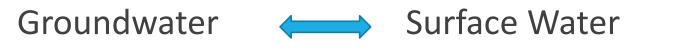
Managing the India's Invisible Resource - The Role of Participatory Groundwater Monitoring and Management at the Village Level

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Groundwater & Environment



Groundwater and lakes

Groundwater is an essential part of the Environment.

Surface water vs. Groundwater

The underground flow can not be controlled;

> Pumping is hard to monitor and control in a country like India

The problem is the excessive use of groundwater

Decentralised resource use and ineffective management

So far, a relatively low level of investment by the government

Groundwater Use

India - 60% of irrigated agriculture and 80% of drinking water rural areas; >50% urban drinking water; >50% of Industry water needs

Denmark – nearly all of water supply; Mexico City, Kabul and many other cities largely depend on groundwater

Green revolution of 1970s – Food security but affected water security

Pumps and drilling technologies

- > We often ignore it or take it for granted.
- > We realise the problem when the well runs dry;
- >No water coming out from the handpump;
- Polluted due to human activity
- Quality is not suitable due to natural processes (Fluoride, Arsenic, Uranium etc) or aggravate the situation due to its over-pumping
- It is a replenishable resource and we need to balance use and

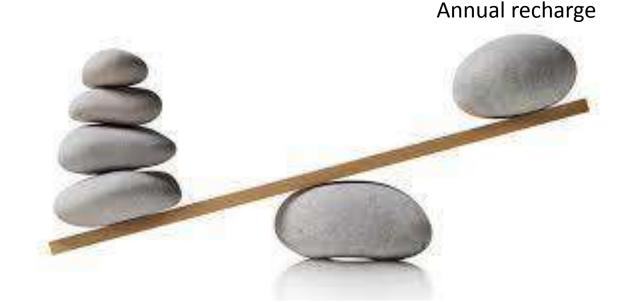
Invisible resource

>When something is invisible – it is hard to communicate

This is one of the challenges with groundwater science and management.

Needs:

- Drinking
- Industries
- Environment
- Agriculture



https://neurohealthchiro.com.au/your-balance-age/

It is a replenishable resource and we need to balance groundwater use and recharge.



MARVI

Managing Aquifer Recharge and Sustaining Groundwater Use through Village-level Intervention



Partnership

Nine organisations:

- Western Sydney University
- Development Support Centre
- Arid Communities and Technologies
- MP University of Agriculture and Technology
- Vidhya Bhawan Krishi Vigyan Kendra
- CSIRO Land & Water
- International Water Management Institute
- Mekong Region Futures Institute
- Carnegie Melon University, South Australia Campus

>30 Researchers + 35 Farmer Researchers (BJs)

Running for the last eight years



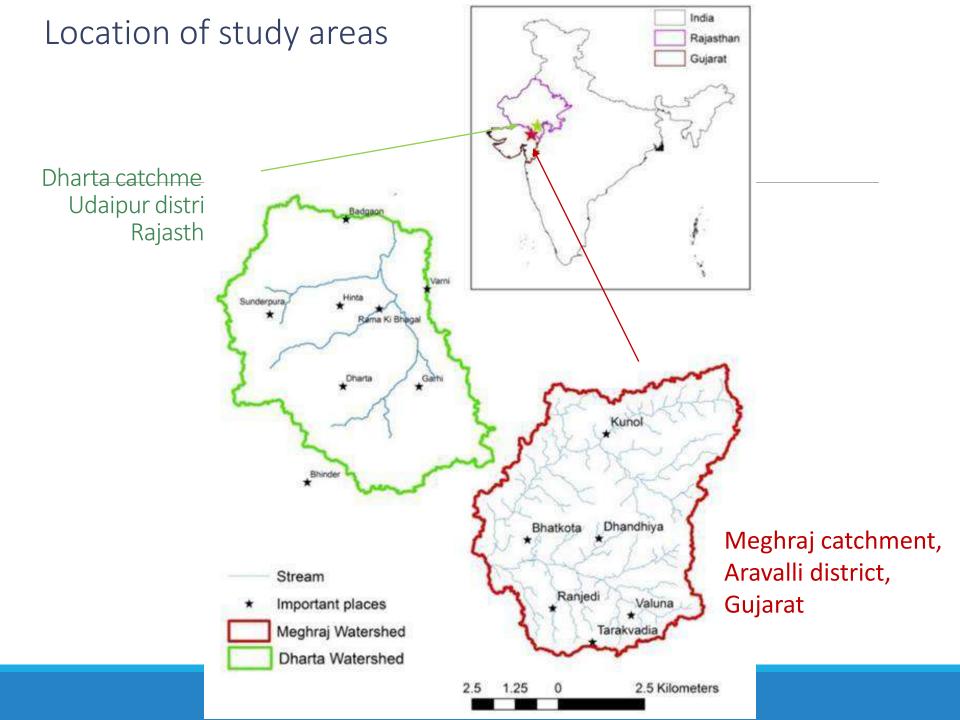
Project team during the visit to the Meghraj Watershed.

