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Editorial

Introduction: The Continued Importance of Smallholders Today

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Abstract: Smallholders remain an important part of human-environment research, particularly in cultural and political ecology, peasant and development studies, and increasingly in land system and sustainability science. This introduction to the edited volume explores land use and livelihood issues among smallholders, in several disciplinary and subfield traditions. Specifically, we provide a short history of smallholder livelihood research in the human-environment tradition. We reflect on why, in an age of rapid globalization, smallholder land use and livelihoods still matter, both for land system science and as a reflection of concerns with inequality and poverty. Key themes that emerge from the papers in this volume include the importance of smallholder farming and land-use practices to questions of environmental sustainability, the dynamic reality of smallholder livelihoods, the challenges of vulnerability and adaptation in contemporary human-environment systems, and the structural and relative nature of the term "smallholder." Overall these contributions show that smallholder studies are more pertinent than ever, especially in the face of global environmental change. Additionally, we argue that questions of smallholder identity, social difference, and teleconnections provide fertile areas of future research. We conclude that we need to re-envision who the smallholder is today and how this translates into modern human-environment smallholder studies.

Keywords: cultural and political ecology; global environmental change; identity; inequality; land system science; smallholders; sustainability

1. Introduction

Smallholders remain relevant today, if for no other reason than their continued sheer numbers and the total area devoted to their production [1]. Approximately, 570 million smallholder households exist worldwide, and those farming two hectares or less take up about 75% of agricultural land globally [2]. Overall, "the world's present day population of 2.0–2.5 billion smallholders and their access to food and resources, combined with non- and off-farm linkages" make them key actors influencing land-use/land-cover change (LULCC) and biodiversity ([3]; p. 4, this volume). As a result, smallholders remain an important part of human-environment research, particularly in cultural and political ecology, peasant and development studies, and increasingly in land system and sustainability science. This edited volume explores land use and livelihood issues among smallholders, in a diversity of disciplinary and subfield traditions and mixed methods approaches.

Despite their importance and research attention, neither a standard definition nor an explicit, systematic set of criteria to define smallholders exists [1,2,4,5]. Rather, different researchers, research communities, and data compiling units (i.e., countries to international agencies) utilize different

criteria or parameters for criteria to define smallholders. These differences, in turn, can lead to variable estimates of the smallholder population and area farmed. Commonly, however, smallholders are considered to be those agriculturalists cultivating from less than one up to 10 hectares of land ([6] and [7], this volume), the size often reflecting differing land pressures, agro-ecological zones, or alternative economic opportunities [1,2]. In addition, smallholders are typically considered to engage in some measure of subsistence production, with ephemeral to incomplete ties to commercial production owing to constraints on land and social and economic capital, to poor market access, to gender roles, or to cultural norms [8–15]. This last factor, cultural norms, is often linked to the term peasant or peasant production, in which societal values engender community obligations that inhibit individual behavior that might otherwise be captured by the state or the market [16,17].

Past work identified smallholder agriculturalists as engaged in risk-averse production [18,19], although innovative [20,21], in which market ties are mainly limited to sales of normal surplus (i.e., production beyond subsistence needs) [11,12]. Currently, however, smallholders engage the market in some way, if at different levels of intensity, while maintaining some element of subsistence [5,17]. Indeed, it is difficult today to identify many smallholder households that are purely subsistence in kind and not engaged in a cash economy in some way. Even if cultivation is largely for subsistence, household members are often engaged in wage labor off the farm, in many cases at distance, sending remittances back to the household [22,23].

