

THESIS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

Remittances, Access & Adaptation

Options to Secure Rural Livelihoods
in Morocco and Myanmar

LAURA M. KMOCH

Department of Space, Earth and Environment

CHALMERS UNIVERSITY OF TECHNOLOGY

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LAURA M. KMOCH

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Department of Space, Earth and Environment
Chalmers University of Technology
SE-412 96 Gothenburg
Sweden
Telephone +45 (0) 28 25 84 24

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Houses and mountain ranges in Tedim,
in the Northern Chin Hills, Myanmar

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Abstract

State leaders have adopted the 2030 Agenda for Sustainable Development and pledged to leave no one behind. This thesis advances knowledge for attaining these goals, through systems thinking and place-based research in the context of climate and land-change processes in Morocco and Myanmar. It (i) advances empirical knowledge about the dynamics that shape the livelihoods of rural people, (ii) assesses what puts them at risk, and (iii) discusses how they could become more secure. It proposes a conceptual framework for studying frontier dynamics through the lens of neglect and demonstrates the utility of local knowledge methods in climate adaptation research.

Papers I and II assess rural peoples' land-dependence, livelihood strategies and associated risks, in the Chin Hills of western Myanmar. They combine cross-sectional household survey data, clustering techniques and access theory, showing that people in Chin State meet much of their needs through farming and products from forests and trees. Households who receive remittances or wages tend to fare better economically yet face additional risks from their exposure to labour markets. Discrepancies between Myanmar's land-sector laws and communities' customary practices imply that many households stand to lose all their land-derived income. Lacking assets, inequalities and local land-change dynamics limit some households' land-access too.

Papers III and IV draw on local knowledge research, in the latter combined with household survey data. The former captures local system dynamics and peoples' disaster experiences to understand how climate-related livelihood risks arise. It argues that interlinked cascading effects, farming challenges and pre-existing vulnerabilities led to escalating disasters when Cyclone Komen crossed western Myanmar. The latter explores tree-based adaptation options to diversify rural livelihoods in northern Morocco. It shows that agroforestry practices are already integral to the regions' smallholder production systems. Yet, complex barriers need overcoming, for further farm trees to be planted and maintained.

Paper V draws on frontiers literature, conceptual thinking and fieldwork for Papers I, II and III to propose a novel framework for studying frontier dynamics. It shows how the workings of neglect render Chin State's rural people vulnerable to dispossession. All papers argue for enhanced efforts to secure rural livelihoods in Morocco and Myanmar.

Keywords: Sustainable Rural Livelihoods, Income Poverty, Remittances, Resource Frontiers, Land System Governance, Swidden Farming, Climate Vulnerability, Disaster Risk Reduction, Local Agroecological Knowledge, Myanmar

Appended Publications

This thesis is based on the following papers:

Paper I

Kmoch, L., M. Palm, U. Persson and M. Rudbeck Jepsen (2018). 'Upland Livelihoods between Local Land and Global Labour Market Dependencies: Evidence from Northern Chin State, Myanmar.' *Sustainability* 10(10), 3707. <https://doi.org/10.3390/su10103707>

Paper II

Kmoch, L., M. Palm, U. Persson and M. Rudbeck Jepsen (in press). 'Access mapping highlights risks from land reform in upland Myanmar.' *Journal of Land Use Science*. <https://doi.org/10.1080/1747423X.2020.1836053>

Paper III

Kmoch, L., M. Palm, U. Persson and M. Rudbeck Jepsen (2020). 'Local knowledge shows how poverty and inequalities fuel climate risk in Myanmar.' Manuscript.

Paper IV

Kmoch, L., T. Pagella, M. Palm and F. Sinclair (2018). 'Using Local Agroecological Knowledge in Climate Change Adaptation: A Study of Tree-Based Options in Northern Morocco.' *Sustainability* 10(10), 3719. <https://doi.org/10.3390/su10103719>

Paper V

Bastos Lima, M. G. and **Kmoch, L.** (2020). 'Neglect paves the way for dispossession: The politics of 'last frontiers' in Brazil and Myanmar.' Manuscript.

Author contributions

- Paper I:** LK conceived the study with support from MP, UMP and MRJ. LK developed the data collected instruments, conducted the field campaign and analysed the data. LK wrote the paper with contributions from MP, UMP and MRJ.
- Paper II:** LK conceived the study with support from MP, UMP and MRJ. LK chose and adapted the data collected instruments, conducted the field campaign and analysed the data. LK wrote the paper with contributions from MP, UMP and MRJ.
- Paper III:** LK conceived the study with support from MP, UMP and MRJ. LK developed the data collected instruments, conducted the field campaign and analysed the data. LK wrote the paper with contributions from MP, UMP and MRJ.
- Paper IV:** LK, TP and FS conceived the study. FS acquired funding and administered the project. LK conducted the field campaign, supervised by TP. LK analysed the data with contributions from TP. LK wrote the paper with contributions from TP and MP.
- Paper V:** MBL and LK conceived the study. MBL and LK developed the theoretical framework and applied it to Brazil and Myanmar, respectively. MBL and LK wrote the paper.

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1 Introduction

1.1 Livelihoods at risk, in a dynamic and unequal world

1.1.1 Societies' relationship with the biosphere is dialectic

A key strand of the human story pertains to people's dialectic relationship with nature. Successive societies have prospered throughout history, by mobilising labour and technologies to extract, convert and redirect environmental resource stocks and flows. Humans' ingenuity in influencing environmental processes has enabled highly affluent and technologically advanced societies to emerge. Yet, it has also led successive societies into crisis (Hedenus et al., 2018), as humans – in their quest to derive goods and services from nature – alter biophysical processes to their own and others' disadvantage.

One reason for this are the dynamics of interlinked societal and biophysical processes, many of which are so complex that humans do not fully understand them. Therefore, they frequently struggle and fail to grasp the proximate effects, let alone wider repercussions, of their actions in and on nature. On the other hand, people also just tacitly accept detrimental impacts of their environmental resource use on themselves and others; because they prioritise their personal gains or for lack of care, awareness or alternatives to act otherwise. Societies are thus exposed and vulnerable, vis-à-vis anticipated and unforeseen biophysical repercussions of anthropogenic activities. They are at risk, as peoples' wellbeing, throughout the world, ultimately depends on biosphere conditions remaining stable enough to be conducive to satisfying human needs (Steffen et al., 2015).

