Wells and Well-being in South India

Gender Dimensions of Groundwater Dependence

DIVYA SUSAN SOLOMON, NITYA RAO

Groundwater has played a pivotal role in transforming the rural agrarian landscape, augmenting rural livelihoods and improving household well-being. What role does the growing prevalence and importance of groundwater play in intra-household relations, particularly the gendered divisions of labour and use of assets? The impacts of failed borewells on gendered vulnerabilities, identities and well-being have been explored. Research indicates that groundwater usage in semi-arid regions has increased the short-term resilience of communities in the region, but has simultaneously increased gendered risks, especially for smallholders, by promoting unsustainable livelihood trends and risky coping strategies to groundwater shortages.

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Divya Susan Solomon (*divya.solomon@atree.org*) is with the Ashoka Trust for Research in Ecology and the Environment, Bengaluru. Nitya Rao (*n.rao@uea.ac.uk*) is at the School of International Development, University of East Anglia, United Kingdom.

Over the last 50 years, groundwater has emerged as the backbone of irrigated agriculture in India. In 2010, groundwater irrigated nearly 27 million hectares of land compared to 21 million hectares irrigated by surface water sources (Mukherji et al 2013). Groundwater usage is growing at an unprecedented rate; it is estimated that one in every four rural households owns at least one groundwater irrigation structure (Shah 2009).

Groundwater development has had manifold benefits for India's agricultural sector. It has been credited with increasing farm incomes and well-being by increasing productivity (Roy and Shah 2002; Sekhri 2014). On the flipside, it has resulted in chronic depletion in quality and quantity of the resource (Gleeson et al 2010). Presently, groundwater irrigation is at an impasse. It has cemented its vital position in drought-proofing agriculture. However, the exploitation of the resource for irrigation has resulted in critical groundwater levels, particularly in already water-stressed regions (Kumar and Singh 2008; Livingston 2009). The number of irrigation blocks in India that have reported overexploited groundwater levels has grown at an alarming rate of nearly 5.5% per year (Gandhi and Namboodiri 2009). Increased well proliferation has led to aquifer contamination and salinisation, alongside increased costs of pumping. The problem is particularly severe in arid and semi-arid regions, where communities depend on groundwater for both domestic and agricultural purposes.

Water scarcity is expected to grow in the future, exacerbated by climatic changes in precipitation patterns and increase in temperatures (Shah 2009). A study conducted by Geethalakshmi et al (2011) on the impacts of climate change over the Cauvery basin of Tamil Nadu using regional climate models showed an increasing trend for maximum and minimum temperatures, and a decrease in the number of rainy days. These climatic shifts will have an impact on the hydrological cycles in the region, lead to more run-off and less recharge, affect the groundwater tables. Furthermore, there has been an increase in the frequency of droughts in the state. Tamil Nadu declared droughts both in 2016 and in 2017 (Promod 2017). This has driven farmers to increase dependency on groundwater resources to secure their crops. Climate changes act as a force multiplier, increasing the criticality of the resource while simultaneously threatening it (Shah 2009).

The emergence and spread of an intensive groundwater-based irrigation regime has had important socio-economic consequences for rural households (Roy and Shah 2002; Shankar

et al 2011). Curiously, given the centrality of groundwater to the contemporary agricultural economy, few studies have focused on the socio-economic impacts, particularly gendered intra-household impacts of groundwater usage and dependence (Mukherji and Shah 2005). In fact, a recent review of the literature on water and gender in India (Kulkarni 2016) focused entirely on surface water and the gendered and social facets of its management. In our research, we attempt to fill this gap by focusing on the relationship between, and the micropolitics of, gender and the multiple uses and users of groundwater, in both agriculture and the domestic sphere. Specifically, we focus on the everyday experiences of men and women to understand the gendered segmentation of agricultural labour and its relationship to control over assets.

Context and Methodology

Tamil Nadu is one of the most water-vulnerable states in India; it has only 3% of the national water resources (Janakarajan 1999). Around 15% of the land area of Tamil Nadu falls under the semi-arid zone with rainfall less than 700 mm per year (Walker 2012). Agriculture, under these circumstances, requires some form of irrigation, explaining why 56% of the net sown area in Tamil Nadu is irrigated (Amarasinghe et al 2009).