This reality notwithstanding, understanding changes in smallholder livelihoods is essential to comprehending some types of LULCC. Contemporary changes in smallholder livelihood strategies, however, have not been at the forefront in more recent LULCC studies, especially as articulated in land system science (LSS) [24,25]. Nor have understandings of household livelihood change been regularly linked to regional or larger patterns of LULCC. The papers in this edited volume seek to bridge this gap by highlighting the role of changing livelihoods to changing land systems. By way of introducing this bridging effort, we provide a short history of smallholder livelihood research in the human-environment tradition. Second, we reflect on why, in an age of rapid globalization, smallholder land use and livelihoods still matter, as a reflection of concerns over inequality, poverty, and poverty traps (e.g., [26]). Next, we discuss the primary themes that emerge from the edited volume, followed by other fertile areas of future research. We conclude that not only is smallholder research as important as ever (or perhaps even more so), but also the current realities of smallholders require that we rethink how we conceptualize "the smallholder."

2. Smallholder Livelihood Research in the Human-Environment Tradition—Past to Present

Explicit attention to smallholder production systems, from the lens of human-environment interactions, can be traced back centuries in anthropology and geography, though the rationale for this attention has differed through time and among disciplines and transdisciplinary subfields. Anthropology has long examined these interactions to gain understanding of the role of culture in shaping group behavior, foremost focused on non-western societies, which includes subsistence-based smallholders [27]. This attention generated questions about "Homo economicus" and the search for behavioral rationales differing from those undergirding classical western economic thought [28]. In contrast, geography, at least as influenced by Humboldt [29], sought to understand the landscapes generated by smallholders, a theme passed down and applied to non-western smallholders in various guises, from Sauer's [30] landscape morphology to Brookfield's [9] examinations of the production rationales leading to those landscapes. Throughout, the influence of the two disciplines on one another was large.

Fast forwarding to the middle of the 20th century, variants of these traditions merged in the transdisciplinary subfield of cultural ecology (CE), which strongly focused on smallholders, foremost those residing outside western, industrialized countries. Maintaining the different core objectives of their disciplines, the anthropological and geographical cohorts shared a desire to reshape human-environment research to be consistent with (eco)system- and theory-based science [31,32].

Much attention was given to system assessments of various types of smallholder production (e.g., [33,34]) and to why and where smallholder agriculture intensified, which required attention to subsistence production rationales. Cultural ecologists borrowed from the agricultural economists Chayanov [19] and Boserup [20], providing the empirical support for Boserup's thesis about land pressures and intensification, which involved, at least partly, a non-market rationale, and paid explicit attention to how site-situation, especially environmental conditions, modified the intensification process [14,35].

As this and ancillary research progressed, vibrations from critical geography and anthropology gave rise to political ecology [36], invigorated in part by challenges to the risk/hazard subfield addressing smallholders in the developing world [37]. Political ecology (PE) emphasized the role of power relationships and politics on smallholder human-environment relationships that challenged the applicability of western-designed development strategies [38]. Initially focused on structural, explicitly critical, perspectives to problem framing (e.g., [39,40]), PE subsequently expanded to include constructivists' perspectives focused on various social theory interests [41,42]. The questions posed of smallholders shifted to those of equity, marginalization, and gender inequality, among others (e.g., [43,44]), and the previous distinctions in the core objectives of practitioners from geography and anthropology faded.

As political ecology expanded in topics and approaches [45], practitioners aligning more with the science-oriented dimensions of these disciplines loosely merged with their risk/hazard counterparts to enter the global environmental change arena, with an eye on questions of sustainability [46]. The smallholder research cohort of this alignment increasingly positioned itself with the emerging LSS subfield, one in which remote sensing, GIScience, and modeling methods were integrated to tackle the causes and human-environment consequences of land change [24,25]. This subfield, in turn, interacted strongly, and in some case integrated with, environmental and resource economists focused on land and smallholders, political scientists and sociologists interested in smallholder governance and the environment, foremost common property regimes (e.g., [47]), and ecologists interested in social–environmental (aka human-environment) systems, many studies of which involved smallholders (e.g., [48]).

