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Multi-Scalar Pathways to Smallholder Adaptation

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ABSTRACT

Smallholder farmers in the Loess Plateau Region of China are highly vulnerable to climate change. Effective adaptation governance requires in-depth, situated understanding of how adaptation is embedded in particular environmental, social, political, economic, and institutional contexts. Drawing on 93 qualitative interviews with smallholder households in five counties across three provinces on the Loess Plateau, we use a multi-scalar pathways approach to analyze two particular adaptations (planting maize and adopting drip irrigation). Our results show (1) how historical and ongoing multi-scalar, social–ecological processes interact to shape smallholder adaptation decision-making, leading to synergies, tensions, and contradictions across risk management domains and social institutions; (2) whether an adaptation strategy persists over time is in part determined by the extent to which the strategy allows smallholder households to manage various forms of risk and uncertainty in both the present and future; and (3) how past and ongoing multi-scalar adaptation pathways determine not only smallholder exposure to current stressors but also possible choices for future adaptation. Specifically, we find some smallholder adaptive strategies, such as planting maize, stabilize over time because they enable smallholders to manage market risk, climatic risk, and water pollution challenges, allow them to take advantage of opportunities to diversify their livelihoods through local wage work and labor migration, and, at the same time, fit the local social institutions that guide their agricultural management decisions. We also find some adaptive strategies promoted by non-local actors, such as drip irrigation, are abandoned because they create tensions with the ways smallholders construct their livelihoods to manage various forms of uncertainty and risk, and contradict the local social relations and cultural values embedded in their day-to-day lives. Together, these results provide insight into why particular smallholder adaptation pathways become stabilized and reproduced over time, and the cross-scalar environmental, social, political, economic, and institutional processes that underpin them.

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1. Introduction

Over the last decade, the concept of adaptation has reemerged in the scholarly literature in the context of climate change, much of it with a focus on examining how smallholder agriculture is affected by and adjusts to climate change. Today, adaptation is broadly used to describe the process of adjusting agriculture and agricultural livelihoods to the impacts predicted to arise from a changing climate (Orlove, 2009). A raft of recent research has examined the adaptation strategies smallholder farmers in the Global South employ to reduce harm caused by and risks associated with climatic and other social–ecological changes (see reviews by Burnham & Ma, 2016 and Harmer & Rahman, 2014). Multiple theoretical lenses have been used to examine smallholder adaptation to climate change, including adaptation governance (e.g., Agrawal, 2010; Huitema et al., 2016; Rodima-Taylor, Olwig, & Chhetri, 2012); adaptive capacity and social capital (e.g., Adger, 2003;

Pelling & High, 2005; Smit & Wandel, 2006); social–cognitive models of adaptation decision-making (e.g., Grothmann & Patt, 2005; Singh, Dorward, & Osbahr, 2016; Spence, Poortinga, & Pidgeon, 2012); risk perception and management (e.g., Field, 2012; Jones & Preston, 2011; Osbahr, Dorward, Stern, & Cooper, 2011; Thomalla, Downing, Spanger-Siegfried, Han, & Rockström, 2006); livelihoods frameworks (e.g., Eakin & Luers, 2006; Orr & Mwale, 2001; Scoones, 2009); and vulnerability (e.g., Adger, 2006; Eakin, 2005; Nelson et al., 2016; Reed et al., 2013; Turner et al., 2003). Much of this previous research is framed with an urgency predicated on the knowledge that significant climate change will happen regardless of mitigation efforts, and that climate change will interact with ongoing social–ecological stressors, both exacerbating them and creating new ones (Adger et al., 2009).

Within the literature on smallholder climate change adaptation, several binary and categorical conceptualizations that describe the function, temporality, origin, and purpose of different adaptation

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practices are discussed, including coping versus adaptation, proactive versus reactive, autonomous versus planned, and incremental versus transformative (Singh et al., 2016; Thorn, Thornton, & Helfgott, 2015). For example, the concept of autonomous adaptation denotes changes households or individuals make to address climatic and other stressors, either reactively or as ex-ante measures designed to reduce potential harm, while planned adaptation refers to strategically planned actions by governments, development agencies, or other actors to enable a target population to adapt to climate change or make them less vulnerable to it (IPCC, 2007). Most empirical studies of smallholder adaptation have focused on autonomous adaptation practices undertaken at the household scale, and are typically framed as contributing a baseline knowledge of existing adaptation practices and adaptive capacities within vulnerable communities that can be built on to develop locally appropriate planned adaptations (e.g., Bawakyillenuo, Yaro, & Teye, 2016; Roco, Engler, Bravo-Ureta, & Jara-Rojas, 2014; see also Burnham & Ma, 2016). This literature has argued adaptation interventions that incorporate local knowledge and practices into their design are more likely to be successful and avoid privileging technological interventions ill-fitted to local adaptive capacities, agricultural management practices, social relations, and institutions (Agrawal, 2010; Crane, Roncoli, & Hoogenboom, 2011; Eriksen et al., 2011; Lemos, Boyd, Tompkins, Osbahr, & Liverman, 2007; Naess, 2013).