Dependence on surface water for irrigation has been overtaken by the extensive use of groundwater in the region (Kajisa et al 2007); the area irrigated by groundwater has doubled since 1950 (Janakarajan and Moench 2006). Around 56% of the land is currently under groundwater irrigation in Tamil Nadu, while tanks and canals irrigate 44% of the net irrigated area (DES 2011). In the last decade, state government subsidies to encourage irrigation—particularly the subsidy on free electricity for pumpsets and loans for deepening of existing wells and construction of new ones—have reoriented the role of wells from a source of supplemental irrigation to a key productive asset.

In the absence of appropriate and properly enforced state regulation, there is stiff competition among farmers who grow water intensive cash crops to extract groundwater (Phansalkar and Kher 2006). From 2002 to 2012, there was an average annual groundwater decline of 1.4 m per year, indicating groundwater usage that was nearly 8% more than the annual recharge rate (Chinnasamy and Agoramoorthy 2015). Farmers with more resources can drill deeper and have a considerable advantage over small and marginal farmers, who are burdened with 73% of the non-functioning wells (Kulkarni et al 2015). Furthermore, the extensive pollution from industries in Tamil Nadu, particularly textile and paper industries, has led to ground and surface water pollution, seriously affecting the availability and quality of drinking water. This, in turn, has affected human health and well-being (Puthiyasekar et al 2010; Saravanakumar and Kumar 2011).

This paper is based on 25 in-depth interviews and a 200-household survey conducted in 2016 in two villages in Coimbatore district of Tamil Nadu. For the household survey, stratified proportional sampling based on landholding size (small: 0–2 acres; medium: 3–6 acres; large: 7 acres and above) and caste, to ensure weighted representation, was used. Two panchayat villages, Marudur (50% small, 43% medium, 7% large) and Chinnakallipatti (47% small, 45% medium, 8% large), were selected for the surveys and household interviews. Twenty-five households were selected for in-depth interviews based on landholding size to understand the intra-household dynamics of groundwater usage among different economic classes of farming households. While the surveys provided information on broader dimensions of livelihoods, in-depth interviews were used to understand groundwater usage, dependency, and intra-household relations. The names of interviewees have been changed in the interest of confidentiality.

Coimbatore is a drought-prone semi-arid district in Tamil Nadu. In the 1950s, Coimbatore was known for the cultivation of dry land crops over large areas using tank irrigation, and a high concentration of landownership (Kosalram 1973). The region developed into a major textile hub and producer of cotton and rice after independence. Over the last two decades, agriculture has significantly declined, which is largely attributed to the scarcity of both water and labour (Selvaraj and Ramasamy 2006).

Chinnakallipatti and Marudur are small agricultural villages in Coimbatore district, having settlements of about 1,000 households. The majority are Vellala Gounders, Vokkaliga Gounders, and Vettaiyar Gounders, all falling under the Other Backward Class (OBC) category. These villages also have a small population of Pallars, who belong to the Scheduled Castes (SCs) category, and Kurumbas, who are a Scheduled Tribe (ST), with have small and medium landholdings. After land distribution in the 1970s, the OBC castes established their hegemony in the region; they are the main landholding castes and occupy the majority seats in the gram panchayat.[1] Around 80% of the farmers use groundwater for irrigation in our study region; of these 74% reported at least one borewell failure in the last decade. The groundwater revolution has allowed farmers to grow water-intensive cash crops, buffering against climate risks but simultaneously increasing the vulnerability of both the resource and the communities dependent on it.

Over the last decade, there has been a shift to intensified cash crop cultivation, aided by mechanisation and the introduction of hybrid seed varieties. Secondary sources of livelihood involve livestock, small ruminants, and agricultural labour. As the region is close to the textile and manufacturing centres in Coimbatore and Tiruppur, many young people from the village migrate daily or seasonally for work. This is a common practice, particularly among young women before their marriage.

Women play an essential role in the agrarian system in this region. Our survey showed that women contributed significantly to agriculture and related activities, including animal husbandry, post-production processing, and farm-based cottage industries. Additionally, women contributed to household nutrition through maintenance of sustenance crops, such as

millets, vegetables, and fodder. Despite women's role and contribution in the farming homestead, they remain subordinate to male kin with respect to agricultural decision-making. Our household survey indicated that men (94%) are the primary decision-makers with respect to cash crops, including crop choices, irrigation inputs, and markets. Men also carried out most technology-related and, indeed, more remunerative tasks. In this section, we discuss the implications of shifting cropping patterns and livelihood choices, resulting from shifts in climate, as well as both policy signals and people's aspirations.