1.1.2 Human affluence drives environmental change

Many contemporary societies are more affluent than they have been at any other point in time. Their wealth has come at the cost of 'increased resource use and pollutant emissions', which persistently grow, despite technological improvements and high-level policy agreements (Ripple et al., 2020; Wiedmann et al., 2020, p. 1). 'The global community now consumes more than ever before. Its 'material resource use [in 2017] breached the 100 billion tonnes mark for the first time in history' (Circle Economy, 2020, p. 12); and 'the anthropogenic [i.e., human-made] mass, which has recently doubled roughly every 20 years, will surpass all global living biomass' this year (Elhacham et al., 2020, p. 1). The world's people and nations are also increasingly interconnected, through networked exchanges of raw materials and processed goods, capital and information, as well as human travel and migration. 'The volume of natural resources traded globally has increased over 60%

since the turn of the century’ (Chatham House, 2020, para. 1), and an estimated 150 million people are migrant workers today (International Labour Organization, 2015).

Human activities have become ‘the dominant cause of most [...] environmental change processes’, which has led some to suggest that ‘a new human-dominated geological epoch’ – ‘the Anthropocene’ – began at least 56 years ago (Lewis & Maslin, 2015, p. 171). Others have argued that peoples’ use of land constitutes humanity’s hitherto ‘largest geo-engineering project’ (Peter H. Verburg et al., 2015, p. 1). Certain is that anthropogenic greenhouse gas emissions and land-change processes have altered biogeochemical and biogeophysical cycles, which are critical to life on earth. Some of these changes ‘pose existential threats to natural systems, economies and societies’ (Steffen et al., 2015; Wiedmann et al., 2020, p. 1), and in conjunction with social drivers, account for much hardship and human suffering throughout the world (Intergovernmental Panel on Climate Change, 2012, 2019; Ripple et al., 2020).

1.1.3 Change is needed to attain sustainable development

The costs and gains of natural resource extraction are unequally distributed in time and space: In time, because contemporary human activities undermine future generations’ wellbeing prospects, and in space because the benefits and burdens from humans’ appropriation of natural capital are not equitably distributed amongst societies and individuals living today (Hoekstra, 2009; Wiedmann et al., 2020). These inequalities signal a need for change, if humanity is to follow pathways for sustainable development, defined as development that ‘meets the needs of the present without compromising the ability of future generations to meet their own needs’ and as ‘a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs (United Nations World Commission on Environment and Development, 1987, pp. 16-17).

That many current development pathways need redirecting, as the global society is not by and large on track towards sustainability, is *inter alia* testified by growing wealth and land-access inequalities (Alvaredo et al., 2017; Anseeuw & Baldinelli, 2020), alarming greenhouse gas concentration pathways (Intergovernmental Panel on Climate Change (IPCC), 2018), unprecedented rates of biodiversity loss (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019), and food insecurity rising afresh throughout much of the world (FAO et al., 2020). Addressing all of these challenges is paramount to

directing humanity's development onto more sustainable pathways. Land-access inequalities and adverse effects of anthropogenic climate change feature most prominently in this thesis. Here, Anseeuw and Baldinelli's (2020, p. 15) argument that land-access inequalities, are 'core to almost every SDG' and 'fundamentally related and often central to broader inequalities, such as wealth inequality, political inequality, social inequality, gender inequality, environmental inequality, and spatial inequality, in particular in agrarian societies', is therefore particularly worth pondering. The same holds with respect to the acute threat that climate change poses to millions of extremely poor rural people, who proximately 'depend on climate-sensitive activities such as agriculture' to meet their needs, but have comparatively 'few[...] resources for protecting themselves against climatic hazards' and 'may be forced to sell of their productive assets or migrate', if adverse climate change impacts put their livelihoods under stress (Food and Agriculture Organisation of the United Nations, 2017, p. 3).

1.1.4 State leaders have pledged to leave no one behind

To address some of the above outlined inequalities, overcome 836 million peoples' extreme poverty and acknowledging that a redirection of current trajectories of global social and environmental change is required to avoid avertable human suffering, the member states of the United Nations have adopted the 2030 Agenda for Sustainable Development in 2015 (The United Nations, 2015). This agenda embodies a declared aspiration for renewed and strengthened collaboration among nation states, in order to engage in transformative actions around 17 Sustainable Development Goals (SDGs) and 169 targets 'to achieve a better and more sustainable future for all' (The United Nations, 2018a, para. 1). This agenda further entails a pledge, for '[r]educing inequalities and ensuring no one is left behind', with emphasis on this being 'integral to achieving the Sustainable Development Goals' (The United Nations, 2018b).

In terms of development practice, this vision translates into a concrete need to address the vulnerability and pressing local sustainability challenges that rural people – including those in upland Asia and the north African Drylands – face today. Morocco has made progress on some SDGs in recent years. Yet, a rural unemployment rate of 39.3 percent, acute water shortages and climate change, which has already led to an average temperature increase of 1.8 degrees Celsius and a 30 percent rainfall decline in the country, remain of major concern (United Nations, 2016). In Myanmar, SDG-related objectives are manifold, but include to 'safeguard ecosystems that provide essential services to local communities', and to '[s]trengthen rural households' land tenure, property rights and related enforcement

capacities’ (The Government of the Republic of the Union of Myanmar, 2018, pp. 26, 52). The nation’s climate change related sustainable development objectives further entail to ‘[a]dapt infrastructure systems [...] to mitigate against heightened risks of natural disasters and new climatic conditions’, to promote climate smart agricultural practices and to [i]ncrease the adaptive capacity of vulnerable households [in response to] adverse impacts of natural disasters including climate triggered events’ (The Government of the Republic of the Union of Myanmar, 2018, pp. 53, 54).

1.1.5 Research can inform development interventions

Researchers can aid in meeting these SDG objectives with a focus on rural people in Morocco and Myanmar in particular, and in making progress towards sustainable development in general, in at least three ways:

First, they can assess social-ecological system dynamics that shape rural peoples’ livelihoods, and the landscapes, resources, technologies and institutions that they depend on. This is especially crucial in regions, where these have so far been little researched. Politicians need such knowledge as a basis for informed policy design, whereas practitioners depend on it for their programming and to conceive, implement and scale targeted and locally appropriate development interventions.

