

Exploring agroecological transitions in a mountainous community in Morocco using fuzzy cognitive mapping

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NATAE
North African Transition
to AgroEcology

Introduction

- Farming in North Africa faces interlinked sustainability challenges - water stress, land degradation, rural poverty, demographic changes.
- Coordinated, multi-level action is needed to enable agroecological (AE) transitions for sustainability. AE transitions entail both technical and social changes at farm, landscape, and value-chain levels. However, context-specific levers, trade-offs and barriers are not yet well understood.
- Fuzzy Cognitive Mapping (FCM) as a semi-quantitative, participatory tool using causal graph-structures to capture peoples' understanding of socio-ecological systems and to explore changes in the system.
- Study aim:** identify and evaluate AE transition levers for a mountainous farming system in Morocco, using participatory FCM.

Materials and methods

Study area

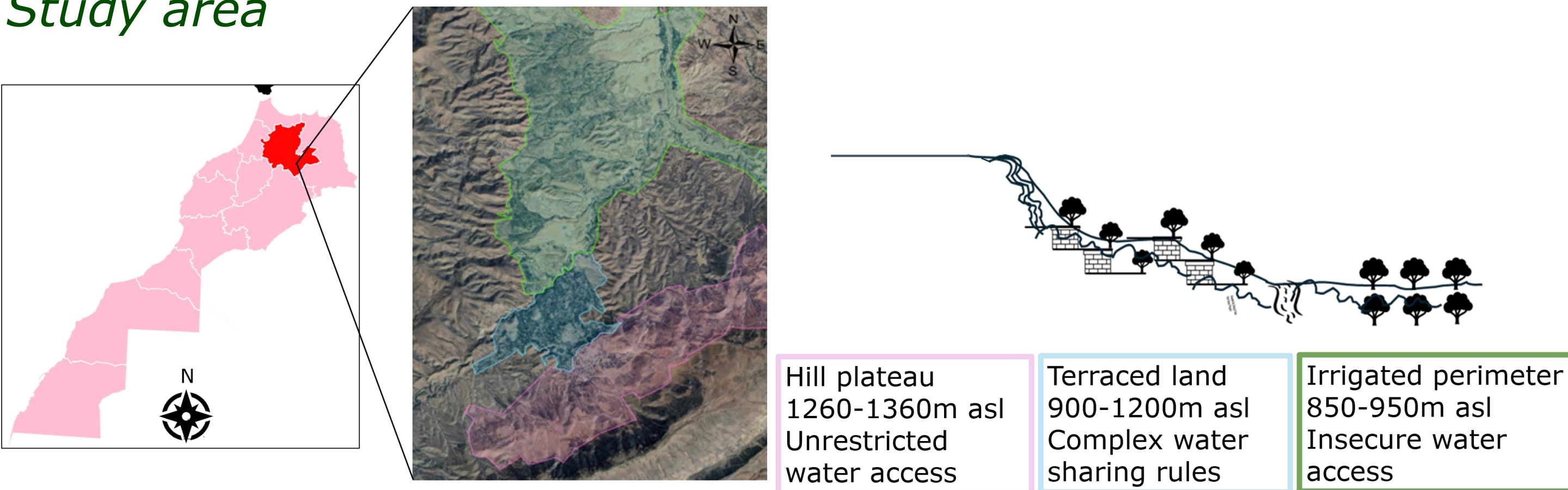
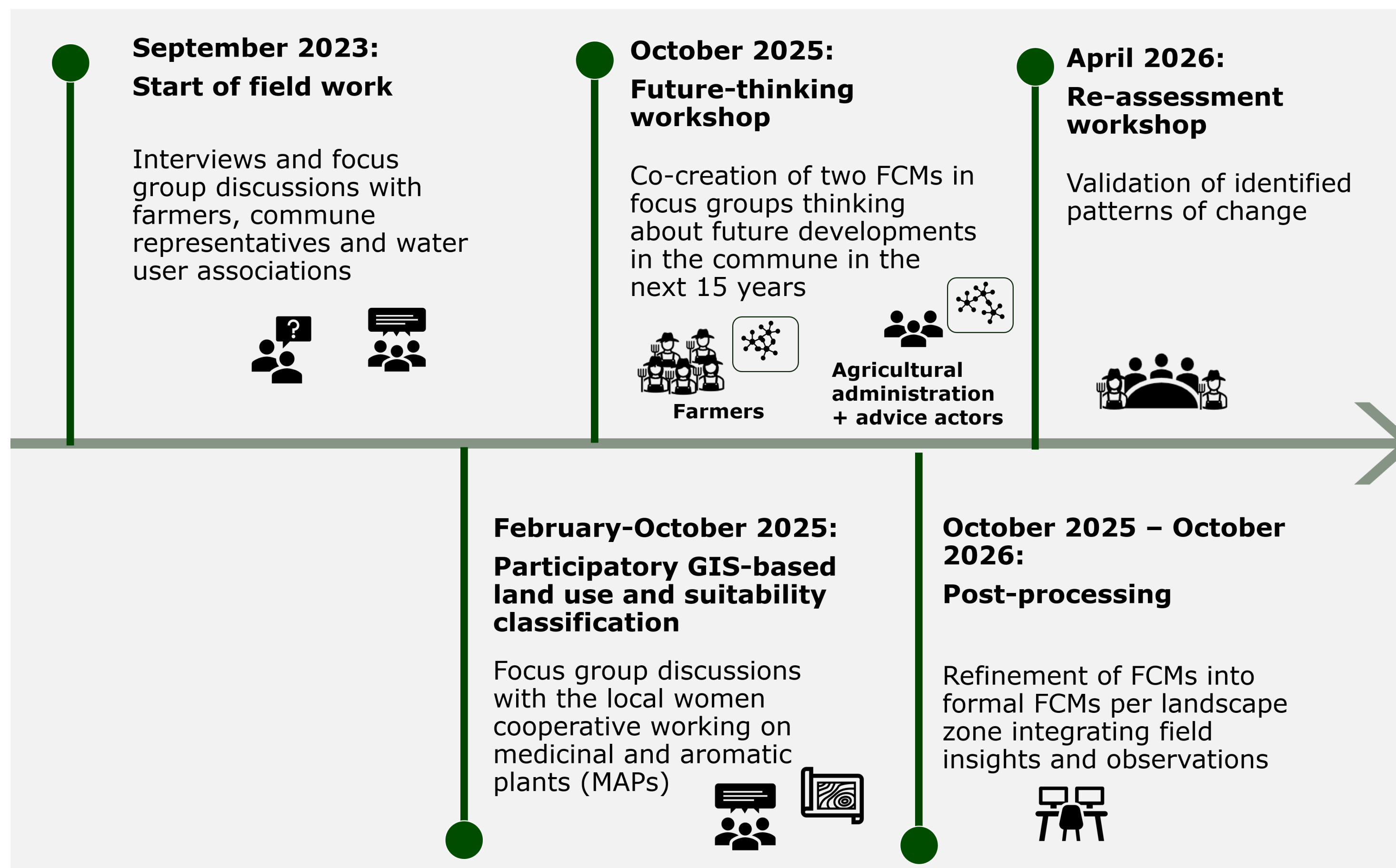