Cropping Patterns and Divisions of Labour

The north-east monsoon, which arrives in early November, is the primary monsoon in the region and marks the peak *aadi* cultivation season. The south-west monsoon, which extends from the end of May to August is comparatively weaker and marks the *avani* cropping season. A recent study conducted in the region found a significant shift in monsoonal patterns, with a weakening north-east monsoon and a strengthening south-west monsoon (Bunyan and Jagdish forthcoming). Results from our survey indicated that 98% of farmers felt that the total annual rainfall has decreased and 84% reported that rainfall variability had increased over the last decade. This monsoonal irregularity, along with increasing instances of drought, has prompted farmers to adapt by shifting from supplemental to complete groundwater irrigation. A functional borewell hedges the household's fortunes against the capricious nature of monsoons and provides a reliable source of water.

The expansion of groundwater irrigation, in turn, has led to a dramatic shift in cropping systems and crop management practices. It has facilitated the shift from rain-fed food and fodder crops (jowar, pearl millet, foxtail millet, and ragi), to high-value and high-risk perennial cash crops, such as banana, turmeric, jasmine, tobacco, and, recently, curry leaf. Rain-fed millets are hardy and resistant to long dry spells, do not require expensive agricultural inputs, and provide nutritional security to families; however, the market for these crops is limited and returns are low.

Around 72% of farmers reported that they grow only perennial cash crops in more than 50% of the cropping area. This shift has increased risks associated with farming. Cash crops are input-intensive and require considerable financial outlays. Our surveys indicated that almost 78% of the farmers reported significant losses from agriculture in the last five years, mainly due to drought and water scarcity. Small landholders depend on loans for inputs. Sources of loans include banks (24%), moneylenders (36%), and relatives (40%), with interest rates of 4%–7%, 20%–40%, and 10%–30%, respectively. The implications of this are discussed further in this paper.

The shift in cropping patterns entails gendered costs and risks. Cash crops are water and labour intensive. Crops such as curry leaf and jasmine require regular pruning and weeding. These are harvested through hand-picking. After the introduction of cash crops, labour requirements have tripled. With an increase in off-farm employment opportunities (primarily for men) and schemes based on the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA),[2] the study area has witnessed a severe labour deficit for farming activities. To offset this deficit, women have taken up additional burden in agriculture. This is particularly relevant for poorer farmers who cannot afford to pay higher wage rates resulting from a tight labour market. Furthermore, continuously engaging in physically strenuous work has taken a toll on women's health. Many of them have been reportedly suffering from chronic back pain.

Rengalakshmi (41) from Chinnakallipatti village, who belongs to the Vokkaliga Gounder caste and has a 6 acre farm, expressed her thoughts on her increasing work burden:

> it is so difficult to get labour to work on our farms, especially during harvest season and when they do come, they demand too much money for us to pay ... I have started working more on the farm now, I do not have a choice. My husband goes for construction work in the neighbouring town, and if I do not do agricultural work the crops will die.

Well-to-do farmers with larger landholdings use technology such as drip irrigation to reduce labour requirements; but medium and small farmers depend on women in the household for additional on-farm labour requirements. Our study shows that the time women from medium-size farming households have for household activities has reduced from an average of eight hours to six hours per day. Around 47% of the women in our study reported that they handled the majority of irrigation activities on the farm. Borewells have ensured the availability of household water, reducing women's household drudgery; however, the time thus saved is often reallocated to unpaid farm work.

While irrigated agriculture has increased on-farm unpaid labour for women, studies have shown that this has had a positive impact on gender wage differentials in agriculture (Narayanamoorthy and Deshpande 2003). With an increase in demand for labour, women have been able to negotiate higher daily wages for their work on agricultural fields. Lakshmi (35), a Kurumba agricultural labourer from Marudur, explains:

> Before we would get paid much less than men. Women would get about ₹100 per day for work on the field while men would get nearly ₹200. Now, since there is so much work on the fields and so few people, we can demand more wages ... Men get ₹350 and women get ₹300 for one day's work.

This has been particularly significant for ST and SC women, with marginal and small landholdings, 75% of whom indicated in our survey that they are engaged in agricultural labour outside their farm.

