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A Feminist Analysis of Women Farmers Navigating Groundwater Qualities in Maharashtra, India

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ABSTRACT: It matters whose practices and knowledges are foregrounded in understanding and managing groundwater. This paper presents the findings of an ethnographic study of a relatively recent irrigation scheme that brings polluted water to farmers' fields in a drought-prone area of Maharashtra, India. After establishing that women farmers are the de facto water managers at household, field, and community levels, we use these findings to compare women farmers' ways of doing groundwater with the dominant techno-managerial versions. Techno-managerial versions of groundwater make it appear to be either an optimizable input for crop production or a source for drinking and domestic uses. Women's practices reveal that groundwater resists such classifications. Because of how it flows, seeps, and percolates, the polluted water earmarked for irrigation contaminates groundwater destined for other purposes. Rather than coming in neatly separated flows or containers, separating waters entails hard work and detailed knowledge. This is work that largely falls on women: they need to learn to appreciate and distinguish between water qualities as the basis for deciding which water to use for which purpose. Our analysis underscores the importance of valuing this unremunerated and invisibilised work in water management. It also shows how feminist analyses contribute to and expand understandings of justice and sustainability in groundwater.

KEYWORDS: Groundwater quality, women farmers, knowledges, feminist theory, Maharashtra, India

INTRODUCTION

Sunita welcomes us (the first author and her translator) into her house as we are walking through Pravah for the first time.[1] Pravah is a drought-prone rural village – receiving less than 350 mm of rain per year – located south-east of the city of Pune in Maharashtra, India (Figure 1). As we approach Sunita's house, we notice different tanks and jars for storing water: a big blue plastic tank is placed just outside the main entrance, covered with a cloth; a smaller stainless-steel jar is placed on the kitchen ground; and an even smaller jar sits on the kitchen bar next to the cooking utensils. This small jar is covered with a plate, with a glass on top of it. It is a hot day in January 2020, and we are thirsty. Sunita takes two glasses from the shelf, and she fills them with water from the smallest jar, using the glass on top of it. "This is filtered water", she is keen to specify. "We [meaning she, her husband, and her children] don't drink the water from the well. It is bad and full of chemicals because of the Purandar water". 'Purandar water' is how farmers in Pravah refer to the water they use for irrigating their farms outside the monsoon season.

Since around 2009, the Purandar water is transported to Pravah by an irrigation system called the Purandar Lift Irrigation Scheme. Designed and constructed by the Government of Maharashtra in the early 2000s, this scheme aims to provide relief from what the government refers to as 'water supply problems' in 60 villages of the Purandar sub-district, south-east of Pune (GoM, 2018). One of the government's main ambitions with the scheme is to offer "farmers latitude to change their cropping patterns to suit market demand" (GoM, 2018).

The scheme transports water that is pumped up from the Mula-Mutha River, which serves as drain and sewer for the city of Pune. While flowing through the city, the river collects (mostly) untreated water from the urban sewer system as well as industrial effluents from, among others, manufacturing industries, construction sites, automobile garages, and hospitals (Jagtap and Manivanan, 2019). For this reason, the Government of Maharashtra refers to the Mula-Mutha River water as "wastewater" (GoM, 2018); the Purandar water delivered to Pravah, and to other villages, is highly polluted (Jagtap and Manivanan, 2019).

The functioning of the scheme is regulated by the Maharashtra Water Resources Regulatory Authority Act (GoM, 2005a) and by the Maharashtra Management of Irrigation Systems by Farmers Act (GoM, 2005b). Both these acts form part of agricultural and water policies that can be characterized as neoliberal in their prioritization of market mechanisms for allocating water, actively concentrating the entitlements or water rights "in the hands of those considered productive and economically efficient" (Joy et al., 2014; see also Kulkarni, 2018).

Those farmers who can afford it submit their demand for this water to the Irrigation Division of the Water Resource Department as soon as their wells – shallow dug wells constructed to collect groundwater to be used for irrigation – are almost empty, which occurs as a function of the intensity of the monsoon rains. After farmers have paid for the water they requested, the Purandar water is transported through a system of pumphouses and closed pipelines to the different villages (Figure 2) (Leonardelli et al., 2022). It is released through gravity into private earthen ponds that farmers have dug. From these ponds, the water slowly percolates into their wells. Once the wells are filled, farmers pump it up and use it for irrigation. Yet the Purandar water released into the ponds does not just (re-)fill the wells; it also mixes with the groundwater of the village's shallow aquifer (Figure 3). This is the very aquifer that women like Sunita rely on as a source of water for bathing, cleaning, washing, and drinking.

[1] Pseudonyms are used for all personal and place names to protect the identity of the research participants.

Figure 1. Map of Pravah: where it is located in Maharashtra, India. Drawing: Sneha Malani.

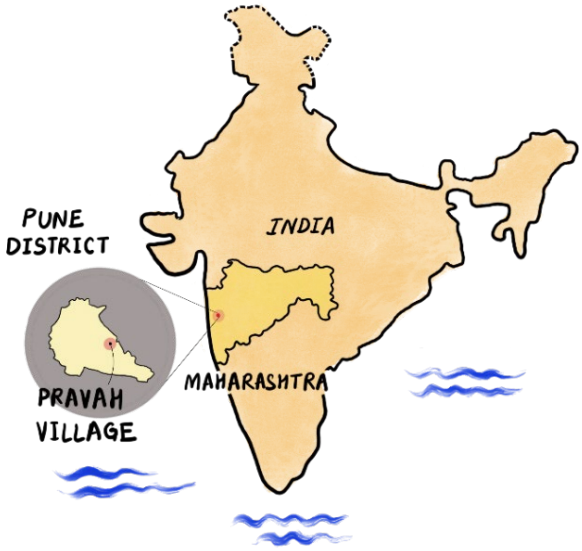


Figure 2. The Purandar lift irrigation scheme lifts polluted water from the Mula Mutha River.

