

Tech4Dev Talk

Intro

Hello, I'm Lewis, and I'll be presenting on MyWell: Crowdsourcing Citizen Science for Groundwater Intervention. MyWell is a project where we teach farmers in rural India about groundwater science, and give them the tools to become citizen scientists. The goal of the project is to inspire and facilitate local groundwater champions, powered by data, to intervene in the groundwater situation.

I'm presenting here on behalf of my company, Vessels Tech, and my co-author, Professor Basant Maheshwari, from Western Sydney University.

Before we go any further, let's look at a picture of groundwater scarcity.

Groundwater Story

Hem Raj Bhatt is from the Hinta Village, one of the study areas of our project. He used to work as a driller, digging tube wells for farmers in his village and neighbouring villages. "In the 60's", he says, "groundwater was much more plentiful". You only needed to drill down 7-9 metres before finding water, and these water sources would be replenished naturally each year. [todo: add pic]

You see, farmers in these parts of India used to use Persian Water Wheels to extract the groundwater. With the advent of electricity coming to these villages in the mid to late 70's, what used to take 1 day to pump now took only an hour.

As a result, the water levels have been declining just about each year. The shallow aquifers are no longer replenished, and Hem Raj Ji found himself drilling wells up to 80m deep - with no guarantee of finding water.

He even has a neighbor who committed suicide after drilling 6 deep tube wells and not finding enough water for his grapes.

Groundwater On a Larger Scale

Let's take a step back and look at the groundwater crisis across India. India is the world's largest user of groundwater in the world, estimated to use over 25% of the world's groundwater supply.

Much of India's agriculture is run by smallholder farmers, with access to their own wells, in the form of open or tube wells. It's cheap and easy to access with a diesel or electric pump, and hence suffers from the tragedy of the commons. Every litre of water I pump, I take away from my neighbour, and every litre my neighbour pumps takes away from me. Naturally, this leads to a race to the bottom, where all parties eventually will lose.

So, intervention is required. Existing interventions have seen top-down approaches to groundwater management, where policy makers and scientists go into villages and tell farmers to reduce their water consumption. In typical cases, farmers are skeptical, don't understand the groundwater science, and naturally, don't want to change their ways.

So we need new forms of intervention. Interventions that are bottom-up in approach, where farmers are engaged and empowered with information and understanding of groundwater science. And this is where data comes in. IN our world, data so often is power. Data, combined with education and ____ poses a great opportunity for citizen-led groundwater interventions.

Such a method is called Participatory Groundwater Management, and this is the subject of MyWell's parent project: MARVI.

Project Marvi

Marvi stands for Managed Aquifer Recharge for Village Level Intervention. It's a project led by the Western Sydney University, and aims to build such bottom-up, citizen-led approaches to groundwater management.

Among other things, MARVI went into 13 villages and trained local groundwater champions - known as Bhujal Jankars, or BJs for short. BJs were trained to record groundwater levels in wells around their villages, taught basic groundwater science, and given the tools to go into their communities and share their knowledge of groundwater science and conservation.

It's the BJs job which MyWell aims to augment, by giving them additional tools to record groundwater readings more easily and accurately, as well as providing data and insights into groundwater to any farmer or villager who has access to a smartphone or sms phone.

One of the key outcomes of MAVI was the formation of Village Groundwater Cooperatives. These cooperatives were formed with the purpose to facilitate sharing of groundwater between the villagers, and are fully citizen led, with inputs from [finish]. This marks a significant milestone in the goal of [finish]

The Study Area

The MyWell study area was two watersheds in rural west India, in the Rujarat and Gajasthan states. Inside these watersheds, we looked at 13 villages, and monitored around 150 wells on a weekly basis. This type of data colletion is much more granular than what has been recorded previously in the region.

What is MyWell?

- We see MyWell as the technology component of project MARVI
- It is an application that enables farmers to crowdsource groundwater data.
- It allows farmers to participate in a network of data collectors, and empowers them to understand the science behind their water, and actively be a part of the solution

I'm now going to show you some screenshots of MyWell in action on a smartphone. Please keep in mind that many of these features are also available in text format over SMS messages.

Data driven insights into the groundwater situation

Simple graphs allow for benchmarking wells against one another and previous years

MyWell can be personalized with images of farmers and their wells

MyWell is easy to use. Just fill in 3 fields.

Impact: 3 Steps

The impact of MyWell is a three step process. It starts with farmers or BJs collecting groundwater data using their phones. Then, MyWell aggregates and turns these data into real insights into the groundwater situation. Farmers and BJs then access these insights, which leads to an improved understanding of the groundwater, and better conservation.