Around 78% of farmers reported that they no longer grow any food crop. The declining production of nutritive millets and vegetables at the farm level has led to increasing reliance on markets and the public distribution system (PDS). The PDS in Tamil Nadu is among the most efficient in the country, characterised by close to universal coverage and a relatively effective delivery system. The security that the PDS provides is one of the reasons that households can make the shift away from food crops. On the flipside, the PDS has further entrenched the dietary shift away from millets and coarse cereals to low nutritive polished white rice as the most consumed cereal crop.

Reflecting on the dietary changes in her household over the last decade, 53-year-old Revathy, a Vellala Gounder from Marudur village with a 4 acre farm said:

> Our profits in the farm have increased, but now we don't grow ragi or jowar. The rice we eat does not give us the energy to work in the fields all day. Before we used to eat ragi *mudde* (traditional ragi ball) and not have any health problems; now almost everyone in the village has diabetes and other problems … I ask my husband to buy ragi when he goes to the market but he says it is expensive. Moreover, it takes a lot of time to make and my children prefer rice.

Revathy indicates that the reduction in cultivation of cereals on the farm has reduced her autonomy in making choices on household nutrition. Nutritional choices are now based on prices and market availability.

Gendered Assets

Bargaining power and agency of men and women in the household are shaped by their control over material assets and perceived (economic) contributions to the household (Sen 1990; Kelkar and Jha 2016). Access and control over assets, however, are not necessarily determined by legal ownership; rather, these are shaped by larger sociocultural contexts and notions of legitimacy prevalent therein (Rao 2017). State-led gender discourses too shape gendered livelihood opportunities. This is particularly prominent in Tamil Nadu, where state-sponsored welfare schemes targeting women have strongly influenced notions of gendered asset control and ownership. We discuss the impacts of borewells on two highly gendered assets: gold and livestock.

Gold: The total cost of digging a borewell in Tamil Nadu averages between ₹1,00,000 and ₹1,50,000, a substantial amount in a region where the average monthly income of families is around ₹5,000–₹10,000.[3] Around 62% of the farmers reported having sold household assets to finance well boring; of them, 72% had medium and small landholdings. Around 85% said that gold was the primary asset to be pawned or sold.

Gold ornaments are a strongly gendered asset in the region (Swaminathan et al 2011). It is traditionally given as dowry, a gift to the daughter during her wedding. While dowry has been used to control and exploit women, women in these communities have control over their gold ornaments. With social legitimacy as women's asset, gold is not just a source of security for women, which can be pawned in exigent circumstances; it also enhances their bargaining power within the household.

Jaya (48), a Pallar with a 4 acre farm from Marudur village, points to her wedding photo and describes the dowry she brought during her wedding:

> My parents gave 50 *pauns*[4] of gold for my wedding. It was not demanded by my in-laws, but my parents chose to present it to me. I have kept it safely for the last twenty years, but over time I have had to pawn most of it. Two years ago, to dig a new borewell, my husband pawned nearly all of it. I was very upset; I wanted my daughter to have it for her wedding … Now I have only this *thali* (wedding pendant).

Jaya expressed resentment towards her husband for pawning her gold. She even suggested that she was made to part with it forcefully. She pacifies herself, however, stating that such situations are commonplace in the village. With borewells increasingly seen as essential for a secure livelihood, women's gold is now being used for financing this investment. She still worries about gold for her daughter's marriage and has started a small chit fund from the money she makes doing agricultural labour in order to buy gold.

Livestock: Livestock rearing is an important source of supplemental income (sometimes providing as much as ₹3,000 per month) for agricultural households and provides nutritional security; it serves as a buffer against crop failure and periods of declining agricultural productivity. Livestock ownership is strongly gendered owing to cultural norms and various government subsidies to promote the dairy industry. The ruling political party, All India Anna Dravida Munnetra Kazhagam (AIADMK), launched a scheme for the free distribution of milch cows and goats/sheep to poor women. Presently, about 36,000 milch cows have been distributed in Coimbatore district under this scheme. Around 84% of the women in the survey reported that up to 60% of their time each day is devoted to livestock rearing activities; it is more or less a female domain.

Women value the managerial and economic autonomy that maintaining livestock provides. Older women who cannot undertake rigorous farm activities contribute to the household by taking care of livestock. Women handle the processing of milk into ghee, butter, and other dairy products, and maintain personal savings through the sale of these products. The prevalence of women's milk cooperatives in the region reinforces the importance of livestock as a source of women's income. Income generated from livestock plays an important role in women's well-being, often spent on their personal or children's needs. Larger incomes from crop sales are spent on consolidating agricultural investments, seen as the responsibility of men as "providers," alongside other household expenses (Garikipati 2009).