Source: Drawing by Irene Leonardelli, based on official maps and documents describing the infrastructure and on 'guided walks' with farmers in Pravah, February 2020.

This paper presents how women farmers like Sunita practice groundwater management. Understanding groundwater based on women's practices is important because in rural Maharashtra, just as in most of rural India, it is women who – at household and increasingly at farm and community levels – are the ones who bear the most responsibility for various types of dealings with water (cf. Ahmed, 2005; O'Reilly, 2006; Mitra and Rao, 2019). In addition to the well-recognized tasks of providing water for domestic uses (bathing, cooking, cleaning, drinking, etc), rural women are also increasingly performing most of the everyday farming work, including the tasks of irrigation. This is because their husbands and other male family members (e.g. sons, nephews, uncles) often work for wages in nearby towns.[2]

[2] This points to what has been called the ongoing 'feminization of agriculture', a phenomenon describing how women play an increasingly central role in farming both as agricultural labourers and cultivators, while their access to land rights remains very limited and framed within a patriarchal system that carries strong class and caste connotations (Pattnaik et al., 2018).

Figure 3. A pond filled with Purandar water located next to a well in Pravah. Polluted water percolates from the pond into the well.

Photo: Irene Leonardelli, February 2020.

Our analysis starts from the conviction that an understanding of groundwater based on women's practices will be different from one that is based on the practices of male farmers or government-employed managers. This conviction stems from feminist critiques of the idea that detachment, distance, and disembodiment guarantee objectivity. By acknowledging that all knowledges, even scientific ones, come from specific places and people, scientific measurements (definitions, methods, conceptualizations, etc) cease to be neutral or innocent reflections of a reality-out-there. Instead, they actively help produce this reality – or help enact it into being (Mol, 2002; Haraway, 1988). To put it in the words of Haraway and others, "It matters what stories tell stories; it matters whose stories tell stories" (Haraway, 1989, 2019; also see Harding, 1986). Particular enactments (scientific or policy representations) of groundwater help make some concerns (and works) present, visible, strong, and real, while rendering others absent, invisible, weak, or less real (see Zwarteveen et al., 2017; Moser, 2008).

Although there is some literature addressing the conjunctive use or management of surface- and groundwater (see, among others, Shah, 2006; Zhang, 2015), and though there are projects that are intentionally designed for multiple – combined – (domestic and productive) uses (cf. Sharma et al., 2010; Sivakumar, 2013), contemporary science-policy treats groundwater either an optimizable input for crop production or as a source of drinking and domestic water. Especially for the first treatment, its market value is an important descriptor. In this techno-managerial version of groundwater, those using groundwater to irrigate their crops first and foremost appear (and are treated) as profit-maximizing individuals (cf. Kulkarni, 2018). This version of water (and of irrigating farmers) is made 'real' within specific networks of practices that bring together texts (policies, bylaws), technologies (pumps), infrastructures (canals and pipes), institutions (rotation schedules, divisions of roles and responsibilities) and much else (cf. Law, 2002; Mol, 2002; Mol and Law, 2002; Latour, 2005; Ballestero, 2019). As we show in the paper, this techno-managerial, neoliberal-inspired enactment of groundwater crucially depends –

at least partly – on the separation between water used for irrigation and water used for other purposes, and on a definition of farming as a productive market-oriented activity. In this particular enactment of groundwater, water quantity is often prioritized over quality.

The insistence that scientific knowledge does not just reflect realities but helps bring them into being creates methodological-political space for acknowledging and imagining other possible enactments, other versions, of groundwater. In this paper, we want to explore that space. Hence, our choice to foreground women's ways of doing water as the basis for knowing groundwater is also a political one (Boelens et al., 2016; Lahiri-Dutt, 2020; Zwarteveen et al., 2021). It is animated by the conviction that transformations to groundwater sustainability require actively enacting other versions of it than the dominant techno-managerial ones, telling and mobilizing support for other groundwater stories (cf. Zwarteveen et al., 2021). As feminist researchers have argued, the practices and vantage points of the politically or economically marginal – of those who are somehow marked by their difference from the norm – are particularly interesting for producing such stories (Haraway, 1988).

Our effort in this paper, then, is a conscious attempt to situate (Haraway, 1988) or ground the practice of knowing groundwater (Powis, 2021; Zwarteveen et al., 2021; Barreteau et al., 2022) – in our case, in the practices of those responsible for dealing with and managing it on a day-to-day basis: women farmers. We use the category 'women farmers' without analytical pretensions. It is how the people we engaged with during our fieldwork in Pravah identified themselves. The category provides a pragmatic empirical starting point for our analysis, helping to make sense of different gender labour and power relations. Theoretically, we adhere to an understanding of gender as a fluid, 'performative accomplishment' (Butler, 1990), recognizing – throughout our analysis – how it intersects with class and caste[3] to produce different subjectivities.

Two theoretical considerations guide our exercise. First, we do not treat women farmers and water(s) as separate entities that exist in isolation or that existed before their relationship with each other. Instead, we make a conscious attempt to acknowledge how 'women' and 'water' co-become or 'become with' (Haraway, 2008) each other. Hence, rather than considering the qualities and capacities of either water or women as intrinsic or innate, we conceptualize them as relational effects of their sometimes contingent coming together (Barad, 2007; Lavau, 2013; Lorimer, 2007; Neimanis, 2013; Ballestero, 2019). Water and women give each other being in a dance of agency (Pickering, 2009; Law and Mol, 2008). Gender roles and responsibilities, practices, knowledges, and bodies, and thus women's subjectivities as women and as farmers, are continuously re-articulated through how women engage with water and with others (including men, field officers, doctors, practitioners, and researchers as well as pieces of infrastructure, animals, algae, and much else) through water (cf. Harris, 2006; Bossenbroek and Zwarteveen, 2018).