MARVI project – Key Activities



- Participatory data collection;
- Sharing information and building understanding;
- Engaging with policy makers, government agencies, GW users and other stakeholders.

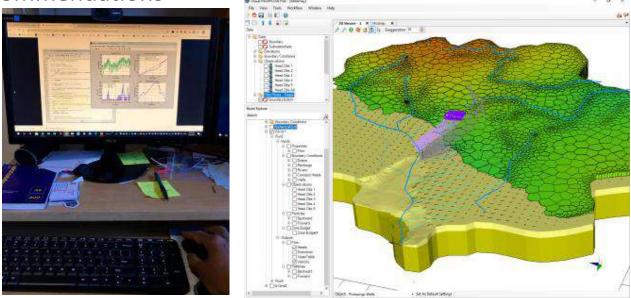
... see Maheshwari et al (2014) MDPI J Water



MARVI project had two options

Option 1:

Data collection, modelling and development of scenarios and recommendations



https://www.waterloohydrogeologic.com/wp-content/uploads/2019/05/Flex_60_withGUIs.png

MARVI project had two options (contd.)

Option 2

>Bring people together to own the problem;

People monitor groundwater and learn together

The develop their own science and strategies and ways to act together







MARVI project had two options (contd.)

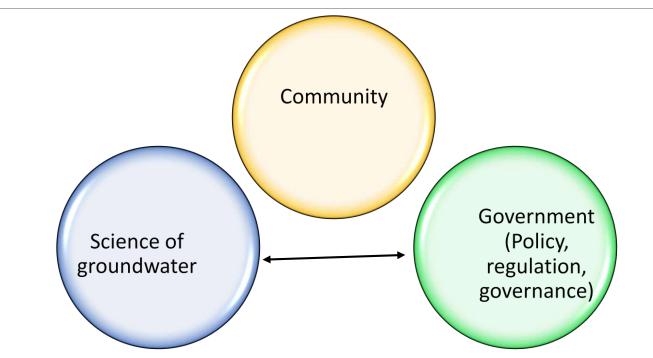
Option 1 was easier but the project would have ended a long time ago.

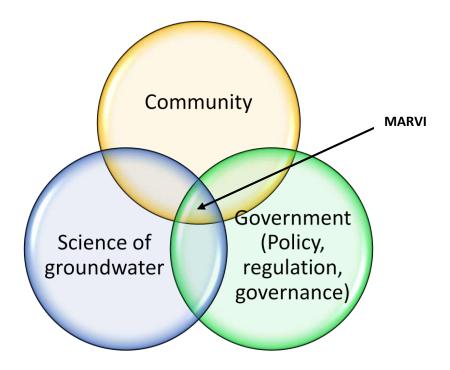
Option 2 was time consuming, requiring patience but has really led to actions by the community. Also, the work is on-going and will get replicated to new areas.