Rearing of livestock is a water-intensive activity. Most of the water for livestock is provisioned from borewells. During periods of water scarcity, there is stiff competition within the household over limited water resources. Men prioritise water for maintenance of cash crops while women prioritise the maintenance of cattle. In extreme scarcity situations, women are unable to maintain their cattle and have to resort to distress sales. With mechanisation, cattle have no direct role in farming. Hence, in our survey, 82% of male household heads reported that cattle are sold in case of financial stress. Furthermore, the shift in cropping patterns away from fodder and food crops has resulted in a scarcity of on-farm availability of fodder from crop residue. Reduced fodder production has led to increasing prices of fodder affecting cattle ownership, which has reduced by nearly 40% in the last 20 years. This has also resulted in a decline of household dairy usage, with accompanying impacts on household nutrition.

Borewells and Indebtedness

There are about 250 drilling units in Coimbatore alone that charge around ₹200 per metre for drilling. A traditional water diviner determines the exact location for the well. Farmers

prefer to use water diviners, as they are cheaper and more easily available as compared to hydrogeological experts. The state government has schemes (Tamil Nadu Minor Irrigation Scheme) that provide support for expertise, machinery, and funds for drilling wells. However, due to poor awareness, and an excessively bureaucratic and inefficient delivery system, many farmers hire private contractors to drill borewells and obtain funds through informal loans from moneylenders or through the sale of assets. The costs associated with informal borrowing range from 10% to 40%. Tamil Nadu has some of the highest levels of household indebtedness in India at 82.5%, compared to the national average of 52% (NSSO 2013). Contemporary farm debt, driven by social and economic aspirations, is leading to pauperisation, marginalisation, and growing impudence of the local elite (Guérin et al 2013). Although the digging of borewells is not the sole reason for the high level of indebtedness in the region, it has a significant association with the practice of reckless debt-taking of people (Taylor 2013).

The hydrogeological characteristics of the region and the exploitation of groundwater have resulted in a high rate of failure for borewells. A study conducted by Palanisamy et al (2008) reported that farmers had a success rate of only 30% in borewell drilling in Coimbatore district. A failed borewell can lead to financial ruin. Farmers often take loans with the hope that a "bumper crop" provisioned by irrigation will allow them to pay off debts. Depleting groundwater tables can drive farmers to bore up to three times in the same plot to ensure a functioning well, often accruing substantial debts in the process. Around 67% of the households in our study reported failed borewells as the primary cause for agricultural debt, and 54% reported selling household assets to finance borewells.

Rajeshwaree (42), a Pallar with a 2.5-acre farm of Chinnakallipati village, told us about the indebted state of her household due to multiple failed borewells on her farm:

> I was not even aware of the cost of drilling the borewell, or the loan taken; we simply continue to pay monthly to the debt collector, hoping that one day we can clear our debts.

Rajeshwaree's household has accumulated significant debt with the local moneylender over the past 10 years. Unable to repay the full amount, they have resorted to taking smaller loans from multiple sources to clear the initial debt. Rajeshwaree's 17-year-old daughter had to discontinue her college studies and take up a job in a textile factory in Tiruppur to help pay off the debt. Presently, Rajeshwaree works as a cleaner in the local panchayat office, apart from domestic and farm duties. She also invests whatever small savings she manages to gather in the village-level "self-help group" and chit funds.

Indebtedness in the region has pushed men and women to diversify their livelihood portfolios. Around 74% of the male farmers reported of seasonal migration to clear farm debts; of this, 92% had landholding sizes below 6 acres. Furthermore, 64% of them were Pallar (SC) and Kurumba (ST) communities, indicating that indebtedness is disproportionately prominent among small farmers belonging to SC and ST groups. Reinforcing the fact that indebtedness and coping strategies are shaped by class and caste positions, 72% of women above the age of 30 in our survey reported engaging in jobs outside the farm and the home, with 31% engaging only in MGNREGA work, 40% working as agricultural labourers, and 29% engaging in both. The MGNREGA provides a valuable source of income for women during the summer months. Given the restrictions on their mobility due to domestic chores, the options that married women have for earning additional incomes are limited. They end up engaging in physically demanding and poorly remunerated jobs that may be locally available.