The second and related theoretical consideration stems from a desire to better account for and acknowledge (ground)water itself as an agent or actor in this process of co-becoming (cf. Strang, 2014; de Laet and Mol, 2016; Powis, 2021). Proposals of post-human scholars to move beyond conventional nature-culture, subject-object, or matter-meaning divides (Haraway, 2003; Barad, 2007) and to re-think the relation between the behavior of groundwater and that of people are part of our inspiration here (cf. Powis, 2021). These, for instance, suggest an interpretation of the oft-repeated observation that water is capricious as water manifesting its – at least partial – escape from human intentionality. Acknowledging that water tends to escape or overflow attempts to categorize, classify, or control it (cf. Callon, 1998*;* Domínguez-Guzman, 2021; Leonardelli et al., 2022) has prompted some scholars to suggest that there is

[3] In India, a person's caste is determined by birth. Besides occupation and access to resources and power, castes define behaviours, spaces, and much else. People belonging to Scheduled Castes have been economically, politically, and socio-culturally marginalised throughout Indian history (Gnana, 2018). Importantly, the caste system interweaves with patriarchal institutions and social classes: in rural areas, (single) women from Scheduled Castes are often the poorest and most discriminated against (Agarwal, 2003; Kulkarni and Bhat, 2010).

merit in adopting a 'going with the flow' approach to knowledge generation (cf. Pickering, 2009; Lavau, 2013). Loosening settlement and certainty, such an approach moves toward treating groundwater flows and aquifers as companions in (rather than subjects of) knowing and doing water (cf. Haraway, 2003; Neimanis, 2013; Strang, 2014; Bourguignon et al., forthcoming). This approach inspires our analysis.

In the rest of the paper, we narrate the water practices of women farmers across caste and class as the starting point for understanding how (ground)water flows into and out of categories (such as productive and domestic water, surface and groundwater, clean and polluted water), depending on where, when, and how it moves, as well as by whom and how it is engaged with and made sense of. Our empirical material helps to reiterate the fundamental role that women play as water experts and managers at household, farm, and community levels. It makes visible much of their largely unremunerated labour – labour that remains invisible at higher levels of water management (for instance at the level of policy making and infrastructural planning). More generally, zooming in on the water work and knowledges of women like Sunita complements but also troubles more conventional techno-managerial understandings of groundwater – many of which centre on mapping and understanding changing quantities (cf. Zwarteveen et al., 2021).

The rest of the paper is structured as follows: after briefly describing our research methodologies, we zoom in on women farmers' engagements with groundwater in Pravah. We first outline how the availability of Purandar water changed their farming practices, re-articulating their roles and responsibilities. Thereafter, we focus on women's ways of navigating and dealing with the changing groundwater quality in and beyond the farm as a result of infiltrations of polluted water into the shallow aquifer. We show how decisions about how to deal with groundwater contamination vary importantly across caste and class, with women belonging to poorer households having to sacrifice health, hygiene, and taste for the sake of affordability. We conclude the paper with some reflections on what can be learned by seeing groundwater through foregrounding women's ways of doing groundwater, and how these vary across class and caste. Different from techno-managerial versions or enactments of groundwater, this version foregrounds the inseparability of agricultural and domestic water, as well as of agricultural and domestic work, simultaneously underscoring the importance of (ground)water quality as a dimension of sustainability and equality. Addressing this version in water policy and planning may help to foreground the struggles and well-being of different groups of people as well as cattle, aquifers, and much else, rather than focusing on the well-being of a few privileged actors.

METHODOLOGICAL NOTES

The stories recorded for and discussed in this paper draw on the ethnographic work that the first author (Irene) conducted in Pravah from December 2019 to March 2020 and in March 2022.[4] She was accompanied by Isha and Janhvi, two Marathi-English translators that worked with her during the two different periods of fieldwork respectively. We engaged with about forty women farmers belonging to different class and caste groups. 'Guided walks' were used as the main qualitative research tool (Kusenbach, 2003): accompanying women in their day-to-day activities as a feminist methodology to document – in a grounded and situated way – their different ways of knowing and dealing with (ground)water in and beyond the farm. Amongst other activities, we followed women on their farms; went with them to different water sources; and spent time with them at home, observing and conversing about their daily practices. All observations and conversations were either recorded or noted through detailed field notes, sketches (such as the maps included in this paper), and photos, after obtaining the participants' (verbal) consent.

[4] Irene had to leave the field unexpectedly at the end of March 2020 due to COVID-19, but she remained in contact with women farmers in Pravah by phone and returned to Pravah in March 2022.

Seema and Sneha (the third and fourth authors) often visited Pravah and supported Irene and her translators in the data collection. The analysis and discussion presented here emerged through conversations among all co-authors, who have different research-activist backgrounds and experiences working on issues around water and agriculture from a feminist perspective in India as well as in other rural areas of the world.

A NEW SOURCE OF WATER: RE-ARTICULATING FARMING PRACTICES AND GENDER ROLES

As long as local people can remember, farming has been the main income-generating activity in Pravah. Even though nowadays not everyone farms, both men and women in the community continue identifying themselves as *shetkari* (farmers). The size of land holdings varies significantly among different people and households, but most farmers own less than two hectares of land. Members of upper castes are the wealthiest and own the largest plots of land. Members of a less wealthy and historically nomadic-pastoralist caste live and farm on small plots of land about 1 km away from the main village. About one third of the people living in Pravah belong to Scheduled Castes and live in a specific part of the village separated by the main road. Scheduled Castes' people are also – not surprisingly – less wealthy than upper-caste people and, although their land is used for grazing and for collecting firewood, most of it has remained barren and uncultivated for years, as they do not have the financial means to invest in farming.