Attention to the human-environment relationships of smallholders no longer resides primarily with practitioners of anthropology and geography linked to the subfield traditions noted above. The currents of global environmental change and sustainability have marshalled in a new era of attention to the social–environmental (or ecological) system. Championed by ecology, this new label for human-environment systems has attracted a wide array of practitioners, largely focused on system resilience and vulnerability [49–51], poverty traps (e.g., [26]), and ecosystem services, including payments for services otherwise lost in land change [3,52]. Increasingly, this problem orientation has been applied to smallholders worldwide (e.g., [48,53]), with linkages to political ecology (e.g., [54]).

In many ways, sustainability and resilience-vulnerability research have become the new transdisciplinary labels for a science-based formulation of human-environment or nature–society science. This is not say that alternative explanatory perspectives, such as structural (critical) and constructivist formulations of smallholder human-environment dynamics, will not remain vibrant and, as noted above, interact with, around, and in spite of this emergent problem framing. For instance, the more historical-, enthnographic-, and cultural-laden version of CE remains intact, interacting with all of the human-environment subfield orientations that have emerged since the middle of the last century. Likewise, PE and LSS increasingly share methods, such as remote sensing, potentially engendering more cooperation among them while maintaining their subfield interests.

This edited volume brings together a diversity of perspectives, including sustainability and resilience-vulnerability framed research along with alternative critical and constructivist framings. Collectively, the contributions in this volume demonstrate how the difference among the approaches is not always that great after all. What remains different is the base set of issues and questions that

garners the interest of each cohort. There would appear to be significant synergies in understanding that could be gained by an improved appreciation and melding of interests among the cohorts.

3. Importance of Smallholders Today: Considering Inequality and Smallholder Poverty

Considerations of LULCC are not the only reason why scholars engaging in human-environment smallholder studies continue to do so. As the above history demonstrates, much of the research on smallholders has been concerned with livelihoods or environments in their own right, and some of this has been motivated by concerns with smallholder well-being and environmental services. Perhaps no rationale for this engagement has been stronger than that dealing with development.

Many early smallholder studies seeking to understand smallholder behavior in the environmental and natural resource arenas were motivated by the desire to inform and improve development efforts. Initially, this work focused on smallholders as rational actors, even if that rationality differed from profit maximization or optimization, rather than smallholders as irrational actors whose production confined them to poverty. This stage of smallholder research, however, did not challenge the notion of development itself. Over the last 50 years, scholarly perspectives on the role of academics and practitioners in development and poverty-alleviation efforts have changed. Frequently informed by more critical theoretical development perspectives, many academics cast a skeptical and even negative eye on efforts to promote agricultural development and/or resource management in the smallholder sector [55,56].

Yet "we cannot not desire development" ([56]; p. 10). The realities of smallholders' poverty and their occupation of a particular position within political–economic systems of often intense inequality that traps them in that position (e.g., [26]) requires that we continue to keep a focus on smallholder studies, even apart from their key role as actors in land systems. The sociopolitical and economic constraints on smallholders are increasingly amplified by climate and socioeconomic and political change, which will continue to push smallholders into precarious positions, raising pressing issues regarding adaptation, vulnerability, and resilience. Not only do these issues necessitate an understanding of change in smallholder systems, as we consider vulnerability and adaptation within these systems, they also ask that we look to smallholder systems as sources of potential dynamism and adaptive possibility, for application to a variety of other production systems [57]. In addition, focusing on smallholders can help us extend our conceptualization of land use in LSS beyond the coupling of land-use change with land-cover change. It can encourage simultaneous attention to both a more intimate scale of land and resource practice, and a multi-site scale of larger production systems and chains, of interest to sustainability science, development studies, and other fields.

4. Smallholder Studies Revisited: Rethinking Land Use and Livelihoods

The papers in this volume illustrate a wide diversity and increasing complexity of smallholder livelihood studies. The research detailed is largely empirical and draws on a wide spectrum of mixed qualitative and quantitative methodologies. The case studies that follow cover a range of geographic locations, including Brazil, Burkina Faso, South Africa, Botswana, Malawi, Madagascar, Vietnam, and the USA, with the greatest emphasis on sub-Saharan Africa. Key themes that emerge include the importance of smallholder farming and land-use practices to questions of environmental sustainability, the dynamic reality of smallholder livelihoods, the challenges of vulnerability and adaptation in contemporary human-environment systems, and the structural and relative nature of "smallholder" as a category. Overall these case studies show that smallholder studies are more pertinent than ever, especially in the face of finite resources and global environmental change.