Second, research can also critically observe sustainable development related policy processes and interventions, be it from afar or through close engagement in an advisory, monitoring or evaluation functions. Such work is key to appraising whether such ongoing processes and interventions steer development trajectories towards sustainable trajectories or further away from them.

Finally, researchers can also become more direct agents of change, e.g., by pro-actively engaging with policy makers or development practitioners, for researching policy and practical intervention options that foster sustainable development, as well as barriers that may stand in their way.

1.2 Sustainable development research in this thesis

1.2.1 Aim, objective and research question

The principal aim that guided my dissertation research was – broadly speaking – to make a small contribution to achieving the SDGs, in line with the above outlined roles for research. More concretely, I sought to aid efforts to secure rural livelihoods in the two regions where the case-studies in this thesis are set: the Fès-Meknès Region of Northern Morocco and the Northern Chin Hills of Western Myanmar.

To meet this objective, I took departure in what I perceived as real-world sustainability problems in need of addressing. This is further discussed in *Chapter 3*, with respect to my overarching research approach, and in *Chapters 4 and 5* with a focus on the starting points for the thesis' appended papers.

The overarching question that guided my research, and ties all five papers in this thesis together, was:

Which dynamics shape the livelihoods of rural people in the case-study areas, in what sense are they at risk, and how could they become more secure?

1.2.2 Scope of the thesis and its appended papers

In addressing the overarching research question, this thesis' scope is delimited in three principal ways.

First, in terms of the thesis' geographical focus on two places,

- (i) the Chin Hills of western Myanmar, which share commonalities with other swidden dominated upland regions in South-East Asia;
- (ii) and the Zerhoun Massif in northern Morocco, which shares commonalities with other dryland regions in North-Africa.

Second, in terms of its theoretical and methodological approach. As outlined in *Chapters 3 and 4*, the thesis builds on three types of systems thinking in combination with a mixed-methods empirical case-study design. *Paper V* constitutes an exception in so far, as it features broader conceptual reflections, draws on reviewed literature as well as empirical data, and contrasts empirical cases from Brazil and Myanmar.

A final delimitation of the thesis' scope arises from the thematic foci of its appended papers (Table 1):

Papers I, II and V address the thesis' research question with a focus on livelihood and land system dynamics in the context of land-sector reforms, local land-change processes and emerging frontier dynamics in the Chin Hills of western Myanmar.

Papers III and IV address the same research question, but with a focus on climate-related livelihood risks and adaptation options in western Myanmar and northern Morocco.

Table 1. Foci and overview of the thesis' appended papers.

Overview of appended papers	Empirical and geographical foci
<p>Paper I draws on household survey data, group discussions and interviews. It shows that land-based livelihood activities enable Chin households to meet a large share of their needs. Yet, wages and remittances aid substantially to income portfolios of households in several cluster groups. These tend to fare better income-wise but also face additional risks from their exposure to labor markets.</p>	<p>Livelihood and land system dynamics South-East Asia</p>
<p>Paper II draws on the same survey as <i>Paper I</i>, combined with access theory. It shows that many households are at risk of losing their land-derived income, due to a mismatch of Myanmar's land-sector laws with communities' customary tenure and land-use practices. Yet, lacking assets, inequalities and local land-change dynamics limit some households' land-access too.</p>	<p>Livelihood and land system dynamics South-East Asia</p>
<p>Paper III draws on data from another household survey and participatory local knowledge research. It captures local system dynamics and households' disaster experiences, to understand how climate-related livelihood risks arise. It argues that interlinked cascading hazard impacts, farming challenges and pre-existing vulnerabilities led to escalating disasters, when Cyclone Komen crossed Myanmar in 2015.</p>	<p>Livelihood and climate change dynamics South-East Asia</p>
<p>Paper IV draws on qualitative local knowledge interviews, to assess the opportunity space for tree-based adaptation options to diversify farmers' livelihoods in light of climate change. It shows that various agroforestry practices are already integral to northern Moroccan smallholder production systems. Yet, complex barriers need overcoming, if further farm trees are to be adopted and maintained.</p>	<p>Livelihood and climate change dynamics Northern Africa</p>
<p>Paper V draws on frontiers literature, conceptual thinking and fieldwork for <i>Papers I, II and III</i>. It proposes a framework for studying frontiers dynamics through the lens of neglect. Applied to the Chin case in upland Myanmar, the proposed framework and lens show how neglect renders rural people vulnerable to dispossession in an emerging resource frontier.</p>	<p>Livelihood and land change dynamics South-East Asia</p>

1.2.3 Summary of contributions

This thesis in its entirety, through research presented in its five constitutive papers, makes three principal types of knowledge contributions:

Empirical knowledge:

This thesis advances empirical knowledge about the income poverty implications of rural peoples' livelihood activities, and their reliance on land vis-à-vis other income sources (*Paper I*), their land-access mechanisms and benefits from land under different land-use and tenure regimes (*Paper II*), and their exposure and vulnerability to cyclone-related hazards, climatic stressors and farming challenges (*Paper III*), in a hitherto little studied upland region of South-East Asia.

In the same region, i.e., in the Chin Hills of western Myanmar, it also advances empirical knowledge about the constitutive role of neglect in unfolding frontier dynamics (*Paper V*).

Further, it advances empirical knowledge about Moroccan smallholders' agroforestry practices, fine-scale variations of their livelihood and social-ecological system contexts, and therewith associated barriers and options for a tree-based adaptation of their production system (*Paper IV*), in an already drought prone region of North Africa.

Methodological knowledge:

The thesis further advances local knowledge research methods, for the study of climate risks and adaptation options, by showing how combinations of causal-diagramming techniques, surveys and in-depths interviews help deriving empirical knowledge about fine-scale variations in rural peoples' livelihood and social-ecological system contexts (*Papers III and IV*).

It also shows that the same methods help in understanding how the interplay of rural people's assets and livelihood activities, with broader social-ecological system dynamics, gives rise to climate vulnerabilities, farming challenges, barriers and options for an adaptation of rural people's livelihoods and production systems, vis-à-vis climatic hazards and stressors (*Papers III and IV*).