Before the implementation of the Purandar Lift Irrigation Scheme, which started functioning around 2011, the farmers of Pravah used to practice rain-fed agriculture during the monsoon season. After the monsoon, they would cultivate small portions of land using the little groundwater available in their wells, growing traditional crops such as *bajra* (pearl millet) and *jowar* (sorghum), chickpeas, garlic, chilies, and a few vegetables for their own consumption. In most years, the wells would run dry around January or February. As farming would not yield enough income to sustain their livelihoods, both men and women across castes complemented working on their own farms with employment as agricultural labourers or as wage workers in industries or in government-sponsored employment schemes in nearby villages and towns.

The Purandar Lift Irrigation Scheme makes it possible for an ever-growing number of farmers to increase their irrigated area and cropping intensity. Hence, those farmers who can afford it now also farm in the dry season. The additional water has also prompted many of them to expand the area cultivated and to complement the cultivation of traditional crops for their own consumption with cash-crops such as flowers, vegetables, and fruits, which they sell at markets in Pune and other nearby cities. Men across castes nevertheless continue to work as wage workers in factories and construction companies in nearby towns, thereby supplementing farm incomes. They only go to their farms in the evenings or during the weekends. While men do take care of constructing and maintaining the irrigation infrastructures and selling the harvest, the bulk of agricultural work in Pravah is done by women (for a detailed analysis of this, see Leonardelli et al., 2022).

The newly available Purandar water increases farming opportunities and improves the economic well-being of farmers in Pravah, or at least of those households that can afford to buy the water; construct and maintain the wells, ponds, pumps and pipelines needed to make use of this water; as well as purchase agricultural inputs. Hence, farmers belonging to upper caste households in particular are benefitting from the scheme. Yet as Purandar water percolates into the shallow aquifer through the earthen ponds, it also recharges, at least to some extent, the wells of other farmers: the shallow aquifer does not discriminate on the basis of caste and class. This means that even some of the farmers who cannot afford to buy it indirectly benefit from the Purandar Scheme (see Leonardelli et al., 2022). This is also how a few women farmers belonging to Scheduled Castes have started cultivating cash crops: the fact that their wells are suddenly filled with more water allows them to farm on small plots of land that used to be used only for grazing. For instance, Archana, a woman farmer of a Scheduled Caste, is now cultivating fenugreek, lady's fingers, and onions on a relatively small plot of land (about half an acre) – partly to sell at the market and

partly for her own household's consumption – thanks to the Purandar water that percolates into her household's well from a pond located nearby that is owned by a well-off household belonging to an upper caste.

The increased availability of water for irrigation significantly impacts intra-household and intra-community gender relations. Women assume new, and more, farm responsibilities compared to in earlier years (Leonardelli et al., 2022). For instance, Nisha – who belongs to an upper caste – continues to sow the vegetables and spices that she uses for cooking in between the rows of flowers she now cultivates for the market. This is how she makes sure that crops used for her household consumption also benefit from drip irrigation. Most women recognize that their work burden is increasing, but many refer to their new farming roles and identities with pride and joy. For instance, Sunita explains that she enjoys taking care of the farm and is happy with her increased influence in the management of her time and in deciding how farming revenues are spent:

> Before we started buying the Purandar water, the little money I was earning as a wage worker, I would give to my husband. (…) Nowadays I can keep the revenues we make by selling milk. I work all day, but I am much happier to work on my own farm than as a wage worker outside the village. This way I have much more freedom to manage my time.[5]

This short introduction to how the new availability of extra water reconfigured the Pravah waterscape helps establish not only how water and women farmers co-become, but also shows how new irrigation water – because of how it flows and percolates – escapes, exceeds, or indeed overflows categories and classifications (cf. Callon, 1998*;* Domínguez-Guzmán, 2021; Leonardelli et al., 2022), at least (partly) resisting human intentions. After all, Purandar water does not just fill the wells of those who have paid for it, but also those of some others – depending on where their wells are located vis-à-vis underground water flows. In what follows, we further elaborate these two points, but move our attention to water quality. As the Purandar water meets and mixes with groundwater through percolation, it transforms not just availabilities and quantities of groundwater in Pravah, but also qualities. Women become aware of this in different ways, as they engage with groundwater both in and beyond the farm, using it for other purposes than irrigation. We show how women get to know and assess different levels of groundwater contamination in Pravah as the basis for deciding which waters to use for which purpose.

WOMEN FARMERS NAVIGATING GROUNDWATER QUALITY

Sick animals, organic matter, and unwanted weeds

One direct way through which women assess water quality is by paying attention to the health of their animals. Several women across castes have noticed that their animals get sick when they drink the Purandar water directly from the ponds where it is stored or from the nearby wells in which it mixes with existing groundwater. Especially those women who spend a lot of time with their goats, such as the members from the nomadic-pastoralist caste, observe how the health of their animals deteriorates after each time the Purandar water is delivered to the village. This forces them to seek advice from veterinarians and purchase medicines for their goats – if they can afford it – or spend additional care and time to prevent the goats from drinking directly from the ponds where the polluted water is stored.