Figure 1. Topographical characteristics of the study area, located in the Middle Atlas mountain range, Morocco³

Field work



Results

Perceived future developments in the farming system

Agricultural administration and advisory actors discussed several issues (Table 1), particularly drivers beyond their influence, such as climate change and market demand. Nevertheless, they recognised their role in supporting a sustainable local natural resource use and local value addition. Farmers focused on future local water availability. Their FCM included more ordinary components, reflecting a more interconnected understanding of the local system: e.g., water availability was seen both as an influential system component but also as something local actors could influence. Both groups highlighted the challenge of maintaining adequate organic fertilisation amid increasing water scarcity and declining livestock herds.

Table 1. Network characteristics of the two FCMs developed with farmers and agricultural administration and advice actors

Network Characteristics	Farmers' FCM	Agricultural administration and advisory actors' FCM
# components	30	49
# connections	40	62
Component types	23% drivers, 20% receivers, 57% ordinary components	31% drivers, 29% receivers, 41% ordinary components
Central components	Water availability	Production of olives, medicinal and aromatic plants and livestock
Common pattern	Decreasing water availability → decreasing fodder availability → decreasing livestock production → decreasing manure availability and organic fertilization capacity → decreasing yields	
Limitation	Limited info on strength of connections	

To support improved farm-level technical innovations, necessary social changes at landscape and value-chain level were identified (Figure 2). Combining insights from both focus groups lead to the development of an integrated FCM for scenario explorations.

Conclusions and outlook

- Participatory FCM in workshop settings captured common and divergent patterns of how local actors perceive the farming system. Resulting FCMs can serve as helpful communication objects bridging these perspectives.
- Promising levers for AE transitions were identified that bundle social and technical innovations at farm, landscape, and value-chain levels. They will be evaluated using FCM-based scenario analysis.



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