Household Cooperation, Conflict and Decision-making

While women in rural South India are seen to have more autonomy than their North Indian counterparts (Dyson and Moore 1983), they defer to men, particularly with regard to farm management practices. The boring of wells is seen as a strongly masculine process. The drilling of boreholes is conducted by private drilling agencies, which are strong patriarchal enterprises. Women rarely take an active role in decision-making with regard to the boring, although the work burden of irrigation often lies with them.

Selvi (53), a Vokkaliga Gounder with a 9-acre farm from Chinnakallipatti, who has eight failed borewells, discussed the decision to invest in well boring:

> The first well was dug about ten years ago, before that we depended only on the rain. My husband wanted to start growing different types of crops, so he suggested that we dig the well … Initially, I was not convinced; it is a lot of money, and I was not sure if we will get water. But he convinced me and dug the well. After two years the water in the first borewell decreased. We had also bought more land for agriculture, so we needed water to irrigate the crops; we decided to dig for another well … My husband did not consult me on this … The first bore failed, and I asked my husband to stop digging. He did not listen to me … If we had not spent so much money on the wells we could have invested in something else, maybe a *petty kadai* (small shop).

Through Selvi's narrative, a sense of resentment towards her husband's decision to assume more risk by boring for more wells is palpable. This is reflective of the attitude of several women in the area who felt that they had limited agency in influencing decisions on the digging of borewells. Women preferred to invest in small businesses or in assets such as land; they regarded the digging of borewells to be a precarious gamble that could result in financial ruin.

Borewells are useful to both men and women. But, perceived as a symbol of a productive farm and a successful (male) farmer, it is socially constructed as a "male" asset. During our interviews, borewell ownership was often used as a qualifier of success, even replacing land as a source of prestige and status within the community. Paramasivam, a farmer in Bhavani, pointed to the neighbouring field of his brother exclaiming, "My brother has no worries, he has two working borewells and is doing very well in his farming." This sense of "success" shapes normative male behaviour, in this case leading to unhealthy and unsustainable competitive behaviour in relation to boring.

The construction of the borewell as associated with male identity can be unpacked using Sandra Harding's seminal text

on how gendered social life is produced via symbolism (Harding 1986; Zwarteveen 2008). The hegemonic construction of irrigation, particularly borewell irrigation, can be attributed to the androcentric trappings of "cash cropping," a co-production of irrigated systems in the region (Connell and Messerschmidt 2005). The very term "cash crop" alludes to crops grown only for sale, relegating it to an "enterprise" that, under traditional cultural and societal norms, falls under the purview of men. Moreover, technology required for boring and pumping has strong masculine connotations. Women lack knowledge and skills to engage with these "technical" processes in male-dominated spaces and have been systematically discouraged by state and the community from entering these spaces. Colonial and neocolonial relations of technology and gender have informed these "traditional" (irrigators) and "globalised" (engineers and mechanics) masculinities (Zwarteveen 2008).

This is what Murugan, Selvi's husband, said on why he decided to bore multiple wells despite repeated well failures:

> I initially got the idea to dig a borewell after our *Ooru thalevar* (village headman) dug his borewell. This was twenty years ago. The well functioned well and allowed me to plant all the crops that I wanted. It provided enough water for the cattle and the house as well. But water in the well started decreasing in the past ten years. This is because everyone around has started to dig many wells. I had to ensure that I had enough water. So I dug two more wells. These failed, so I took a loan and dug another well … Of course, I have to keep digging to ensure that I have a functioning well. How else will I irrigate my crops? I cannot go back to rain-fed farming. All the farmers in the village have wells. If I have a good well I can make my farming very successful … I cannot consult my wife regarding these decisions. She does not understand farming.

The borewells in Murugan and Selvi's farm have been financed through a combination of personal savings, bank loans, and, more recently, loans from relatives and moneylenders. The household has sold assets to repay these loans, but they still have outstanding debts to pay off. Murugan hopes that he can at least pay back the loans to the moneylender after the next harvest of his banana crop.

The proliferation of borewells has had important implications for intra-household gender relations. Economic success and financial provisioning are an important conjugal expectation from men in patriarchal rural societies, who in turn expect their wives to meticulously perform familial and mothering roles (Rao 2012). Financial stress associated with what is regarded as a male decision on well boring within the household has caused strains in marital relationships. Women have suggested alternate investment strategies, but once the borewell option is pursued, they have no choice but to also contribute to the repayment of loans. Men frequently resort to drinking to cope with a sense of "hopelessness" as a result of failed borewells and mounting debt burdens, sometimes even leading to violence.