Another way through which women across castes get to know groundwater quality is by paying attention to how the water they use for irrigation impacts the growth of plants. The nutrients that the Purandar water contains do not only boost the growth of the crops; it also triggers the growth of much less-wanted weeds. To deal with this, women have to do more weeding work, spending long hours under

[5] Interview Sunita_23March2022

the hot sun to remove whatever prevents the crops from prospering. They have also resorted to using more herbicides and pesticides. Sunita explains:

> Before, during the rainy season, there was only one type of weed on the farm, which used to grow with the rain. Nowadays, because of this water, many different types of weeds are growing throughout the year, so we [women farmers] have to do much more weeding work.[6]

Ushpa, a woman farmer belonging to an upper caste, shows us a bunch of weeds populated by little worms and insects. Since they started using Purandar water, she and her husband have had to buy and use more pesticides and herbicides to prevent the insects and weeds from damaging the crops. This suggests that the use of these chemical products further contaminates the soil as well as the aquifer, making it even more difficult for women to find waters of good enough quality for washing, cooking, cleaning, and drinking and risking an increase in their exposure to toxic substances.

Another aspect of water quality that some women cannot fail to notice has to do with how the organic matter that the Purandar water contains favours the growth of algae, which in turn causes the clogging of their drip emitters. The most well-off farmers of Pravah (mostly those belonging to upper castes) use drip irrigation systems to irrigate their crops – especially flowers. The drip pipes are connected to a small filter that is supposed to purify and clean the water before it flows through the drip lines. Yet these women farmers notice that the filter does not block smaller sediments and organic matter, which therefore end up blocking the discharge of water through the tiny drip emitters. Padma, a widow farmer belonging to an upper caste, explains:

> Before planting the flowers and installing the drips to water them, we [she and her husband] need to wash the drips with a specific acid, because the Purandar water is full of things that plug the drip lines, so drips need to be washed carefully before being re-used or they won't work.[7]

After each cropping cycle, the organic matter in the drip lines is dissolved with an aggressive acid detergent, a task usually carried out by women. Another way in which these women prevent the drip emitters from getting clogged is by constantly monitoring them: they walk along the drip lines to ascertain that the emitters release water. As soon as they notice that an emitter is clogged, they clean it with a small, sharp stick. Savita, a woman farmer belonging to an upper caste, uses a safety pin for this that she keeps attached to her wedding necklace. All women wear a safety pin, as they also use it to shorten and adjust the saree while they are working.

The Purandar water intended and provided as an optimizable input for crop production mixes and mingles with other waters, creating challenges not considered by public irrigation managers or in irrigation policies. Women are among the first to face these challenges. By observing how the groundwater that they pump from the irrigation wells affects the health of their animals, accelerates weed growth on their farms, and impacts the infrastructure they use for irrigating, women farmers understand that the Purandar water is not just a life-giving source for plants but also 'dirty', 'polluted', and 'dangerous'. This means that, through experience, they learn how different waters are connected and mix. In conversations with them, they are quick to draw attention to the change in the quality of the local aquifer's groundwater – as found in the well from which they used to drink directly – before and after the implementation of the Purandar Lift Irrigation Scheme. Women know that irrigation waters and domestic waters are not separate, but that separation requires work. This work – the careful sifting, selecting, and treating of waters – largely falls on them. In this way, the Purandar water used for irrigation does not just increase possibilities for crop production, but also forces women to become water quality

[6] Interview Sunita_23March2022

[7] Interview Padma_12March2022

managers. This emerges even more clearly when looking at how they engage with water in their daily life beyond the farm.

Looking at, smelling, and tasting groundwater

As Purandar water infiltrates the shallow aquifer, polluted water mixes with groundwater. This has complicated the task of finding and accessing water that is clean enough for drinking and other domestic purposes. Before the Purandar Lift Irrigation Scheme was operational, women across castes in Pravah used to go and fetch water for drinking, cooking, washing, and bathing at the main public dug well of the village. This well is called *Sakarbai*, which is Marathi for 'sugar Lady'. Bhavana, a woman farmer belonging to an upper caste household, explains that the well has this name because "its water used to be clean, fresh, and sweet. It used to taste like coconut water". She adds: "Even in summer, when we used to climb down the well to get whatever water we could find, the water was very good".[8] Yet at the end of the monsoon season, Sakarbai would run dry, forcing women to find water elsewhere. Older women narrate how they had to walk long distances to fetch water from other villages. In the early 2000s, the state government started delivering drinking water to the village through tanker trucks.

Around 2011, when the Purandar Lift Irrigation Scheme started functioning, Sakarbai's water changed. Women farmers across castes recount how the water suddenly became dirty and turbid; its colour became greenish; its smell and taste, unpleasant. Bhavana explains: "She [Sakarbai] was really badly affected by the Purandar Upsa water. It's not her fault, but her water became disgusting".[9]

This is how the Purandar scheme is making household water management more difficult. Women have had to learn to assess which waters are suitable for which domestic uses by paying careful attention to the colour, smell, and taste of water at different water sources or moments in time. By prudently observing where and when cleaner waters can be found, they have started developing an understanding of how different flows of water travel through and mix in the aquifer, creating different levels of contamination in different places and at different moments. Hence, they have noticed that the wells located just next to the ponds where the Purandar water is stored are the most polluted, especially just after this water is delivered to the village (Figure 4).