4.1. Smallholder Practices and Environmental Sustainability

Linkages between smallholder practices and sustainability are explored in depth in the volume's first set of papers with implications for sustainability science. First, sociologist Thomas Rudel and colleagues [7] draw on Netting [5] and others to explore if and how diverse smallholder

livelihood trajectories encourage sustainable land use practices through mixed crop–livestock practices. They create an index of sustainable agricultural practices and perform a meta-analysis of previous studies. Results show that, in general, smallholders more frequently practice sustainable agricultural techniques than do large-holders, although this is not always the case. Ultimately, they press for agricultural policies that support the mixed crop–livestock systems frequently characteristic of smallholder livelihoods and land use.

Geographers Karl Zimmerer and Steven J. Vanek [3] also use a meta-analysis to draw complex linkages and feedbacks between smallholder agrobiodiversity, livelihood diversification, social-ecological systems, and sustainability. Their work expands upon and reframes previous land use and livelihood studies to also include the impacts of livelihood diversification on both above- and below-ground biodiversity, and soil and water resources, with implications for sustainability science. This re-framing contributes to better understandings of processes related to Sustainable Intensification (SI) and Ecological Intensification (EI).

Agriculture and forestry expert Daniel Etongo and colleagues [58] test the poverty and degradation vicious circle hypothesis through a case study approach in southern Burkina Faso. Drawing on participatory poverty assessment methods, the team created indicators to categorize wealth status, environmental degradation, and land management practices. Results suggest ambiguity in the relationship between poverty and degradation. For instance, farmers who are better off tend to be involved in the most environmentally degrading activities, such as deforestation and overgrazing. However, results also reveal that the poorest farmers are the most constrained, and are less likely to adopt land management practices to improve their land. Their findings suggest that, in specifying theories of how poverty and class shape land-use and management practices, there is a need to differentiate among these practices.

4.2. Dynamic Smallholder Livelihoods

The next three papers focus on shifting smallholder livelihoods. Geographer Ritaumaria Pereira and colleagues [59] explore how smallholder farming in the Brazilian Amazon has changed over time. Drawing on mixed-methods field research in southeastern Pará, Pereira and colleagues show how smallholders are influenced and exploited by transnational cattle corporations and global production networks. As a result, smallholders have reconfigured their livelihood systems away from diversified agriculture to increasing engagement with the cattle economy through processes of contract ranching "land grabs." As Pereira and colleagues show, such shifting livelihood processes leave Amazonian smallholders increasingly vulnerable to various kinds of shocks, with implications for long-term socioeconomic and environmental sustainability.

Geographers Sarah Turner and Thi-Thanh-Hiền Pham [60] used remote sensing and ethnographic fieldwork to examine rapid land-use/land-cover change (LULCC) in three borderland provinces in northern Vietnam. Results show that government interventions, state policies, market opportunities, and changing agricultural and ecological conditions led to highly heterogeneous LULCC in the region between 2000 and 2009. Turner and Pham's results reveal the complexity of LULCC mapping, especially in areas undergoing rapid change. This empirical case study demonstrates the need to look at land use and livelihood dynamics using mixed methods across multiple scales, including the importance of on-the-ground ethnographic fieldwork to better inform policymakers.