Further, it showcases minor adaptations to established household income accounting methods, which aid in gathering data about the role of income from agroforestry practices (*Paper I and II*) and plots under specific land-use and management regimes (*Paper II*) in rural peoples' income portfolios.

Finally, it features a rather novel combination of household income accounting methods with access theory, which aids in gathering data about rural people's risk of experiencing income losses vis-à-vis land-access regime shifts in upland Myanmar (*Paper II*).

Conceptual knowledge:

The thesis conceptual contribution lies in proposing a novel framework for the study of frontier dynamics, through the lens of neglect. It argues that neglect not only precedes but co-constitutes frontier dynamics and works throughout them in at least four phases.

1.3 Structure of the remaining thesis

The remainder of this thesis is structured as follows. *Chapter 2* contains a brief overview and reflections on three types of systems thinking, which conjoined served as the theoretical framework for my thesis research. *Chapter 3* serves to motivate my overarching research approach. It also provides an overview of my study sites, field campaigns and methods that I used during field work and for analysing data. *Chapters 4 and 5* hold summaries and reflections on the thesis' appended papers, with a focus on livelihood-land system dynamics in the former (*Papers I, II and V*) and livelihood-climate change dynamics (*Papers III and IV*) in the latter. *Chapter 6* serves to discuss my research findings in relation to the thesis' overarching research questions and pertinent literature. Further, it contains reflections on the findings' practical implications and discusses possible avenues for further research. *Chapter 7* concludes the thesis, with a call for enhanced efforts to secure rural livelihoods in Morocco and Myanmar.

2 Theoretical framework

2.1 Three types of systems thinking

In terms of its theoretical framing, this thesis builds on three systems theories (i.e., types of systems thinking). First, social-ecological and land systems thinking, to conceptualise my case-study areas as coupled, open systems that are made up of human and natural elements, as well as dynamics and emergent properties arising from their interconnections. Second, livelihoods systems thinking, to conceptualise the central subjects of my study, i.e., rural people and their livelihoods. And third, knowledge systems thinking, to conceptually distinguish academic ways of knowing from those of my local research participants, whose local knowledge particularly features in *Papers III and IV*.

2.2 Social-ecological and land systems thinking

In opening this thesis, I referred to the dialectic relationship of people and nature (or societies and the biosphere). This is my entry point to theorising the world we live in and the places that I study. The latter are typically rural landscapes, made up of biophysical features and organisms, man-made material structures, technologies and institutions, the people who live in these places, and the processes and activities that tie these elements together. The academic literature that conceptualises these interconnections of humans with nature is rich in theoretical perspectives and stems from the work of numerous authors and reaches across the social and natural sciences disciplines (Stone-Jovicich, 2015; Turner & Robbins, 2008).

The resilience thinking community, with its roots in the science of ecology, conceptualises humans and nature as constituent parts of one type of ‘complex adaptive systems’, i.e., ‘social-ecological systems’ (Walker & Salt, 2006, p. 11). These social-ecological systems are characterised by ‘thresholds’ and ‘adaptive cycles’ (Walker & Salt, 2006, p. 11). This implies that they can cross tipping points, where they shift from one relatively stable state into another; and they are dynamic in the sense that they are subject to constant cycles of expansion, collapse and reorganisation – ‘an adaptive cycle operat[ing] over many different scales of time and space’ (Walker & Salt, 2006, p. 11).

These conceptions of dynamic systems are important in so far as they point to advantageous entry points for actions, aimed at achieving system change, i.e., when systems, after a phase of collapse, begin to reorganise (Walker & Salt, 2006, p. 82). Further, they facilitate inquiry into which human actions or non-human driving

forces may be required to (i) push a system across a threshold into a new state, e.g., to lift people or communities out of vulnerability; or (ii) prevent a system from crossing a threshold, e.g., to avoid the collapse of rural peoples' farming and livelihood systems, due to impacts of anthropogenic climate change.

One of the most prominent frameworks for studying such systems (Binder et al., 2013; Fisher et al., 2013), is Elinor Ostrom's social-ecological systems framework (2009), which emerged out of collaborations with other academics, *inter alia*, from the Resilience Alliance (McGinnis & Ostrom, 2014). First developed for the management and study of conflicts over the use and governance of common-pool resources, e.g., in the fields of forestry or fisheries (Binder et al., 2013; Ostrom, 2009), this framework has been adapted over time to broaden its scope of applications to more diverse actor groups and social-ecological systems settings (McGinnis & Ostrom, 2014).

Scholars with stronger affiliations to the social sciences, who often employ the concept of human-environment interactions, rather than the notion of social-ecological systems, have critiqued resilience scholars on the ground of their insufficiently reflective 'application of ecological concepts to society' (Cote & Nightingale, 2012, p. 475). This critique is important in so far, as it highlights a need for paying attention to different actors' power and land governance agendas, which shape rural peoples' aspirations, decision-making spaces and vulnerabilities, in livelihoods and land-system research (Cote & Nightingale, 2012).

Systems terminology also features prominently in the field of land-system science (Global Land Programme, 2016; Rounsevell et al., 2012; Verburg et al., 2013). Authors in this field engage in research observing and explaining land cover dynamics and study the drivers, impacts and possible future trajectories of land-use systems across various scales (Rounsevell et al., 2012; Verburg et al., 2013). Land system research has thus greatly advanced knowledge about the magnitude, spatial extent and character of land-system changes, and their social and environmental driving forces, during past decades (Verburg et al., 2013).

This body of literature, including central ideas such as the concepts or 'proximate causes' and 'underlying driving forces' of land change processes (Geist & Lambin, 2002, p. 143), and the notion of feedback processes between human actions, land-use decision making and land-cover changes (Verburg et al., 2013) broadly informs my thinking about the land-system contexts and dynamic driving forces that shape rural peoples' livelihoods.

2.3 Livelihoods systems thinking

Social-ecological and land-systems thinking broadly inform my conception of the world and the landscapes – or human-natural systems – which it contains. These theories are central to my thesis research. Yet, even more central is livelihoods systems thinking, which is my main theoretical lens or starting point to conceptualise the livelihoods of rural people (including their constitutive elements; and their interconnections with the greater world), which are the objectives of my research.