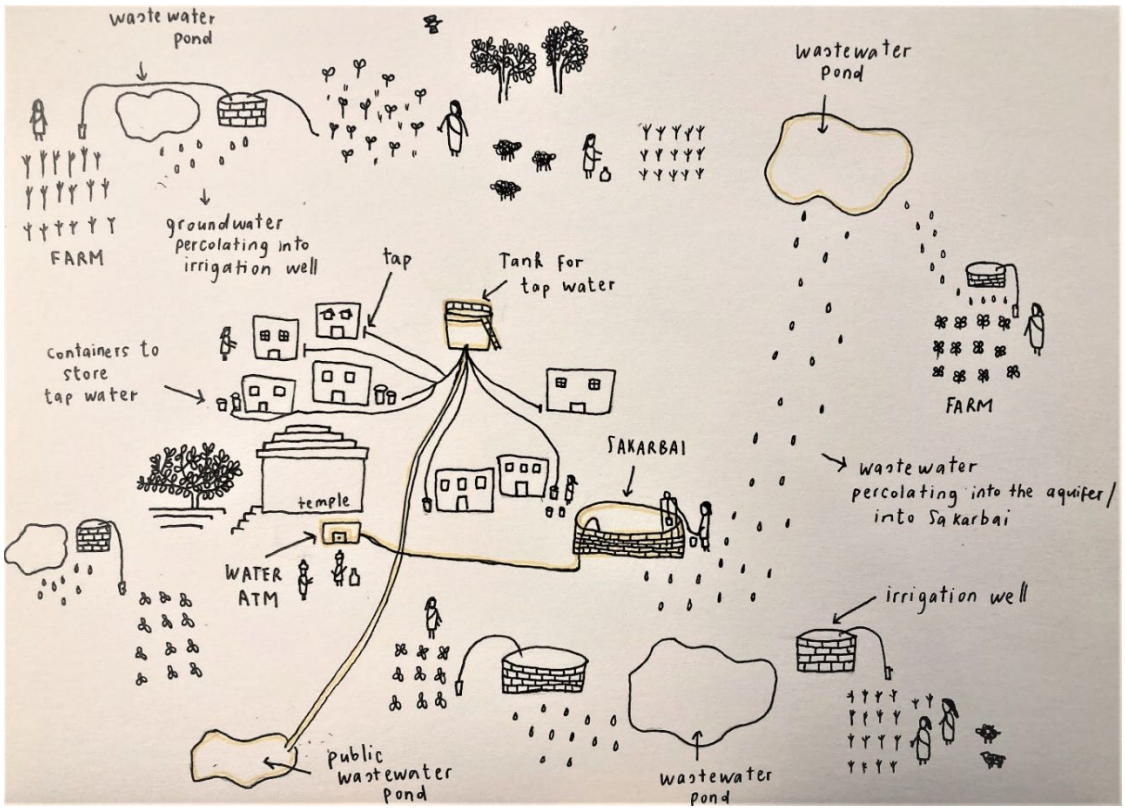
The wells located farther away from these ponds, in contrast, contain water that is cleaner or less polluted. Women also note how the quality of the water improves as a function of the time that passes after the Purandar water reaches Pravah. In their understanding, this is because the soil – at least partly – purifies the water, acting as a filter. In addition, or so they reason, the flow of polluted water gets diluted as it mixes with groundwater when it travels over a longer distance through the aquifer. Women therefore relate differences in groundwater quality to the distance and time that the Purandar water spends flowing through the aquifer. They thus consider Sakarbai's water as less contaminated than the water in the upstream wells that they use for irrigating. In their understanding, this is because Sakarbai gets recharged by a mix of groundwater – the sweet, clean water that used to characterize her – and Purandar water that percolates from ponds located a few hundred meters away and uphill from Sakarbai. Still, while Sakarbai keeps her name, her water is no longer as sweet as it used to be.

Women farmers base their appreciation of different water sources on this understanding, using it to decide which waters to use for which purpose and whether or not to treat it before use. The cost of water figures prominently in these decisions: which water or treatment or filter system they can afford and how much time they need to fetch the water co-determine their choices about which water source to rely on for which purpose. This is how access to different kinds of water is both a function of their position in intersecting relations of caste and class, while also partly reproducing caste and class differences.

[8] Interview Bhavana_28February2020

[9] Interview Bhavana_28February2020

Figure 4. Water sources in Pravah, where women navigate different levels of contamination.



Source: Drawing by Irene Leonardelli based on 'guided walks' conducted with women farmers in Pravah, February 2020.

For instance, soon after the scheme started functioning, the people of Pravah – in consultation with local health officers who measured water quality – deemed Sakarbai's water unhealthy to drink. Around 2011, the *Gram Panchayat* [village council] arranged the transportation of water tanks from a nearby village: those who could afford it (mostly people belonging to upper classes) would buy and drink only this water. Simultaneously, they agreed to disinfect Sakarbai's water with a purifying product to limit the health damages for those who could not afford to pay for other sources of drinking water. This would also allow everyone to continue using Sakarbai's water for other domestic purposes. Eventually, around 2017, the Gram Panchayat installed a water purification technology, a machine that pumps up and filters Sakarbai's water through a reverse osmosis system (commonly called a water ATM). This machine is located just behind the main square of the village (Figure 5). The contaminated groundwater of Sakarbai is transformed into drinking water: not only the pathogens, but all micro-organisms and minerals get removed. Bhavana tells us that while this water may be the cleanest of the village, it is also very "poor", and "it does not taste like anything".

People use the filtered water cautiously, as they have to pay for it (about 5 INR [0,6 Euro] per 20 litres): the revenues serve to cover the costs of the operation and maintenance of the machine. Women go and buy this water, filling small jars of it. They store this water in a specific corner of the kitchen so that all members of the household know that it is precious filtered water. Those who can afford it – mainly those who belong to upper castes, including Bhavana and Sunita – also use filtered water for cooking, because they think it is the safest water in the village. Yet most women farmers continue to fetch groundwater at Sakarbai's well on a daily basis: they filter it through a plastic sieve after fetching it, boil it, and use it for cooking (Figure 6). For them, it would be too expensive to buy filtered water at the water ATM for cooking also.