Geographer William J. McConnell and colleagues [61] use LSS informed by political ecological contexts to critically re-think dominant narratives of smallholders as deforesters and land degraders in Madagascar's highlands. In particular, remote sensing analysis reveals increased patchy patterns of tree growth on mainly smallholder farms and village lands, illustrating that increasing land pressures elsewhere have led to tree planting of mostly exotic tree species as a means of adopting more resilient livelihoods. Such trees (including eucalyptus, pine, acacia, and a variety of fruit trees) have become central to rural livelihoods, helping to secure rural land tenure, while also helping to fulfill increasing urban needs. At the same time, the long-term environmental consequences of exotic tree planting need

to be further studied. What McConnell and colleagues suggest is a more nuanced understanding of the costs and benefits from shifts in rural livelihood strategies on social-environmental systems.

4.3. Smallholder Vulnerability and Adaptation

The next three papers focus on smallholder adaptation, resilience, and vulnerability. Geographer William Moseley's [62] research in Botswana explores smallholder vulnerability in the face of climate change. More specifically, Moseley's research reveals that a middle-income, relatively prosperous country also has high rates of poverty, food insecurity, and income inequality. Using semi-structured key-informant interviews and smallholder household surveys, Moseley's case study shows the importance of looking beyond climate change to include the local, regional and international political economy when considering issues of smallholder marginalization, vulnerability and household food security.

Geographer Brian King and colleagues [63] make a strong argument regarding the need for more studies related to environmental perception and smallholder adaptation in the face of global climate change. Using qualitative methods and a regional case study approach, King and associates studied adaptation in three communities in the Okavango Delta of Botswana. Results reveal that while flooding and precipitation patterns are heterogeneous and fluid, some livelihood responses are rigid due to local regulations, suggesting the need for evolving environmental governance.

Environmental scientist Sheona Shackleton and forest economist Marty Luckert [64] synthesize their research and experiences, providing lessons learned from a large mixed-methods research project dealing with smallholders in the Eastern Cape, South Africa. They argue that as agricultural production decreases, rural Eastern Cape smallholders are increasingly vulnerable to adverse outcomes following livelihood shocks. They identify multi-scalar and complex drivers ranging from historical and national to local processes that influence a smallholder's capacity to adapt. Specifically, Shacketon and Luckert show that being female-headed or HIV-impaired, and having low education levels, along with polarized historical–political legacies, may drive some households into a "trap," thus making it difficult to respond to current and future stressors on the social-ecological system. Overall, they make a strong case for using multiple methods and time trajectories to better assess the complex drivers influencing smallholder vulnerability and adaptation, with policy implications.

4.4. Beyond Smallholders

Finally, the last two contributions in this volume push us to think beyond traditional smallholder categories, to grapple with smallholder definitions that are more fluid and relational in nature. These studies stretch us to consider that what makes a smallholder a smallholder is often more a state of mind or the result of complex power dynamics, than an easy definition related to the number of hectares in their individual land holding. First, geographer Christian Brannstrom and colleagues [65] use GIS and secondary data sources to study the spatial distribution of estimated wind power royalties in West Texas. Results reveal a "property advantage" and a "royalty paradox" when it comes to the unequal distribution of wind power royalties, where large ranchers seem to have a much greater advantage over small-farm cotton growers in the region. This study demonstrates how family farm producers in this context, whom we may not have otherwise thought of as "smallholders," are positioned more weakly within the wind economy. Here, being a smallholder is clearly relative to the larger ranchers.

Last, development economist Ward Anseeuw and colleagues [66] explore the discourse surrounding the seeming transformation of smallholder farmers into medium-scale farmers in Malawi. Surveys, however, reveal that just less than half of the medium-scale farmers are actually urban-based professionals. Anseeuw and colleagues, therefore, challenge the idea that smallholder agriculturalists are emerging through economic growth and development as producers of a larger scale, but instead argue that much of the growth of medium farmers is due to outside urban investment. Instead of transformation, such changes lead to significant land consolidation, thus endangering some

smallholders. Ultimately, this research makes a strong case regarding the need to explore the "Other" with regards to smallholder impacts for sounder policy development.