The key strength of sustainable livelihoods thinking lies in its ‘focus on people’ and in its holistic perspective, where the principal aim of livelihoods analyses is to ‘identify the most pressing constraints faced by, and promising opportunities open to, people regardless of where (i.e., in which sector, geographical space or level, from the local through to the international) these occur’ (Department for International Development, 1999, p. 5).

2.3.1 Origins of sustainable livelihoods thinking

The livelihoods perspective adopted in this thesis draws on Chambers’ and Conway’s (1991, p. 5) seminal conception (Scoones, 2009) of ‘sustainable livelihoods’ as rural peoples’ complex ‘means of gaining a living’. This conception roughly dates back to the time, during which Chambers (1993) also published his seminal work on the third agriculture, and as his critique of professional rural development research and practice at the time (compare *Section 2.4*). The development of these ideas can thus be interpreted in relationship to one another. They aimed at bringing attention to the complexities of rural peoples’ livelihoods and to foster new modes of rural development research and practice, which could account for them (Scoones, 2009). Yet, the very roots of sustainable livelihoods thinking – under different names – reaches at least half a century further back in history (Scoones, 2009).

2.3.2 Conceptual elements of sustainable livelihoods thinking

The perhaps most well-known visual and conceptual representation of livelihoods thinking, is the Sustainable Livelihoods Framework of the United Kingdom’s Department for International Development (1999). This framework helped making livelihoods thinking somewhat more tangible, and therefore raised its profile in the late 1990s and 2000s, as evident from its uptake by intergovernmental organisations in the field of agriculture and rural development, including by organisations such as Oxfam and CARE (Scoones, 2009).

The basic building blocks – or conceptual elements – of the Sustainable Livelihoods Framework of the Department for International Development (1999) are shown in Figure 1 and include: (i) the five *livelihood assets* or capitals of rural people, (ii) the *livelihood strategies* or portfolios of different activities through which people mobilise these assets, in order to (iii) meet their livelihood objectives, i.e., *livelihood outcomes*. In trying to meet their objectives, rural people are subject to the influence of (iv) *transforming structures and processes* such as laws, institutions or different levels of government; and (v) a *vulnerability context* comprised of *shocks*, *trends* and *seasonality*, which mediates their livelihoods.

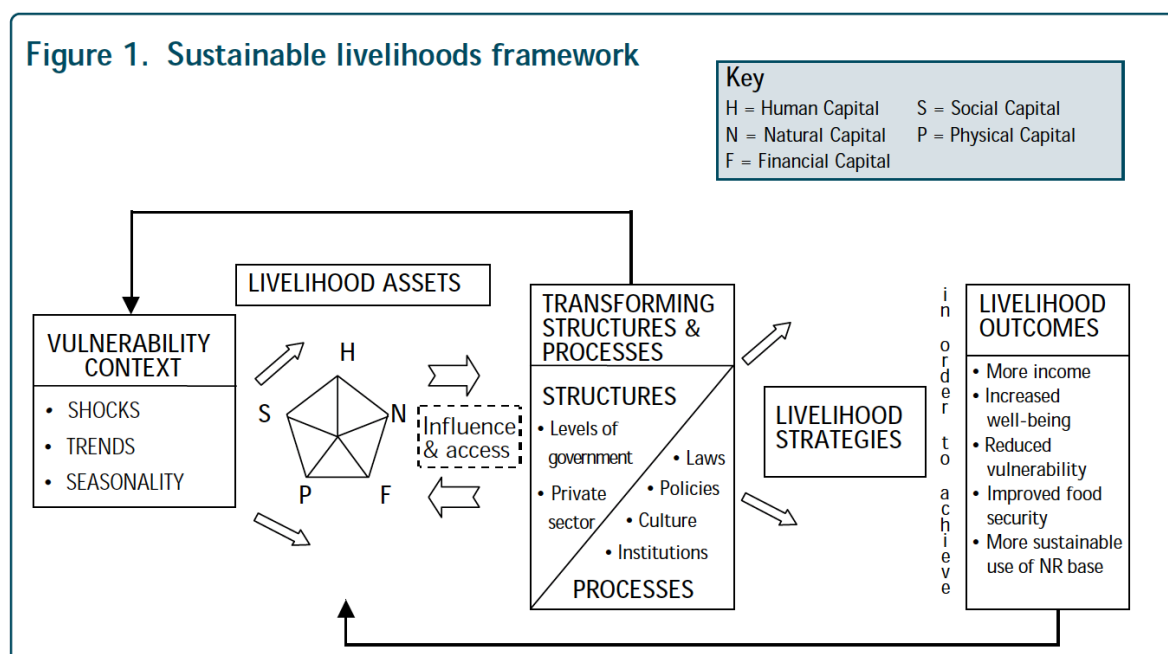


Figure 1. The Sustainable Livelihoods Framework (Department for International Development, 1999, p. 13)

The livelihoods framework as presented above focuses on *sustainable* rather than *secure* livelihoods. These notions are closely intertwined, however. A sustainable livelihood is defined as one that ‘comprises the capabilities, assets (including both material and social resources) and activities required for a means of living’ and that ‘can cope with and recover from stresses and shocks and maintain or enhance its capabilities and asset both now and in the future, while not undermining the natural resource base’ (Department for International Development, 1999, p. 1).

Livelihood security, in line with this, is defined through its opposite, i.e., vulnerability. Chambers (1989, p. 1) defines the latter with reference to its ‘two sides’: ‘an external side of risks. shocks. and stress to which an individual or household are subject: and an internal side which is defencelessness, meaning a lack of means to cope without damaging loss’. Further, he elaborates on what makes

peoples' livelihoods less vulnerable (or more insecure), e.g., having the 'means to make investments' (or not); being able 'to build up stores. and to establish claims' (or not); benefiting from improved services and reduced isolation (or not); and 'tenure of land. water and trees [being] clearly vested' in them (or not) (Chambers, 1989).