For example: Atal Bhujal Yojaya (Jal Shakti Ministry and the World Bank)

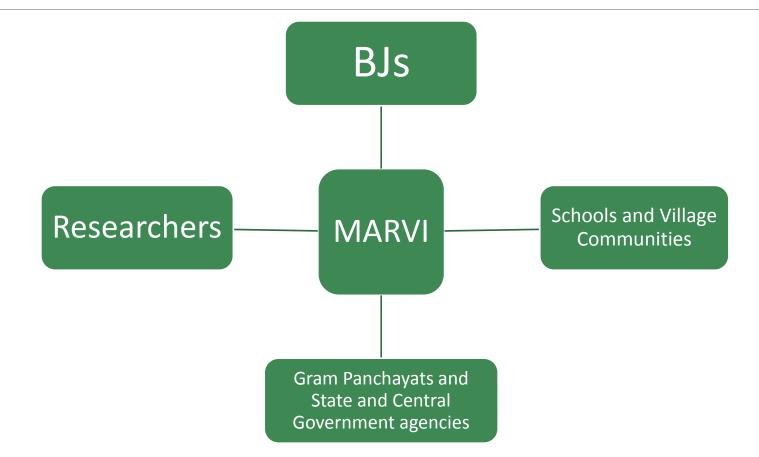
The MARVI Approach

Complexity of groundwater management



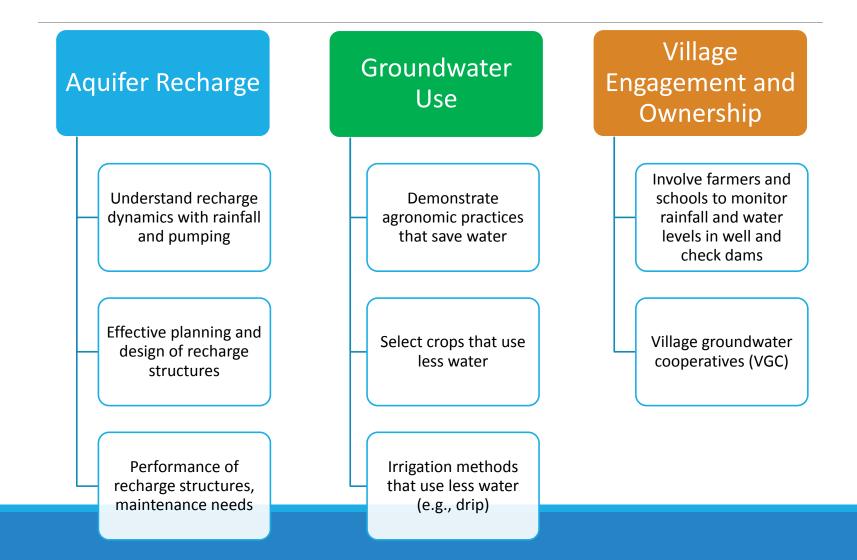


Actors in MARVI



MARVI =

Local management of groundwater, Improved livelihood and Groundwater Sustainability



What did we really do in the MARVI project?

Trained BJs and worked with them on on-going basis;

Collected groundwater depth, rainfall amount, water quality, check dam water level and socio-economic data;

Worked with local schools and community groups;

Worked with Gram Panchayat and State Government agencies;

Developed tools and resources for data collection, analysis and capacity building; and