5. The Road Forward: Fertile Areas for Future Research on Smallholders

While the papers in this volume emphasize the importance of smallholder farming and land-use practices to questions of environmental sustainability, the dynamic reality of smallholder livelihoods, the challenges of vulnerability and adaptation in contemporary human-environment systems, and the structural and relative nature of "smallholder" as a category, here we emphasize a few related but pressing areas for smallholder studies. These include smallholder definitions and identities; gender, race, ethnicity, and difference; and the place of smallholders in teleconnections and global environmental change research.

5.1. Rethinking Smallholder Definitions and Identities

The contributions in this volume encourage us to rethink standard definitions of smallholders and smallholder identities. Considering smallholders in terms of land holding size alone restricts what is observed and how research problems are formulated, limiting the implications for land change and related issues. The assessment of landholding size—once a common-sense matter of knowing a smallholder when you see one—is changing as, for example, the number of medium-scale farms begins to grow in many developing countries, especially if they retain subsistence elements of production. In addition, the breakdown of a conceptual distinction between agricultural systems and situations in developed versus developing countries brings into question traditional definitions of smallholders by holding size and subsistence-orientation.

What these differences suggest is that it may be better to think of smallholder definitions as more fluid and/or relational in nature. As such, important questions remain to be explored: How does a more fluid concept of smallholder relate to that of the "peasant" and the "moral economy" today? How does it relate to a distance from the state and considerations of citizenship? To contemporary incorporation into markets?

Another way to understand relationships between smallholders, land use, and livelihoods is to focus on understanding smallholder identity. Collectively, the contributions in this volume, in some ways, challenge us to reimagine smallholders in a more contemporary way. With the varying smallholder definitions used throughout this volume, the term can be seen as many things: a moving target, as something to be defined in relation to the Other, or, perhaps, even as a state of mind.

For instance, work in the western Brazilian Amazon shows the importance of identity and 'cattle culture' as influencing land use not only among cattle ranchers, but also among more traditional swidden agriculturalists and rubber tappers [67]. Diving into these issues further, it becomes apparent that changing smallholder identities have serious implications for sustainable resource management.

Furthermore, Brannstrom and colleagues ([65], this volume) push us to make space in the discussion for "family farmers and small ranchers" in the USA and elsewhere that may have increasingly more in common with traditional smallholders than with corporate farms and transnational agricultural conglomerates. Traditional family farms in the industrialized west are neither purely subsistence-oriented nor even remotely similar to smallholder land holdings in size alone. Yet as these family farms continue to decrease in number, and are replaced with substantially larger corporate industrial farms, they appear to be moving in some ways culturally closer to smallholders with regards to both their production attributes and their relative position of power. For instance, family farmers tend to be risk-averse, and share strong social and community obligations, similar to smallholders. While not wanting to understate the vulnerability of those smallholders who eke out a living on less than two hectares of land, we do note that family farmers feel increasingly marginalized and vulnerable to the larger structural and economic processes going on around them [68]. For instance, family farmers and ranchers in the High Plains of the American West share a strong sense of identity as

agriculturalists and Dust Bowl survivors, with a growing concern about the death of a way of life [69]. As a result, both land use and livelihoods are deeply embedded in identity.

5.2. Gender, Race, Ethnicity, and Difference in Smallholder Studies

Noticeable in its absence from the contributions to this volume is the explicit treatment of socially-constructed difference, including, for example, gender and race. Several of the contributions do consider the question of ethnicity, through an examination of how different ethnic groups are positioned differently within local land systems ([58], this volume) or socioeconomic systems ([60], this volume). In many smallholder studies, ethnicity functions as a more naturalized and therefore often unexamined category of constructed difference. The research in this volume by Shackleton and Luckert [64] highlights smallholders in a highly racialized context; however, race is not a key aspect of the authors' analysis. Nonetheless, structures of race and ethnicity are arguably central to the systems in which smallholders must operate, conditioning, for example, their access to land, the state, and markets. In many cases, understanding the linked processes of livelihood and land-use change requires that we better understand the construction of racial and ethnic difference, at various scales, and its outcomes for smallholders.

