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EDITED AND REVIEWED BY
Eric Justes,
Centre de Coopération Internationale en Recherche Agronomique pour le Développement (CIRAD), France

*CORRESPONDENCE
Sandra Ricart
sandra.ricart@polimi.it
Julie Ingram
jingram@glos.ac.uk

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# Editorial: The social side of agroecological systems: farmers' adaptation capacity

Sandra Ricart[1,2]*, Julie Ingram[3]*, A Amarender Reddy[4], Nicholas A. Cradock-Henry[5] and Nicholas Kirk[6]

[1]Environmental Intelligence for Global Change Lab, Department of Electronics, Information and Bioengineering, Politecnico di Milano, Milan, Italy, [2]Water and Territory Research Group, Interuniversity Institute of Geography, University of Alicante, San Vicente del Raspeig, Spain, [3]Countryside and Community Research Institute (CCRI), University of Gloucestershire, Cheltenham, United Kingdom, [4]School of Crop Health Policy Support Research, Indian Council of Agricultural Research—National Institute of Biotic Stress Management (ICAR-NIBSM), Raipur, India, [5]Environmental Social Science Department, GNS Science—Te Pu Ao, Lower Hutt, New Zealand, [6]Landscape Policy and Governance Department, Manaaki Whenua—Landcare Research, Lincoln, New Zealand

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Editorial on the Research Topic
The social side of agroecological systems: farmers' adaptation capacity

The impacts and implications of climate change are increasingly evidenced by gradual rising temperatures, irregular rainfall, and the potential for more frequent and extreme, even sequential and cascading events (Raymond et al., 2020). These changes are projected to adversely affect agroecological systems and their contribution to food security, water management, and ecosystem functioning and provisioning through reduced tolerance of these systems to biotic and abiotic stresses (Twecan et al., 2022; Semeraro et al., 2023). Evidence of these impacts are documented by science, but are also socially perceived through individual and collective perspectives (Azeem and Alhafi-Alotaibi, 2023). Individuals socially construct risk and determine how to deal with it (Tiet et al., 2022). Although risk awareness is considered necessary in the first stages of the adaptation process to reduce risk exposure (Akano et al., 2022), weather variability can make it difficult to detect long-term trends, leading to divergent perceptions of climate change (Ricart et al., 2023). Furthermore, observations are spaced over time and individual and collective experiences of past events can be faulty or uncertain (Song et al., 2021). For example, concern about climate change can vary due to perception of scale: local problems often seem more urgent; while recent effects, and the occurrence of extreme meteorological events, can rapidly increase risk perception (Savari et al., 2023).

Farmers have developed processes for managing their land in complex agroecological systems through a combination of first-hand observations with an improved understanding of climate change manifestation, relevance, and its effects (Talanow et al., 2021). Our understanding of known drivers of farmer action has expanded since the earliest work on adaptation (Smit and Skinner, 2002) (Hanger-Kopp and Palka, 2022; Cisternas et al., 2023), with researchers now considering both inner or cognitive drivers (e.g., farmers'

characteristics, experiences, background, cultural, and geographic context) as well as external or institutional drivers (e.g., innovation support services and access, costs and incentives, role and trust in authorities, supply chain actors, policy-makers, and managers) (Owen, 2020). Both dimensions are now understood to drive changes that reinforce adaptive capacity, such as technological advancement (Gardezi and Arbuckle, 2020); credit and extension services (Batung et al., 2023); crop production practices (Shah et al., 2023); and sharing information, knowledge, and skills in effective knowledge and innovation systems (Ingram, 2014; Williams et al., 2022). Examples of hard and soft adaptation strategies can additionally differ by purposefulness, temporal scope, role, and typology, even if they are executed before or afterward the occurrence of extreme weather events (Hou et al., 2023).

The contributions to this Research Topic address the challenges posed by climate change to agroecological systems and farmers' adaptive capacity from diverse spatial, methodological, and disciplinary perspectives. De Grandpré et al. emphasize the softer, more subjective side of adaptation and resilience by exploring the effect of social capital on the farmers' adaptive capacity. Results from Canada confirmed that social capital – those features (e.g., networks, norms, and trust) that enable participants to act together more effectively to pursue shared objectives) – is a vital strategy for cultivating agricultural resilience, social connections, networks, reciprocity, learning, and transferring knowledge that enhances farmers' adaptive capacity. Interestingly, social capital was also considered a building block for other forms of capital, such as financial, physical, and environmental. Similarly, Kaine and Wright describe a novel approach for predicting adoption rates concerning agricultural technologies and practices as a step forward in gauging farmers' adaptive capacity. Results from a survey of dairy farmers in New Zealand confirmed that forming an intention to try or adopt a technology or practice may take several months for relatively simple technologies and practices, and several years for more complex ones. Consequently, subsuming decision and implementation into a single event (adoption) may lead to a weak understanding of which factors are facilitating or impeding adoption. From Iran, the case study by Nazari et al. provides interesting results in terms of how a single decision motivated by a low-cost strategy (e.g., the application of additional nitrogen fertilizer improves rainfed wheat productivity) can be used to balance farmers' perspectives and environmental demands in complex agroecological systems, mainly if process-based crop models can be used for assessing cropping systems responses to climate change and different management strategies.

Using the 'triggering change' cycle to help explain the dynamics of community-level development path transformations in New Zealand, Kirk et al. focus on which advice and expertise on sustainability-based topics are promoted among farmers and producers to address environmental issues. The authors highlight the importance of conceptualizing producers as curators of advice and information rather than mere recipients, which involves doing their research to identify what role they want an advisor to play. These findings, informed by a survey and focus groups with farmers, have important implications for developing future extension programs to help producers adopt, adapt and/or co-design more sustainable land use practices. The research of Mudombi-Rusinamhodzi and Rusinamhodzi goes one step further in linking food producers' and consumers' demands by reviewing the relevance of economic growth and competitiveness in the ability of local communities to ensure food sovereignty and, consequently, increase their adaptive capacity to cope with extreme events. Authors observed, from a sub-Saharan Africa case study, that barriers in the form of taxes or certification costs are causing the abandonment of farmers' trades, affecting smallholder farmers' resilience and other stakeholders' demands, such as urban food consumers. This multifocal approach resonates with the study presented by Ricart et al., who provide an updated version of the Hydrosocial Cycle approach to further highlight the importance of stakeholders' interactions and power imbalances when addressing conflicts over water demands in agroecological systems. Results from an exploratory case study in Spain confirmed that this approach could build trust and promote collaborative problem-solving, ensuring better collaboration among stakeholders and increasing adaptive capacity by contrasting the social, institutional, and environmental spheres of agroecological systems.

Overall, the papers presented in this Research Topic convey new knowledge and innovative approaches for advancing climate change adaptation for agroecological systems. The Research Topic reinforces the potential of social learning to enhance farmers' adaptive capacity when facing climate change, and highlights the relevance of social capital, collaboration, and the need to rethink the adoption process. Managers and policymakers can refer to this knowledge to inform their policy agendas, specifically the need to incorporate technical as well as social (individual, collective, and institutional) perspectives to ensure and foster agroecological systems resilience as part of the decision-making processes at the local scale for climate-adapted futures.

## Author contributions

SR: Writing – original draft. JI: Writing – review & editing. AR: Writing – review & editing. NC-H: Writing – review & editing. NK: Writing – review & editing.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Publisher's note

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