Impact: MyWell Empowers Farmers

The real key here is that MyWell aims to empower farmers to be a part of their own solutions.

Impact: Builds Groundwater sharing within communities.

And that MyWell enables groundwater sharing between communities. As I said earlier, one of the key outcomes of MyWell's parent project were these village groundwater cooperatives. VGS need data in order to assess what measures need to be taken, and these data need to be collected in a scalable manner, and insights need to be localised for those communities.

Results: Field Trials + Workshops

I was lucky enough to travel to Megraj and Dharta villages earlier this year with some of the MARVI team.

We ran field trials, gave demos of MyWell in action in workshops, and surveyed 15 BJs about their opinion of using MyWell. In our field trials we went out to a well and recorded a reading (as you can see in the photo), and also got BJs to submit well readings from some paper recordings they had made in the last couple weeks.

This was a great opportunity for us to teach the BJs about MyWell, but also be taught about the ways they interact with technology, and the areas where we can improve MyWell.

Results: Good + Bad

From these surveys, and the conversations we had while watching BJs use MyWell, we came away with the following points:

On the good side; - BJs noted how MyWell can be used to make their jobs easier and more accurate - They saw the potential for how this technology could help with crop planning, and understanding their water needs - They trusted MyWell inherently, (good, but we need to respect and not lose that trust) and loved that the data in MyWell is both secure (it's not going anywhere soon), and accessible

The three main points about MyWell which can be improved are: - We need to translate MyWell into Hindi - it's been on the todo list for a long time, and this workshop really drove home how important it is to get this done - It was difficult to read the graphs inside of MyWell, especially on android phones with small screens. We need to work on ways to make these more accessible, especially to people who aren't used to reading graphs every day. - Finally, there were some minor user interface bugs, which to us might seem trivial, but when we saw the BJs using them, with low technology literacy, they were much more apparent, and in some cases deal breakers for making MyWell usable

Lessons Learned

Aside from the purely functional or technical results, I thought I'd also share just 3 of my own personal takeaways that I hope will encourage some of your work in related fields.

#1 Technology can only do so much by itself

- Technology in and of itself is quite limited. In order for interventions like these to succeed, we need to also target the socioeconomic challenges of groundwater management

#2 Let's not overlook the subject of our interventions

- What I mean here is that as a technologist, we could opt for a highly automated, more accurate and reliable system. But that would defeat the purpose.
- What would it look like if we involved and empowered more people through our work, ... [finish thought]

#3 Be Patient

This one has been critical for me. As a software developer by trade, I work on a much shorter time horizon than most of my colleagues on this project. When a project is 6 months old, it's a dinosaur, and I struggle to find motivation to keep working on it.

MyWell has been a great lesson in patience for me, and I've learned a lot about working in a cross-disciplinary team.

Next Steps: Short Term

In the short term, we're focusing on those translations as I said, as well as improvements to the user interface and user experience

We're also going to trial out an idea that came out of the workshops with using QR codes to identify wells, rain gauges and checkdams. Instead of users having to remember a string of numbers or a location to identify a well, the user can simply scan a qr code (much like PayTM), reducing the number of fields to be filled out from 4 down to 1 or 2. This will hopefully also reduce the likelihood of farmers entering fake or incorrect readings, as they have to be at the well to make these readings.

Finally, we're working on a set of tools to make MyWell more accessible to researchers. Among others, we have a researcher from Flinders University who is trialling MyWell in Laos, and we want to make it possible and easy to adapt this from India to other places.

Next Steps: Long Term

Longer term, we're interested in pursuing partnerships and integrations. This is really the future we see for MyWell, to become a useful tool for Groundwater conservation projects and citizen engagement around the world.

We're already working on an integration with the International Groundwater Resources Assessment Centre in the Netherlands, and this is my chance to say: please get in touch if you're interested in partnering or integrating with our platform.

Sharing of scarce resources is not a problem unique to groundwater, and we're hoping to adapt MyWell and the MARVI approach to other projects where engaging local citizens in being part of the solution to coordinate and share resources is key.

Finally, we've had talks with a number of parties about building out an Open Water Data Platform. If you don't know much about Open Data, it's an initiative much like open source software or open access journals: institutions can freely publish data, and access each others data. We would love to see a platform where organisations who are involved in groundwater research can collaborate and share their water data, reducing the amount of institutional silos, and hopefully enabling more learning from each other and application of different ideas and innovations.