Social and Institutional Factors Shaping Farmers' Adaptation to Groundwater Depletion in Madhya Pradesh, India

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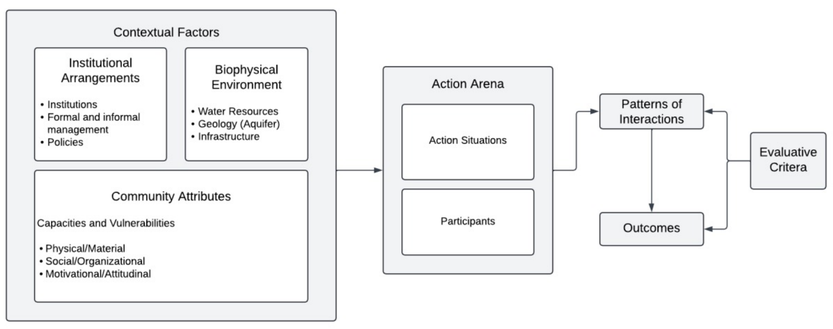
1 Introduction

India is moving towards a groundwater crisis[1], driven largely by agriculture. Decentralized, community-led groundwater management offers a promising solution but its success varies regionally. Further, due to social inequities, irrigation is not just about water availability but also about access.

Aims

- Exploring social and institutional factors influencing irrigation and water use.
- Identifying key decision-making spaces and patterns of interaction related to water management.
- Proposing context-specific measures that promote both water conservation and social equity.

Combination of **Institutional Analysis and Development (IAD)** and **Capacities and Vulnerabilities (CVA)** framework:



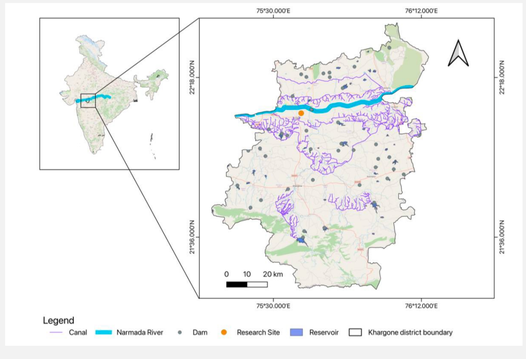
2 Materials and Methods

Study Area: Nimar Valley, Madhya Pradesh, India. High diversity of ethnic groups, tribes and castes.

Water Sources: Narmada river, ponds, wells, safe groundwater levels in the area.

Methods: 12 individual interviews, 5 focus group discussions, 6 expert interviews.

Social Groups: Large-scale farmers, small-scale farmers, tribal farmers and rainfed farmers.



3 Results and Discussion

Capacities and vulnerabilities: Notable differences between tribal and non-tribal groups, particularly in physical/material and motivational/attitudinal vulnerabilities. Capabilities more alike.

Rainfed farmers greatest disadvantages: Poor access to water, electricity, support, and decision-making, but higher levels of farm diversification.

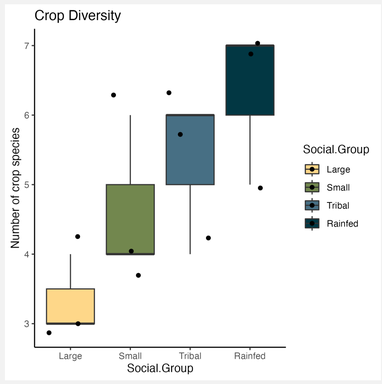


Figure: Boxplots of the number of different crop species grown by the social groups in addition to cotton.

Table: Coding Report of Farmer Interviews. Number of codes related to capacities and vulnerabilities in the interview transcripts of different social groups. For each social group, the values represent the cumulative totals from three interviews.

Category	Rainfed (n=3)	Tribal (n=3)	Small-scale (n=3)	Large-scale (n=3)
Attitudinal/motivational capacities	27	24	34	26
Attitudinal/motivational vulnerabilities	31	11	9	19
Physical/material capacities	47	60	59	52
Physical/material vulnerabilities	71	49	31	20
Social/organizational capacities	16	11	22	18
Social/organizational vulnerabilities	22	19	21	12

Action arenas and patterns of interaction: Despite the existence of many structures for participatory water management, like democratic canal associations, their effectiveness was often undermined by negative dynamics like insufficient inclusion of the community or corruption.

Discussion of solutions: Participants favored improving water access over conservation-oriented measures. Awareness of agroecological practices, but focus was mainly on supply-side interventions to address irrigation water depletion.

4 Conclusion

- Importance of equity in sustainable water resource management and need for removal of barriers to access.
- Strengthen participatory water management by improving existing action arenas and addressing negative patterns of interaction.
- Holistic water conservation policies should support wide range of practices, prevent unintended consequences, and include measures reducing income inequality.
- Future research: Gender dynamics in water management, inclusion of non-organic farmers.

References

1. Fishman, R., Devineni, N., & Raman, S. (2015). Can Improved Agricultural Water Use Efficiency Save India's Groundwater? *Environmental Research Letters*, *10*(8). https://doi.org/10.1088/1748-9326/10/8/084022

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