While tensions are rising due to failed borewells, new forms of cooperation are also visible. Although the primary impact of wells has been in the sphere of livelihood, wells have also allowed easier access to water for domestic activities. Reproductive roles remain women's primary responsibility, and the direct burden of water provisioning falls on them. Yet, focus group discussions (FGDs) conducted with women indicated that men increasingly contribute both cash and labour to the provisioning of domestic water for their households.

Savitree, a 32-year-old Vokkaliga Gounder from Marudur, with a 4-acre farm, discusses this shared responsibility:

> During the dry years, when there is less water in the borewell, my husband goes to the stand pipe to collect water. I used to do it, but he has a bike, and it is easier for him to do it especially later in the day when it is not very safe for women to go out … When we have scarcity of water, usually during the summer months, we have to buy water from tankers for household needs like cooking and washing. My husband knows that I need water to cook for the family, so he will make sure we get water from the tanker even though it is very expensive … We both contribute towards this.

Men acknowledge the importance of water for domestic chores and contribute towards its provisioning. This is an interesting reversal of the gendered binary of domestic water as the domain of women, while its livelihood use becomes the domain of men (van Koppen 2007; Zwarteveen and Ahmed 2012). Savitree and her husband Gopal both agree that it is no longer the responsibility only of women to collect water; if there is no water in the house, all of them will suffer. However, she does admit that during the summer months, when there is no work on the fields and her husband goes to the town for construction work, she has to collect the water herself.

Female-headed Households

Feminist scholars have postulated that the atomisation of water ownership through borewells allows women to circumvent historical inequalities in access to water by invalidating the necessity to participate in male-dominated, patriarchal water-user groups (Meinzen-Dick and Zwarteveen 1998; Ilahi and Grimard 2000). However, rights to water are tenuous and mediated through other constraining factors such as technology, knowledge, and infrastructure (Boelens and Zwarteveen 2005; Ahlers and Zwarteveen 2009). This comes to prominence in the boring and maintenance process, when women have to depend on external support systems to operationalise their access to groundwater. Furthermore, groundwater access has never been fully equitable and is often determined by other hydrogeological features of the land, shaped by patterns of marginalisation propagated through inheritance of less productive lands (such as land located on hard rock aquifers).

There are a limited number of women-headed households in this region; usually these are headed by widowed, divorced, or unmarried women. The amendments in 2005 to the Hindu Succession Act of 1956 established a gender-equal basis for inheritance of land and resources (Kelkar and Jha 2016). However, women continue to confront a host of barriers and taboos that make their cultivation less productive than that of men (Agarwal 1994). Women-headed households usually have to diversify their livelihood activities and they prefer to undertake more gender-accepted livelihoods such as animal husbandry and millwork.

Recounting her experience, this is what Nagamma (48, Vellala Gounder), a widow from Chinnakallipatti village who owns 5 acres of land, had to say:

> There was only one well on the 10 acres of land that my father owned. When it was time to divide the land, I had no say or choice on which land I received. I received an equal portion of land because it is the

> law, but my land does not have any water source. I have to buy water from my brother to irrigate the land but he usually does not have enough water to spare. I cannot dig a well as I do not have the money and I will not be able to do it by myself. I will require support from my brother, and I do not wish to be indebted to him. I have decided to sell the land as it has become unprofitable.

Nagamma cultivates only half of her land with millets and has kept the rest fallow; she has limited access to water even for supplemental irrigation and usually suffers crop losses in dry years. The unprofitability of the land has made her decide to sell it. Nagamma is the sole breadwinner of her family. She has two daughters, and her husband passed away 10 years ago. She will work as an agricultural labourer and perform odd jobs around the village to provide for her family as she cannot move out of the village for work. She says that she can save the money she gets from the sale of the land for her daughter's wedding. Nagamma is in a particularly vulnerable position, as she has no sons to help consolidate her social agency. She is vulnerable to land-grabbing from the local land mafia and depends on her brothers' family to provide security to her and her family.