2.3.3 Sustainable livelihoods thinking in this thesis

Scoones (2009, p. 172) asserts, that 'livelihood perspectives start with how different people in different places live'. Beyond this entry point, the livelihoods framework has been critiqued for being difficult to operationalise, on the grounds that analyses become either too narrowly focused on households' assets; or too wide in scope, if they attempt to capture all contextual factors that shape rural peoples' livelihoods, in their entirety (Levine, 2014).

I have not perceived these issues as particularly problematic in my own research. On the one hand, because the framework served me as a framing lens and starting point to conceptualising rural peoples' livelihoods and the dynamics shaping them, rather than the sole theoretical tool for conceptualising my research and interpreting results. For the latter, I draw on complementary concepts and theories as outlined with respect to the thesis' individual papers in *Chapters 4 and 5*. On the other hand, Levine's (2014) suggestions for how to approach livelihoods research also helped me, i.e., by focusing on what different people do to make a living, and on the various forces that shape rural peoples' livelihoods – the frameworks arrows, rather than boxes – as he puts it. Further, my thinking has also been shaped by Levine's 'operational map' for livelihoods research (Figure 2). It emphasises rural peoples' perceptions of contexts, risks, and possibilities as mediators of their livelihoods, and therefore fits well with the local knowledge methods that I use in my research.

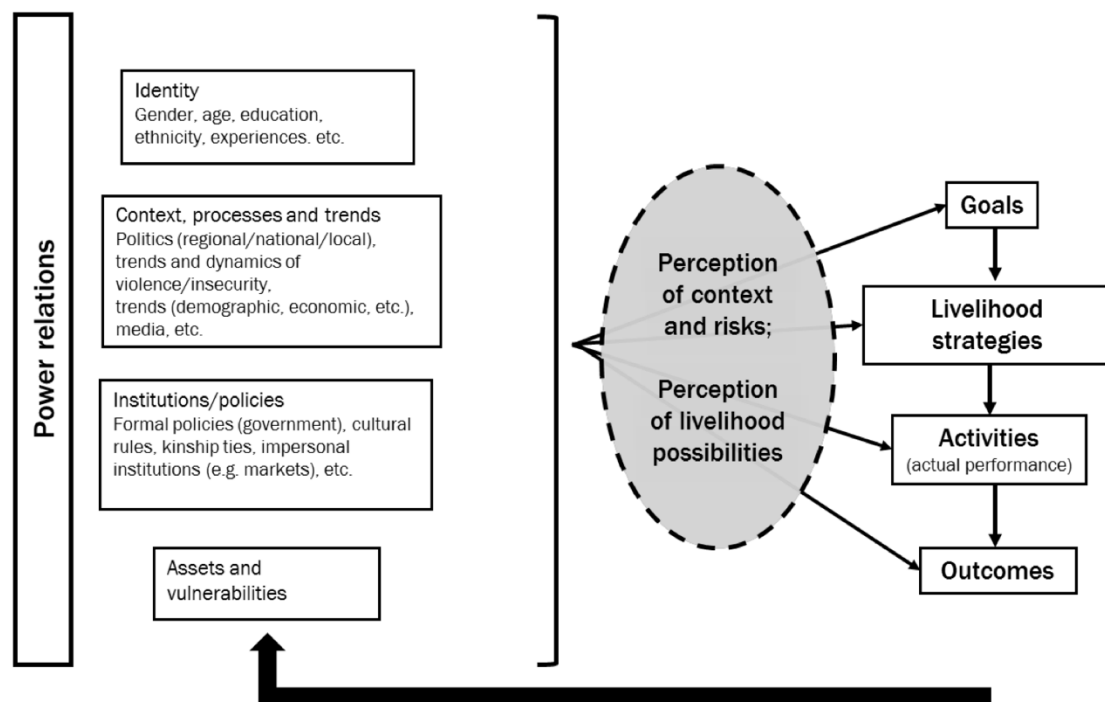


Figure 2. An operational map for research using a Sustainable Livelihoods Framework (Levine, 2014, p. 10)

My own mental framework of rural livelihoods and their embeddedness in social-ecological (or land systems) thus resembles what I sketched out in Figure 3. I conceptualise rural people in terms of being characterised by their own sets of beliefs, aspirations, needs and material, as well as non-material assets (white circles). These people are interconnected with one another, and with the social-ecological systems they are embedded in, which are in turn also interconnected with one another (double arrows).

As a function of their own resources and their livelihood contexts, rural people have various livelihood options (long arrows), i.e., opportunities to engage in various livelihood activities (dark circles). Yet not all conceivable livelihood options are also de facto accessible for households (dark and light grey arrows), as barriers (red symbols) may stand in their way. These barriers arise in consequence of rural peoples' assets (or lack thereof), dynamics in their livelihood context, their own perceptions (dashed white line), or a combination of any or all of these factors. Which activities people do or do not engage in, influences their livelihood outcomes and therefor (re-)shapes their assets, beliefs, aspirations and needs over time.