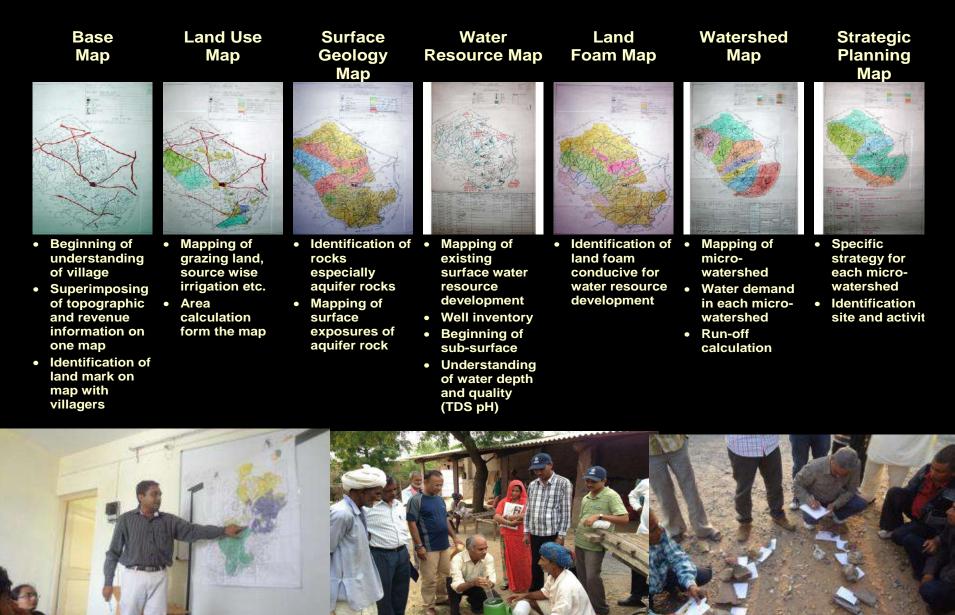
Connected with policy makers at the State and Central Government levels

Bhujal Jankaars (BJs)

- Engaged local volunteers, called Bhujal Jankaars (BJs); Groundwater Informed' (25 +10)
- Trainings: basic hydro-geologic concepts, mapping, watertable and water quality measurements;
- Local champions and interface between research team and community
- Empowered and felt valued



Knowledge Transformation Processes for BJs



Tasks Performed by BJs









Bhujal Jaankars (BJs) were trained in making field measurements and in reporting back to communities

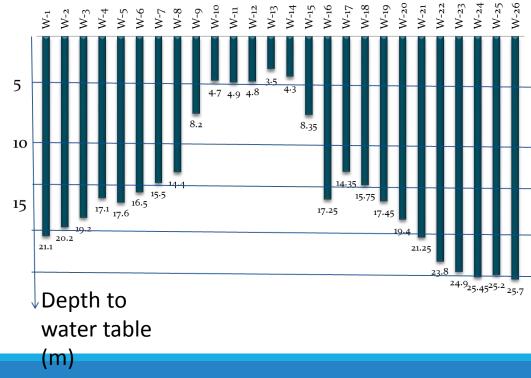


Kookana et al (2016) – gender and education; Packham et al

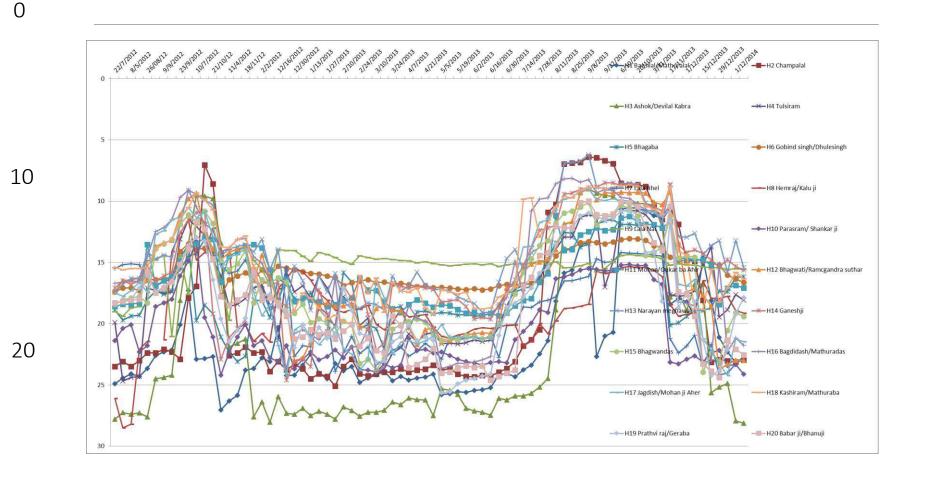
Groundwater monitoring by BJs



Example of Weekly Water Level Fluctuation in Rajasthan from July'12 to Jan'13



Hinta village hydrographs -20 wells Depth to watertable in 20 wells, July 2012-Dec 2014



