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GROUNDWATER MANAGEMENT AND GENDER IN EQUALITIES: THE CASE OF TWO WATERSHEDS IN RURAL INDIA

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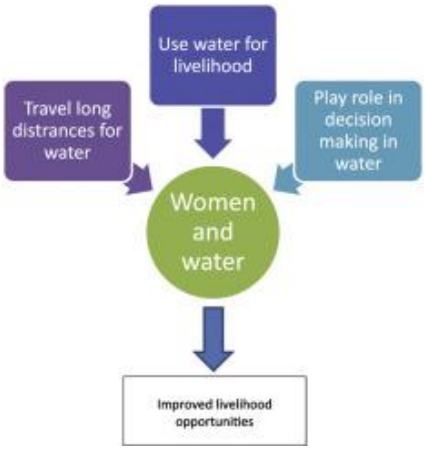
Abstract:

The primary objective of the research described in this paper is to better understand the reality of gender in relation to ground water management and use in two watersheds located in Gujarat and Rajasthan. Over the past three decades, women's issues have gained prominence on the international and national development agendas. It is more evident in India where the plight of poor and disenfranchised women have been central to the formulation of government policies. In contrast to policy deliberations and prevailing perception that the primary role of women is confined to that of domestic users of groundwater, the survey results of the study confirm that women also make substantial use of groundwater for productive purposes. The results confirm that a large number of women continue to travel many times a day to collect water for various uses. Women travelled an average of three times in a day for 50–77 min per trip to collect drinking water, depending on the season. Improved access to a reliable and proximate water supply reduces the time spent by women in collecting water and the proportion of hard labour performed by women. Respondents indicated improved water access translated as diversified livelihood activities that increase their income earning potential and help strengthen their bargaining position. The majority of women respondents in the Meghraj watershed in Gujarat (80%) and the Dharta watershed in Rajasthan (76%) believed that they have equal chances of being selected in ground water management committees. In contrast, only 15–20% of interviewed women considered they were empowered to make difference in the domains of income, crop production and resource use.

Graphical Abstract:



Introduction:

Groundwater plays a pivotal role in Indian agrarian livelihoods and human wellbeing. In the 1930s, well irrigation accounted for over 78% of total irrigation compared to 10% sourced from canals (Prakash, 2005). Currently groundwater supplies 80% of the domestic water supply in rural areas and contributes to 50% of urban and industrial demand (Narain, 2004). Deb Roy and Shah (2003) estimates 70–80% of the value of production from irrigated lands in India depends upon groundwater as a source of irrigation, representing a substantial proportion of the agriculture sector's share of approximately 17% of the total Gross Domestic Product (GDP) of India. The agricultural sector provides employment for over 60% of India's population (Arjun, 2013).

The Green Revolution was introduced in the mid-1960s to increase food grain production by mitigating the uncertainty of climatic conditions, primitive agricultural practices, low efficiency technologies and high demand from a rapidly increasing population. The program mostly focused on areas endowed with water and with agricultural inputs that were highly subsidised. India transformed from a food deficit to food surplus in the subsequent two decades (Joseph, 2016)). In contrast, the acute poverty levels and low livelihood status of the 60% of rural households situated in the arid and semi-arid regions that were not the focus of the Green Revolution prevailed, because of inadequate water access and limited capacity to invest in agricultural inputs.

Despite past efforts to improve the sustainability of groundwater in India, the problem of groundwater extractions exceeding recharge remains severe, particularly in Rajasthan and Gujarat. Several reasons may be attributed to this phenomenon. First, access to groundwater has increased since the 1970s, when diesel and electric pumps became affordable to most small land holders. Second Government schemes subsidising rural electricity, initially introduced as a poverty alleviation mechanism, have meant well owners are subject to set annual fees in contrast to metred usage (Shah 2008). Third, the high levels of population growth and economic expansion. Fourth, the adoption of high yielding crop varieties and increased cropping intensity to meet food demands and livelihood

improvement have resulted in escalated pressure on groundwater resources in most parts of India. Fifth, the dependence on groundwater resources has substantially increased due to the increased scarcity of surface water and variance of monsoon patterns, particularly the arid and semi-arid regions (Sakthivadivel, 2007). Finally, the increase in competition for water from non-agricultural uses, particularly urban water supplies and industries (Lal, 2009) has led to over exploitation of groundwater resources resulting in escalating rates of water table decline predominantly in Punjab, Haryana, Gujarat and Rajasthan.