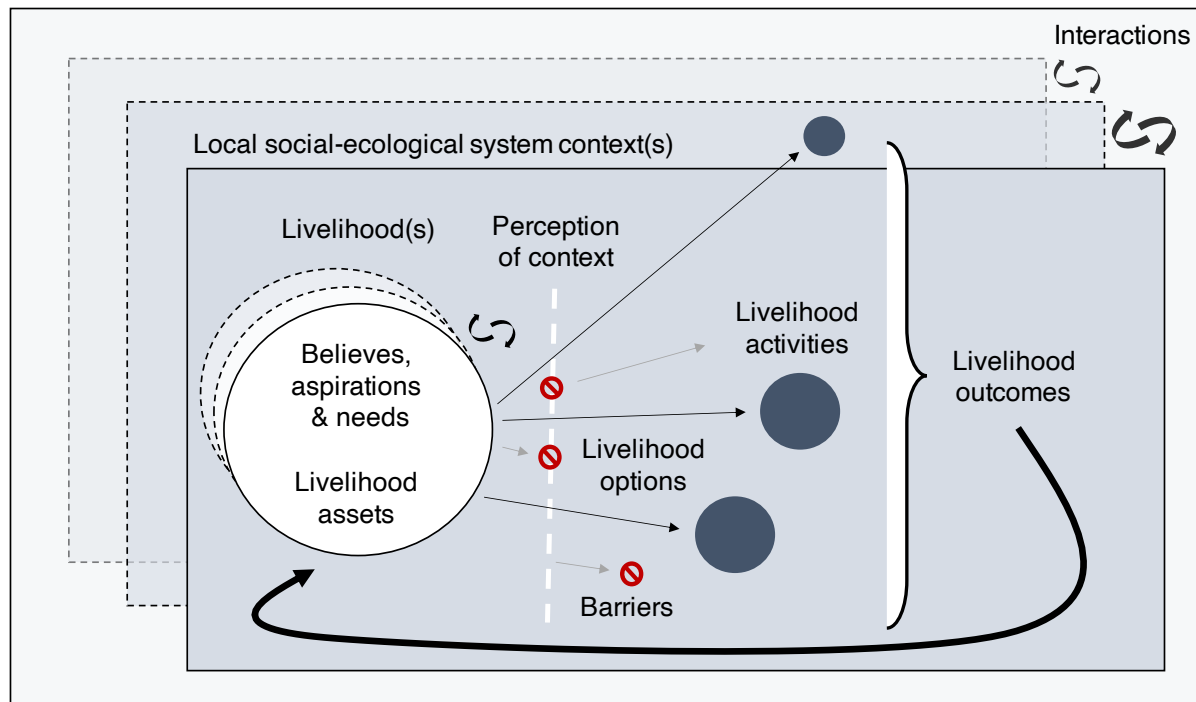


Figure 3. 'Mental framework' of livelihoods thinking guiding the research in this thesis.

2.4 Knowledge systems thinking

The last type of systems thinking framing my research, pertains to the distinction of rural development professionals' (including researchers) and rural peoples' knowledge systems. This distinction matters primarily for *Papers III and IV* in this thesis, which explicitly aim to draw on rural peoples' local knowledge to inform and complement experts' knowledge in the respective fields of study.

The roots of the specific strand of knowledge systems thinking that my thesis draws on, lie in the field of rural development and agronomic research and practice. This field has an explicitly transformative agenda. Its ultimate aim is to address rural peoples' vulnerabilities, and to transform their livelihoods and livelihood-system contexts, e.g., through agricultural innovations, the co-creation and scaling of feasible and context sensitive livelihood options that enable rural people to meet their aspirations and needs.

2.4.1 Definition of local knowledge in this thesis

What I refer to when talking about local knowledge in this thesis, is 'locally derived understanding' of local livelihood and social-ecological system characteristics and dynamics 'which is based on experiences and observations' (Dixon et al., 2001, p. 2). This differs from typical conceptions in e.g., research with a focus on indigenous or traditional knowledge, which is often explicitly concerned with

understanding that is ‘modified by [...] cultural believes and values’ (Dixon et al., 2001, p. 2). My own research has been primarily concerned with capturing respondents’ functional understanding of their livelihoods and social-ecological systems context. This understanding is certainly influenced by local cultural believes and values. Yet, it is likely also shaped by my research participants’ interactions with staff from development projects, commercial traders, media sources, etc., which is why I find the term local knowledge to fit best with my analyses.

2.4.2 Chambers’ seminal positions on professional practice and pathways for technology adoption in rural development

As the livelihoods systems theory presented above, the strand of knowledge systems thinking in this thesis yet again departs from Chambers’ (1993, p. 60) work, i.e., his seminal critique of rural development professionalism, and his ‘farmer-first’ paradigm for the ‘third agriculture’. When Chambers (1993, p. 60) proposed this paradigm, his reasoning was that technological advances and productivity gains in industrial (the first agriculture) and ‘green revolution’ agriculture (the second agriculture) had relied on a technology-innovation model that implied a linear and unidirectional research-extension process; where researchers first developed technologies under controlled conditions and then attempted to promote them for adoption by farmers.

According to Chambers (1993, p. 60), this research-extension model had been suited to certain rural communities and farming systems; yet it would not fit with resource poor farmers in marginal mountain, dryland, and humid-tropical environments, who managed ‘complex, diverse and risk prone’ farming systems that barely met their own food needs – let alone those of an anticipated growing world population. Further, Chambers (1993, p. 65) challenged the dominant professional practice of researchers and extension workers of this time.

The grounds for his critique were: (i) his perception of these actors’ inability to adequately account for the complex and risk prone nature of resource poor peoples’ production systems; (ii) an overreliance on disciplinary agriculture and forestry research that did not capture in-between practices such as agroforestry; and (iii) researchers’ reliance on experimental research set-ups, which were unsuited to deal with the complex interactions and need for ‘multiple simultaneous innovations’ for farming system improvements under marginal socio-environmental conditions.

Yet, there was a solution to address the challenge of resource-poor farmers’ non-adoption and rejection of agricultural innovations, and great potential for a

sustainable intensification and diversification of their production systems (Chambers, 1993). This solution, according to Chambers (1993, p. 67), lay in ‘farmers’ priorities and participation’ in extension and research processes. Such research would explore farmers’ reasons for technology non-adoption, facilitate agricultural innovation with and by rural people and on their own farms (Chambers, 1993). Further, it would build on the recognition of rural peoples’ priorities, knowledge and analyses of their own farming systems, and in innovations that met their self-perceived needs (Chambers, 1993).

2.4.3 Contemporary positions on local knowledge for research and innovation-scaling, drawing on Chambers’ work

Contemporary positions on pathways for technology adoption, scaling and the role of local knowledge in rural development research, resonate with and are in fact often informed by Chambers’ (1993) work. For instance, Van Ginkel et al. (2013, p. 752) advocate for the integration of ‘agro-ecosystem and livelihood approaches’ in research seeking to address the challenges of rural farmers in the worlds’ dryland regions, many of whom face climate induced production risks (e.g., water scarcity), challenging market and governance conditions, and lack access to extension services.

Coe et al. (2014, p. 73) recently called for a new paradigm of ‘research ‘in’ rather than ‘for’ development’. Their idea is to integrate rural development research in development practice, by first deriving cross-disciplinary innovative solutions with specific rural people in their particular livelihood contexts, which can then be scaled-up and scaled-out across systematically identified scaling domains (Coe et al., 2014). According to Coe et al. (2014), such research could capitalise on the substantially greater funds going into rural development practice, than those available for research. Further, it could draw on rural peoples’ local knowledge, e.g., to investigate the fit of innovations within their specific livelihood system and contexts (Coe et al., 2014).