30 metres

Checkdam monitoring and recharge analysis







Hydraulics of checkdam

Water Balance Equation

$$\Delta V = V_i - V_{i-1} = Q_{in} - Q_{out} - 0.5 * (A_{i-1} + A_i) * (R_i + E_i - P_i) - U_i$$

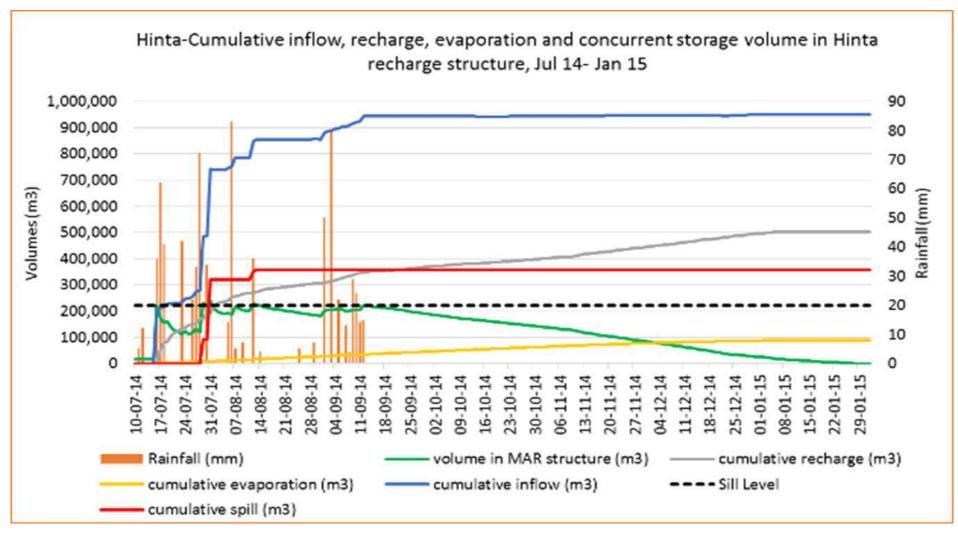
Dry weather Infiltration rate

$$R_i = h_i - h_{i-1} - \overline{E}$$

Spill

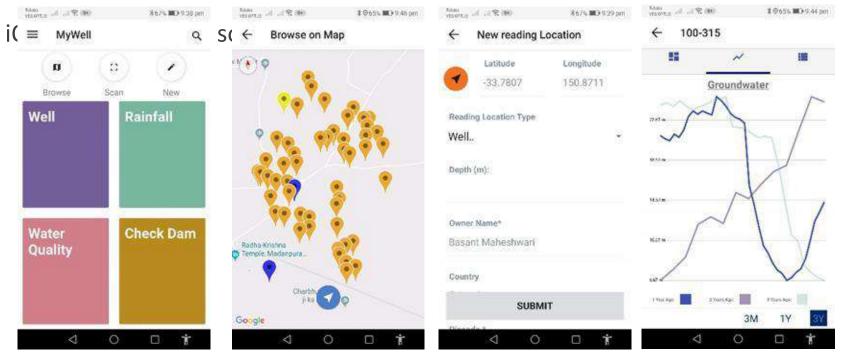
$$q_{out} = C_d B H^{1.5}$$

Hinta 2014

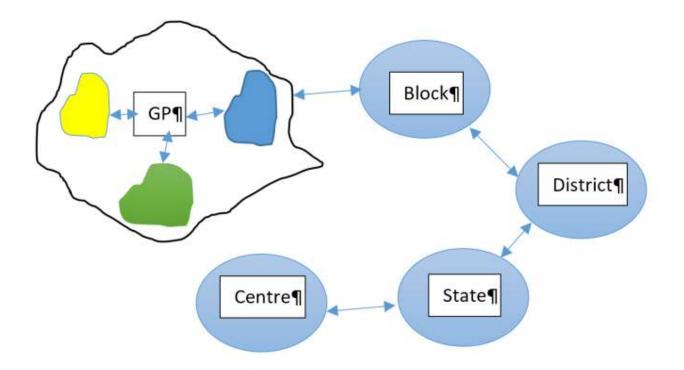


MyWell

Crowdsourcing rainfall, groundwater levels, checkdam levels and water quality data to support VGCs; Android version 2;