Figure 5. A woman buying filtered water at the water ATM installed in Pravah to purify Sakarbai's water.

Source: Photo by Irene Leonardelli, October 2022.

Figure 6. A woman fetching water at Sakarbai and filtering it through a plastic sieve.

Source: Photo by Irene Leonardelli, February 2020.

Only members of the less privileged nomadic caste (though not Scheduled) residing about one kilometre away from the main village do not buy filtered water. Women belonging to this caste told us that the water ATM is too far away from where they live: they do not want to walk such a distance hauling water jars on their head. Some would not be able afford it anyway. Instead, they continue fetching water from their irrigation wells as they used to do before the implementation of the Purandar Lift Irrigation Scheme. Women know that this water is highly contaminated, as the irrigation wells are located just next to the ponds where the Purandar water is stored. Before drinking it and using it for cooking, they sometimes add a disinfectant called Mediclor-M. This is widely used throughout Maharashtra to make any available water safe for drinking, but the women may not know that it is less effective than reverse osmosis. Harita, a woman belonging to this caste, told us that this disinfected water tastes and smells just "fine", surely not as good as groundwater used to before the implementation of the Purandar Lift Irrigation Scheme but, she adds, "what else can we do?"[10]

Because of how the Purandar water is mixing with Sakarbai water, women farmers now have to pay for safe drinking water so as not to compromise their health and well-being. Women belonging to Scheduled Castes and poorer families are less able to afford safe filtered water. In fact, while also indirectly benefiting from the Purandar Lift Irrigation Scheme, they appear to be the most exposed to the health hazards caused by the deteriorating quality of groundwater. This becomes even more evident when focusing, as we do in the next section, on the waters that women farmers use for washing and bathing.

Embodying groundwater

Women get to know groundwater quality – and signify what groundwater is – not only through their sensory observations and by paying attention to how it affects their animals, the drip system, and the weeds that grow in the farm as outlined in the previous sections, but also through how their bodies react to it. These bodily responses especially emerge as women engage with water while they bathe, wash dishes and clothes, and clean the house. Prachi, a woman belonging to an upper caste, shows us the skin irritation on her arm: "It itches a lot, and it looks nasty. I don't want other people to see the rashes, because I don't know what they would say about them, so I always cover my arms with my saree".[11] Similarly, Shristi, a woman of a Scheduled Caste whom we met outside her household washing the dishes, timidly pulled her saree up to show us the rashes on her feet and leg triggered by the tap water she uses for bathing. Harita, a woman belonging to an upper caste, told us that her baby twin nephews lost all their hair the first time they bathed them with tap water. She herself also suffers from hair loss, which she thinks is caused by the chemicals contained in the water she uses for bathing.

For all domestic purposes other than drinking and cooking, women use water released from the outdoor taps located outside of almost every house in the main village of Pravah. The water released from these taps is pumped from a public well located downhill of the village, about one kilometre away from Sakarbai. This public well is located close to a large public pond that stores Purandar water for agricultural use. The water from the well is pumped to a public water tank located uphill from the village. From there, it is released through a system of closed pipelines to the household taps. Women consider this tap water to be highly contaminated, much more than Sakarbai's water, because the Purandar water takes very little time to percolate from the pond into the public well that fills the tank. Babita, a woman of a Scheduled Caste, told us how she notices the poor quality of the tap water by looking at its colour: "I can see with my own eyes that tap water comes from ponds where Purandar water is stored. I know it is bad because it is green. I would never use it for cooking".[12] Most women use the tap for bathing,

[10] Interview Harita_13March2022

[11] Interview Prachi, 10 February 2020

[12] Interview Babita, 14 March 2020

laundry, and household chores (Figure 7). This water is the most easily accessible water for most women: it flows every two to three days in relatively large quantities, and women can fetch it just outside their house. They store the water in plastic tanks and buckets so they can use it at any time.

Figure 7. A woman storing tap water in small tanks outside her house and using it for washing.

Source: Photo by Irene Leonardelli, February 2022.

While all people across gender, caste, and class in Pravah can suffer from skin diseases caused by the use of tap water, there are differences in levels of exposure to this water. It is for instance plausible that men suffer less from such skin rashes because they do not spend as much time directly in contact with it as the women: they do not wash clothes, do dishes, or bath children. Those women farmers who are better off have more means to treat the water before using it (e.g. boiling, disinfecting), while they can also afford to buy medicines to cure their skin rashes or to purchase better quality water for bathing and washing. Saira, a thirty-five-year-old woman belonging to an upper caste, told us that her husband buys a cream for her to accelerate the healing process of the recurrent skin rashes on her arm.

On the contrary, the pipelines that provide tap water to most houses in Pravah do not reach people residing far away from the main village – including Harita and other members of the less privileged nomadic caste. Hence, they have no other choice than to use contaminated groundwater straight from their irrigation well, including for bathing and washing. They do not have the financial means to access better quality water or to boil it, nor to add Mediclor-M to disinfect all the water they use. This is why they are more exposed than other farmers to contaminated groundwater, being forced to sacrifice health, hygiene, and taste for the sake of affordability.

The dominant techno-managerial version of groundwater, the version that treats it primarily as an input for crop production, makes surface water and groundwater appear to be separate, just as it separates productive water from domestic water and polluted water from treated water. Women farmers' practices and experiences reveal that waters are not separate or separated. On the contrary, they mix and mingle, forcing them to assume the difficult and costly task of differentiating and sorting waters.