Gender difference is likewise mostly invisible in the majority of human-environment smallholder studies, and this volume is little different (although Zimmerer and Vanek [3] include in their meta-analysis an assessment of the examined studies' inclusion of gender analysis). Women often become visible in the context of female-headed households (see [64], this volume) or as specific or dominant categories of smallholders (see [62], this volume). These glimpses of gender difference invite us to consider further how we might better incorporate into smallholder studies the progress made in gender scholarship in other fields of study. A particularly promising avenue may be to further explore how identities of gender intersect with smallholder-related identities to shape land use and livelihood practices. However, considerations of gender-based differences in access to agricultural inputs, networks, and information remain key to understanding women and men as differentially situated in relation to markets, institutions, and states.

Sociologists have long debated whether the family should function as the unit of socioeconomic class stratification, with the conventional view of the family or household as the appropriate unit challenged by feminist scholars who argue that individual work situations lead to individual (and potentially different) class status for men and women in the same family [70]. Likewise, we suggest that men and women agriculturalists in the same households should be understood individually, and potentially differently, vis-à-vis smallholder status. Thus we must consider the likelihood of a currently invisible group of smallholders, whose own structural position relative to the state and to markets is hidden by their situation within a dual-agriculturalist household or within a household in which another member holds enough land to no longer be considered a smallholder.

5.3. The Place of Smallholders in Teleconnections Research

Urban impacts on smallholders within the urban hinterland are well known and documented. Increasingly, however, the forces external to the smallholder or smallholder communities emanate from well beyond the urban hinterland, constituting teleconnections. Research that explicitly considers the impact of teleconnections on smallholder land use and livelihoods is key to better understanding broader LULCC processes and patterns, as suggested in this special feature (see [59,60]). With increasing calls for studies related to teleconnections in land systems and sustainability science [71,72], it is worth stressing the importance of smallholders in teleconnections research. Changes in smallholder livelihoods and land use often reflect or respond to processes emanating from distant urban and rural areas.

For instance, smallholder households play a key role in understanding complex dynamics around the food, energy, and water nexus [73]. In another example, a teleconnections framework is used to explore vulnerabilities to climate change, and global transmissions of severe acute respiratory

syndrome, while focusing on the livelihoods and adaptations of coffee farmers [74]. Lastly, "land grabbing"—corporate or country entities taking large areas of distant land—is a form of teleconnections that directly affects smallholders not only through the loss of land, but also the access to water on that land [75]. While some smallholder communities have successfully negotiated this access to their benefit, perhaps a larger segment of them have lost land and water access owing to their inadequate power to prevent the loss. Regardless of which outcome is involved, the character of land use is changed, as are the livelihoods of smallholders.

Overall, more explicit focus on smallholders in teleconnections research is needed, to understand questions including what agency smallholders have within different kinds of production chains; how smallholders are differentially impacted by various kinds of teleconnections; how the nature of various teleconnections shape LULCC, as well as smallholder social difference and identity; and how smallholder practices can, in turn, shape processes and outcomes elsewhere.

6. Conclusions and Implications

Smallholder studies are more pertinent than ever, given finite resources, climate change, and political and economic globalization. Many land change science models of smallholders treat these groups as static or fixed, primarily as regards their material base. We suggest that solely material conceptualizations of smallholders may be problematic for a variety of reasons. The contributions in this volume challenge us to reimagine smallholders in a different way, inviting us to rethink land use in a way that considers an intimate scale of land and resource practices. This rethinking holds important implications for understanding smallholder farming and land-use practices relative to questions of environmental sustainability, the dynamic reality of smallholder livelihoods, the challenges of vulnerability and adaptation in contemporary human-environment systems, and the structural and relative nature of "smallholder" as a category. Questions of smallholder identity, social difference, and teleconnections provide fertile areas of future research. Together, these re-imaginings and roads forward call us to re-envision who the smallholder is today and how this translates into modern human-environment smallholder studies.

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