Recent work has highlighted that the boundaries between these categorical concepts are fuzzy, and that analytical reliance on them can be counter-productive as it may mask the social processes that shape adaptation practices (e.g., Agrawal, 2010; Osbahr, Twyman, Adger, & Thomas, 2008). For example, autonomous adaptations do not occur independently of governmental and development policy (Adger & Vincent, 2005). Instead, autonomous and planned adaptations often occur simultaneously and interact to shape the effectiveness of the other (Milman & Warner, 2016). Further, the types of proactive and reactive adaptations chosen at the household scale and their effectiveness are shaped by social, political, and economic processes occurring at other scales. Likewise, the boundaries between coping and adaptation are murky as repeated exposure to climate variability and change blurs boundaries between the two and coping strategies may morph into adaptations (Agrawal, 2010).

Furthermore, viewing climate change adaptations taken by smallholders as responses to changes in climatic conditions alone may not be helpful for understanding why smallholders make decisions to engage in or change their agricultural and livelihood practices in ways that directly or indirectly, intentionally or unintentionally, help them address climate change-related challenges over time (Burnham & Ma, 2016; Mercer, Perales, & Wainwright, 2012). As Forsyth and Evans (2013) have argued, it is imperative to understand smallholder adaptation to climate change within the context of their livelihood activities and interacting institutional changes if local knowledge and adaptation practice are going to be successfully integrated into adaptation planning at larger scales (also see Eakin, 2005). They contend adaptation must be conceptualized as actions undertaken by smallholders with the intent to maintain their livelihoods in the face of social–ecological change, as opposed to the “control of physical hazards without connection to livelihoods.” In this vein, a growing body of literature has shown that multi-scalar issues such as political economy, power, and social institutions (e.g., property rights) are often more important drivers of smallholder decision-making than are climatic concerns or impacts (Agrawal, 2010; Burnham, Ma, & Zhu, 2015; Eakin, 2000; Hageback et al., 2005; McDowell & Hess, 2012; Mertz, Mbow, Reenberg, & Diouf, 2009; Mertz et al., 2010; Osbahr et al., 2008; Thomas, Twyman, Osbahr, & Hewitson, 2007; Tucker, Eakin, & Castellanos, 2010). While the question of what shapes the types of adaptation smallholders undertake has been

the subject of much research, little attention has been given to the interactions between adaptation practices developed and implemented at different but linked scales within a broader social–ecological context, and the question of how contradictions and synergies between them shape ongoing and future adaptation pathways remains understudied.

In this paper we bring together perspectives from recent literature that has highlighted the importance of investigating how cross-scalar processes shape household adaptation decision-making (e.g., Feola, Lerner, Jain, Montefrio, & Nicholas, 2015; Osbahr et al., 2008) and how past adaptation pathways have emerged by placing them in their historical and social contexts (e.g., Barnett et al., 2014; Fazey et al., 2016; Wise et al., 2014). We present a case study of smallholder household adaptation decision-making to climate variability and change and other social–ecological changes in the Loess Plateau Region of China, with a focus on two specific smallholder household adaptation practices: the planting of maize and the adoption of drip irrigation. We ask the following three research questions: (1) Why do smallholder households choose to undertake these adaptation practices or not? (2) What are the tensions, contradictions, and synergies between the adaptation practices employed by smallholder households and the adaptation interventions introduced by non-local actors at various scales? And (3) how does smallholder household adaptation interact with broader environmental, social, political, economic, and institutional processes to shape ongoing and future pathways of change and response? We use interview data collected in three provinces to analyze and demonstrate how smallholder household adaptation and livelihood practices create pathways conducive to certain adaptation interventions but unconducive to others. Specifically, we find some household adaptation strategies, such as planting maize, stabilize over time for two primary reasons. First, it enables smallholders to not only manage the largest number of interacting risks in the present (compared to other adaptation alternatives), including market, pollution, and climatic risks, but also take advantage of opportunities to diversify their livelihoods through local wage work and labor migration, thus maintaining livelihood flexibility to address future risk and uncertainty. Second, it fits the local social institutions that guide smallholder agricultural management decisions. In contrast, we find some smallholder adaptation strategies developed and promoted by state actors, such as drip irrigation, contradict with the ways smallholders construct their livelihoods to manage present and future risk, and create tensions with the social institutions embedded in their livelihood practices, leading to their failure and abandonment. Overall, our case study enables us to understand the reasons behind the stabilization and reproduction of smallholder household adaptations, particularly how they function as the risk management strategies and the social, political, economic, and institutional processes that underpin them. This understanding leads to insight into how smallholders make adaptation choices that reflect their attempts to manage risk and uncertainty in the present while maintaining their options to take actions to mitigate risk in uncertain environmental and institutional landscapes in the future.¹

2. Analytical framework

To address our three research questions, we combine two inter-related lenses to examine smallholder adaptation decision-making. First, we examine how *multi-scalar processes* converge to mediate how climatic and other forms of social–ecological risks are experienced locally and acted upon through adaptive practice. Second,

¹ We thank an anonymous reviewer for making this point and helping us to clarify our argument.

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