Village Groundwater Cooperatives



Key considerations for forming 'Village Groundwater Co-operatives

Facilitate/support VGC groups to succeed

Redirect/redesign government programs to support VGCs

Strategies to reduce groundwater demand and increase supplies through MAR

They will not pump water more than the recharge

They will not be worse off under VGC

Key practical challenges during the initial dialogue

- •Convincing farmers to share and manage groundwater as common resource is the hardest task.
- •Farmers who have groundwater why should I share? How will it benefit me?
- •Those who do not have groundwater they are not clear as to what will they have to contribute for sharing to take place.
- •Some farmers are selling water to a neighbour farmer but this is not the same thing as sharing and managing the resource from commons point of view.

Steps in implementing VGCs

- Monitoring of the groundwater levels by BJs
- •Creating an environment for a meaningful dialogue on groundwater common

Local ownership of the solution

- •Work together to identify local options and strategies
- Create framework for collaboration based on local constraints and needs;
- •Village Groundwater Cooperatives are in principal formed and registered.

- Local actions to increase groundwater supplies and reduce groundwater use
- Necessary support from within VGC members and Government programs organized;
- •Capacity building
- Hand holding to make VGC successful

Local Implementation of the solution

Local ownership of the problem

The Journey to Village Groundwater Cooperatives

- •Initially the farmers believed that if they can drill deeper, they can access more water and didn't care about their neighbours;
- •The MARVI project and Bhujal Jaankaars (BJs: Groundwater informed volunteers) engaged the village communities
- •Farmers realise \rightarrow they are pumping from a common pool resource;
- •The on-going dialogue \rightarrow Villagers started working together.
- •The concept of the Village Groundwater Cooperatives is born!

Achievement so far in forming VGCs

- •Three VGC have been formed in-principal in Rajasthan and one in Gujarat through the farmers' own initiatives. The dialogue for another one in Gujarat is currently underway.
- •The hard work is about to begin to operationalise these VGCs
- Resources for capacity building developed for farmers, BJs, Schools and policy/decision makers
- 2. MyWell app for collecting and disseminating water data in real time (crowd sourcing of groundwater level, rainfall and check dam water level data)

Understanding Co-op formation and governance

State	Village	Cooperative status	Membership (n)
Gujarat	Meghraj	Proposed	≈ 20
Gujarat	Meghraj	Registered	21
Rajasthan	Hinta	Registered	17
Rajasthan	Badgaon	Registered	15
Rajasthan	Dharta	Registered	21
Workshop during April – May 2019			





From coming together \rightarrow Learning together

We moved from our simple idea of training of farmers in monitoring their wells and capacity building for citizen science to 'self realisation'.

We were able to engage farmer for 'social learning'

Learn collaboratively, and
Learn to collaborate in their own social setting

MARVI resulted in change in attitudes of farming communities

Realisation that they needed to 'act in concert' to protect 'their commons'

The final point

Groundwater Commons can do better with effective practice of communication \rightarrow that comes through learning together and acting together.

Conclusions

- Complex problems often require simple solutions. This is very much true for groundwater management.
- The participatory, village level monitoring approach developed in MARVI can empower local community and help develop their own groundwater management dialogue and strategies.
- Communication about what is happening, what can be done and how it can be done is the key with a common pool and invisible resource such as groundwater.
- We need to develop and simplify groundwater science that can be used by farmers and implemented by government agencies.

Conclusions

- •BJs can collect highly reliable information for groundwater level, rainfall and recharge estimation.
- •BJ collected data can be used for communicating village scale groundwater balance analysis and modelling
- •Villagers can find their solutions if they are supported and nurtured.

The MOU signing between MARVI and Jal Shakti Ministry



MARVI Publications



Available for download at http://www.marvi.org.in/books



Australian Centre for International Agricultural Research



^{THE} AUSTRALIAN WATER PARTNERSHIP





Thank You More information: <u>www.marvi.org.in</u>







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