Groundwater and Gendered Well-being

The development of groundwater in the region has been credited with increased farm profits, reduction of rural poverty, and equitable access to water. Having access to a fully functioning borewell ensures uninterrupted water supply, allowing farmers to grow crops of their choice, increasing both productivity and incomes. Our research suggests that the availability of groundwater has had positive and negative implications on gendered well-being, varying across class and caste. Groundwater has allowed for the spread of intensive cash crop-based agrarian systems, augmenting livelihoods and increasing gender–wage parity for agricultural labourers. It has also provided water for domestic usage, reducing women's domestic work burdens. One finds a flux in the gender roles concerning water, with men taking increasing responsibility for domestic water provisioning, while women spending more time in irrigation activities. Further, with groundwater now reframed as a symbol of wealth and prosperity and not just a productive asset, it has emerged as an embodiment of economic aspirations and gendered well-being.

Over the last five years, this enhanced sense of well-being has begun to show signs of waning, with the decrease in quality and quantity of groundwater. Farming households have indicated that household well-being, which in many ways is inextricably tied to groundwater, both in the domestic and the livelihood sphere, is seriously threatened by depletion of the resource in the region. Farmers in Chinnakallipatti reported that, 20 years ago, groundwater was available at less than 200 feet. But now, they must dig to a minimum of 800 feet to access water. The depth of boring has increased, as has the number of failed borewells.

Failing borewells are severely affecting agricultural productivity and livelihoods, ensnaring communities in debt cycles. Indebtedness has resulted in increased work burdens on both men and women. While men have wider options for more remunerative work owing to their mobility, women often have to shoulder additional burdens of paid and unpaid farm work. The cost of water significantly increases; women invest more time in collecting water from other sources, such as public standpipes. In particularly dry months, water is bought from tankers, which is expensive and has to be strictly rationed. Yet, with a focus primarily on cash crop cultivation, women's nutritional choices have been compromised.

Jayamala (62), a Vellala Gounder from Marudur village, whose family has been farming in the region for the last three generations, had this to say regarding the present state of groundwater in the region:

> Twenty years ago, we used to only grow millets and grains, sometimes vegetables. It was enough for the household. After we got access to a borewell, we have started growing jasmine, this gives us more money, but we have to buy our vegetables and grains from the ration shop or the village market … The last five years we got less and less water from the wells. This year is the worst. Our crop has failed. We have no money to buy food, and there is no food in our fields.

Peer pressure and unhealthy notions of masculinity have led to competitive borewell digging, with implications on the financial security of the household, alongside marital conflict. In such a context, women have a tenuous hold on their assets, vital to their social standing, household agency, and economic autonomy. In the absence of other risk management strategies, women's assets are the first to be pawned or sold.

Despite the precarious state of groundwater in Tamil Nadu, there remains no tangible implementation of regulation on groundwater usage. A Groundwater Regulation Bill that has been on the anvil for the last 20 years was passed in 2003. This bill included provisions for the setting up of the Tamil Nadu Groundwater Authority. In 2013, the act was repealed, and no further headway has been made in this regard. The lack of regulation has abetted the exploitation of groundwater in the state (Moench et al 2012; Palanisami et al 2014). Communal water sources in the region, such as traditional tanks and farm ponds, have been neglected, leaving farmers with a lack of alternate viable water sources. With the growing threat to the resource from climate change and other development variables, the need for properly enforced regulation has become critical.

Although our entry point is groundwater, our analysis has allowed us to explore the complexities of decision-making at the household level, where men and women hold gendered interests in resource management through their distinctive roles, responsibilities, and livelihood stakes. These vary with class and caste positions, with women in smallholder households, mainly SC and ST, often bearing the brunt of growing indebtedness, higher work burdens, and less nutritive food.

Although groundwater is "multi-use" water, its epistemic roots lie in the livelihood sphere. This has allowed patriarchal norms and practices from the male-dominated agrarian space to be carried forward into partisan decision rubrics in the domestic sphere. The experiences of women-headed households emphasise the key gendered relational aspects of groundwater usage. Women continue to require the support of male family members to operationalise their usage of groundwater, pointing to the persistence of disadvantage confronted by women in resource access, use, and control in the agrarian sphere.

NOTES

1 Body of local self-government at the village level.
2 The MGNREGA is an Indian social security measure that guarantees 100 days of work per household per year.
3 According to the National Sample Survey's 70th report, "Situational Analysis of Agricultural Households 2012–13," the average income for farm households in Tamil Nadu is ₹7,000.
4 *Paun* is a unit of measurement of gold. It is approximately equal to 8 grams.

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