In India, the total number of mechanised wells and tube wells rose from less than a million in the 1960 to estimated 21 million in 2002 (Shah 2007). As a consequence, India now withdraws some 230 billion (109) cubic meters of groundwater per year (Planning Commission 2007) to provide additional irrigation to 45 million hectares of gross cropped area (GoI, 2005). Hence, competition by individual well owners to compensate depleted ground water levels relied on deploying high horse power submersible pump sets, accelerating water table decline and the emergence of a groundwater elite.

Due to the importance of groundwater in production and domestic use, conflict over water access and the effects of gender-influenced decisions about groundwater use have far-reaching consequences in human wellbeing and economic growth. At the same time, social conflicts and social change are shaped and mediated by the natural conditions in which water occurs. However, the social relations, endowments and entitlements concerned with water access and use remain poorly understood (Crow and Sultana, 2002). This research contributes to the discussion by outlining questions that arise from a concern to understand the broader context of gender and groundwater management.

Scholarship in the field of gender and water has emerged with ways in which water influences gendered relations and livelihoods in a variety of contexts (Cleaver, 1998, Crow and Sultana, 2002, Jackson, 1998, Reilly, 2006). This diverse and expanding body of literature is generally linked to the broader topic of society and gender. The development literature has generally focussed on the gender division of

labour, ownership and control of productive assets, and intra household distribution of resources influences the responsibilities, roles, rights and norms that constitute the relationship that men and women have to natural resources (Agarwal, 1997, Jackson, 1998).

In India, particularly in the rural areas, access to water is generally more problematic, more differentiated, less secure, and frequently requires substantial expenditures of work, time and money (Crow and Sultana, 2002). Scarcity of water influences the social structure, in that water is distributed in accordance with the influential power of groups-caste, class and gender. These three types of stratification systems of the community have a strong relationship with water (Zwarteveen, 1997).

Further, it is widely understood that access to safe and sufficient water is controlled not only by environmental factors, but by social, political and institutional correlates and that water use and management are generally gendered in nature (FAO, 2003). A review of literature (FAO (Food and Agriculture Organization), 2003, FAO (Food and Agriculture Organization), 2004) reveals that women and men understand the environment differently, have different uses for natural resources and have different levels of influence and representation in the management of natural resources and decision making. This balance of power is influenced by the gendered roles within rural households and communities and the gendered division of labour.

In most developing countries, like India, the trend is that women are responsible for household water collection and water use and management, including promoting hygiene within the household and community (Upadhyay, 2005). On the other hand, men are perceived to be responsible for productive water use and management such as the running of farms or small businesses even though women are very much involved in productive water use as well. Despite women's significant role in water use and household management, women's needs and uses of water are not often represented in water resource management policies or projects.

Following on from these observations, the primary objective of this research is to better understand the reality of gender and groundwater issues in three (3) villages of Gujarat and in four (4) villages of Rajasthan. Specifically, the research aims to:(i)

ascertain the primary responsibilities of men and women regarding groundwater use and collection; (ii) elicit women's perceptions of water use, availability and quality; (iii) determine the impact of groundwater depletion on women's work; (iv) discover women's perception on their chance to be part of the local water management committee; and (v) find out the extent of women engagement in the study area. In this paper, women empowerment refers to the creation of an environment for women where they can make decisions of their own for their personal benefits as well as for the society.

Section Snippets:

Region of study and water access in the Region:

The reported research was conducted in the Meghraj watershed in Aravalli district, Gujarat, and the Dharta watershed in Udaipur district, Rajasthan located in India (Fig. 1). Both watersheds have a semi-arid climate, with an average annual rainfall in excess of 600 mm, with more than 90% of this rainfall received only during the monsoon months of June to September. Most farmers in the two watersheds grow maize, black gram, mung bean, guar, soybeans (recently introduced) and vegetables as *Kharif*

Research Methodology:

A village case study approach was used in this study, and a total of seven villages were selected in the two study area. These villages have differences in socioeconomic and physical attributes as well as in terms of water supply. The data were collected by semi-structured interviews and questionnaires. The draft questionnaire was reviewed by the Development Support Centre (DSC) located in Ahmedabad, Maharana Pratap University of Agriculture and Technology (MPAUT) located in Udaipur and

Discussion of Results:

To check the reliability of the survey questionnaire, the Cronbach's alpha statistic was calculated and found to be approximately 0.82, indicating valid reliability. The succeeding sections report the findings in more detail.

Concluding Remarks:

The paper reports on the gendered roles and responsibilities of water usage and collection in two watersheds of rural India. Women were

found to be responsible for domestic chores and the collection of water for drinking, carrying out domestic chores and nurturing of farm animals. The results further reveal that women have to travel many times in a day to collect water for various uses. For drinking water alone, women have to travel an average of 3 times a day for around 50–77 min per trip

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