DISCUSSION AND CONCLUSIONS

We started this paper with the theoretical idea that dominant techno-managerial versions of groundwater, the ones that dominate scholarly and policy texts, are just that: particular versions, or enactments, of groundwater. These are the versions of groundwater that are – or are supposed to be – useful for (public) managers: they enact groundwater in ways that make it amenable to manipulation and control, in accordance with particular logics. In Maharashtra, as elsewhere, these logics have a distinct neoliberal flavour: they prioritize productive and efficient uses of water, foregrounding water quantity over water quality. In this paper, we have constructed another version of groundwater: the one that emerges when seeing it through the practices of women farmers.

This is important because, in Pravah, it is no exaggeration to say that women are the de facto water managers. They are not just increasingly responsible for many of the tasks related to irrigating and organizing on- and inter-farm water distribution (also see Leonardelli et al., 2022), but also remain the ones to provide water for all kinds of so-called domestic uses: drinking, bathing, washing, cleaning, etc. The increased availability of water for irrigation has allowed women to assume a more prominent role in farming. This is true not only for women of upper-caste households, who can afford to buy the Purandar water for irrigation, but also for at least some women of Scheduled Castes, as the Purandar water bought by others also percolates into their wells. Simultaneously, because of how the Purandar water mixes with groundwater in the shallow aquifer of the village, its introduction into the village forces women to assume new water quality management tasks at household and community levels. Women farmers observe how their animals are affected if they drink directly from the ponds where the Purandar water is stored. They notice and deal with the organic matter that blocks the drip emitters. They look at the colour, smell, and taste of water at different water sources, thus developing an understanding of how and where different waters mix in the aquifer. They experience how contact with water triggers rashes and sores on their (and other people's) skin. Hence, through their relationship with water and through interactions with others (including men, field officers, doctors, NGO practitioners, and researchers) over water, women learn how to distinguish between different qualities of groundwater from different sources or locations as the basis for deciding which water to use, how to treat it, and for which purpose. These decisions are not just determined by health and hygiene considerations, but also by the time, money, and effort required to access, disinfect, filter, and store water. This is why they vary across caste and class, with women belonging to poorer households having to compromise health, hygiene, and taste for the sake of affordability (cf. Mehta and Karpouzoglou, 2015). It is in this way that women farmers and (ground)water co-become, and in this process, water itself is an agent or actor: its behaviours often overflow human intention.

Dominant techno-managerial versions of groundwater hinge on making distinctions between irrigation waters and domestic waters. Foregrounding women farmers' practices and experiences instead makes visible the many connections between agricultural and domestic waters, as well as between agricultural and domestic work. In a village like Pravah, of which there are many in India, failing to appreciate those connections and overflows risks compromising the health of people, animals, and the environment. Indeed, our analysis shows how categorizations – between productive and domestic, public and private, groundwater and surface water, and so on – that are often used to make sense of either water or women (or, more broadly, gender relations) are not just arbitrary, but also performative. What (ground)water *is*, or what a woman *is*, is never given before the analysis; it is the outcome of work. This is the work of putting together words, materials, and matters in specific configurations and relations. It consists of collecting water in wells, ponds, tankers, and containers; conveying it through pipes, wells, pumps, canals, irrigation drips, and much else; transporting it, sometimes with the help of pumps and sometimes by carrying it in jerrycans; treating or filtering it, et cetera.

Crucially, defining what a woman *is* or what (ground)water *is* also involves the work of the researcher(s) in tracing and documenting their relations and making sense of them (using specific words

and categories). Remaining reflexively aware of how initial definitions and categorizations help make visible and real *some* specific waters and genders is therefore important. The choice of these definitions and categorizations is never innocent but is informed by political (or ethical) considerations (see also Leonardelli et al., 2022).

Ironically, what emerges from our analysis is that in Pravah, it is women – through their work of separating waters, literally storing them in different containers for different uses – who help make the techno-managerial version (or enactment) of groundwater real, or seem real: only by not noticing, appreciating, or remunerating this work can techno-managerial neoliberal versions of groundwater continue to have some legitimacy. Cleaver and Elson predicted this long ago (Cleaver and Elson, 1995) when discussing the gender implications of the neoliberalization of water. They argued that by prioritizing the productive and marketable, neoliberal water framings and policies would render the unremunerated labour of women non- or less important, while at the same time the realization of these policies – and of the techno-managerial version of water – crucially relies on this labour (and its elasticity) to generate (at least on paper) the expected increases in efficiencies and productivities (see also Birkenholtz, 2022 for a similar argument). A feminist analysis of groundwater – constructing a version of it that highlights the importance of women's labour and knowledge – is therefore one important political strategy to challenge techno-managerial and neoliberal beliefs and policies.

Amongst others, this version may help foreground the struggles and well-being of different groups of people as well as cattle, aquifers, and much else beyond economic imperatives. In the specific case of Pravah, our analysis clearly suggests that treating the Purandar water – at least taking out its most toxic substances – before delivering it to the village would help reduce the labour that women need to put in to make water suitable for different purposes. It would also help address the (short and long-term) health concerns arising in relation to the use of this water. And it could be a starting point to tackling the consumption of potentially polluted crops produced in Pravah, which are sold at markets in Pune and in other nearby cities.

We would like to end this paper by reiterating that the grounded and situated understanding of groundwater that we have produced yields one of a number of possible versions of groundwater, and that it is a highly specific one. Other places, women, and researchers – even when following a similar feminist approach – will produce different versions. Even when these other versions may resemble or have similarities to our version, it is important to resist the temptation to generalize or homogenize – for instance, as part of attempts to produce a gendered water wisdom, or a more feminist water management protocol. Transformations to groundwater sustainability, we posit, instead hinge on learning to acknowledge, live with, and perhaps even celebrate the existence of many waters, appreciating that actual use and management decisions are not only always specific, but also pragmatic and political.

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