Advocates of integrating local knowledge and academic perspectives in rural livelihood, technology adoption, and climate adaptation research further emphasise that: (i) rural development processes should depart from ‘what local people already know and do’; (ii) that these people command over a great wealth of knowledge that originates in their daily ‘interactions with specific social and agroecological contexts’; and (iii) that local knowledge is not evenly distributed amongst rural people, but a function of power and social status (Warburton & Martin, 1999, pp. 1, 2). Other researchers in the field highlight that local peoples’ knowledge can be a tool in adaptively managing environmental resources, e.g., to account for

environmental feedbacks and uncertainties, which are inherent to environmental processes (Berkes et al., 2000). Finally, Meijer et al. (2014, pp. 1, 4) highlight the importance of paying attention to ‘both extrinsic and intrinsic variables’ – the latter including ‘knowledge’, ‘perceptions’ and ‘attitudes – which affect rural peoples’ technology adoption decisions, which ties the arguments presented here back to Levine’s (2014) framework for livelihoods research (compare *Section 2.3*).

3 Research approach

3.1 Research strategy

This thesis in its entirety was realised through an interdisciplinary, mixed-methods, case-based approach. No single academic discipline could alone do justice to the complexity of rural livelihoods and land-system dynamics on the whole. Given my ambition to shed light on the dynamics shaping rural livelihoods in my case study areas, I had thus little choice but to engage in interdisciplinary research.

An interdisciplinary research approach also fits with my self-concept as a systems thinker and the systems theories that guide my research. In fact, systems thinking and sustainable development research arguably require interdisciplinary practice, for two reasons (Jackson, 2001; Robinson, 2008): First, because systems thinking entails ‘a commitment [...] to looking at the world in terms of ‘wholes’ that exhibit emerging properties’ and can therefore not be understood through sole analysis of their constitutive parts (Jackson, 2001, p. 234). Second, due to the frequent mismatch between the boundaries of real-world problems and traditional academic disciplines (Jackson, 2001; Robinson, 2008).

Below, I motivate how the choice of a mixed-methods case-based approach fit with my ambition to address real-world problems, and to work with various knowledge holders to meet my research objectives. Before that, I briefly discuss my ‘undisciplinary journey’ to ‘issue-driven interdisciplinarity’, however (Haider et al., 2018, p. 191; Robinson, 2008, p. 70).

3.1.1 An undisciplined journey to issue-driven interdisciplinarity

My academic training, up to and continuing with my PhD studies, has been ‘undisciplined’, in so far as all educational programs that I have been enrolled in cross traditional boundaries, rather than fitting neatly within a single natural or social science discipline (Robinson, 2008, p. 70). The fields of my studies, i.e., International Forest Ecosystem Management, Forests and Livelihoods, Agroforestry and Physical Resource Theory, share – by virtue of their academic and practical subject matter – a concern with societal and biophysical objects and processes of human reality. They are also (to a greater or lesser extent) united in their ‘problem-driven and solutions-oriented’ research agendas (Haider et al., 2018, p. 192). I therefor consider myself to be among the distinct generation of early-stage researchers, who have ‘early interdisciplinary backgrounds’ and conduct interdisciplinary, problem driven research from the outset of their academic

training, rather than entering this activity field at later career stages, after having been grounded in ‘strong disciplinary foundations’ (Haider et al., 2018, p. 191).

Upon reflection, I conceive my interdisciplinary research background as a strength. It comes with associated challenges, however. On the one hand, it means that over the course of my academic training, I have been introduced to diverse research traditions and strands of sustainability and development related literature. I have been fortunate to learn from teachers with varied disciplinary backgrounds, at four different universities. Each of these encounters has added to the toolbox of theoretical perspectives, concepts and methods, which I now draw on to develop my own research. On the other hand, it implies a need to effectively navigate and bridge the diverse research traditions, concepts, languages and epistemologies that characterise the different disciplinary research fields upon which I seek to develop my own academic practice (Haider et al., 2018). This is a fundamental learning process and has been both one of the greatest challenges and joys of my graduate research.

Robinson (2008, p. 71) argues that there are two distinct types of interdisciplinary researchers, or ‘types of interdisciplinary temperament’. The first essentially works at disciplinary margins, sets their concepts and theories into dialogue and furthers understanding by drawing on both. If successful, such practice may give rise to new research fields or (sub-)disciplines (Robinson, 2008). The second type of interdisciplinary scholars does not work at the margins of disciplines, but ‘in the sometimes uncomfortable borderlands between the academy and the larger world’ (Robinson, 2008, p. 72). I find the latter to be the most accurate description of what my interdisciplinary research approach for this thesis has been all about. Consistent with Robinson’s (2008) typology, my research is driven by an interest in addressing complex, societal challenges, rather than academic, theoretical puzzles per se.

For my research practice, this has meant that the ideas for this thesis’ articles did not primarily depart from academic literature. They were first inspired by societal issues, i.e., an agricultural policy in Morocco, as well as land-sector policy changes and a cyclone-triggered disaster in Myanmar. Only after these issues had caught my interest, did I begin to identify theoretical, methodological and empirical literature to address them academically. In doing so, I often worked across the social and natural science divide and collaborated with non-academic partners or used participatory research methods to lift and draw on perspectives of non-academic knowledge holders. This approach fits with what Robinson (2008, p. 72) calls ‘issue-driven interdisciplinarity’, where researchers’ main interest lies in creating

knowledge that is ‘inherently useful’, which leads them to create ‘hybrid forms of knowledge’ by combining insights from various disciplines and knowledge from their research partners in ‘the external world’.

3.1.2 Motivating mixed-methods research

My choice of a mixed-methods research approach was primarily motivated by the interdisciplinary nature of my research problems, and by the complexity of the land systems and rural livelihoods that I studied.

One strength of mixed-methods research approaches is that they allow for the integration of complementary data types and modes of inquiry, to tackle the same research problem from various perspectives (Creswell & Clark, 2011). A combination of quantitative survey data with insights from in-depth qualitative interviews, e.g., can help to understand rural livelihood activities from ‘objective’ as well as a more ‘interpretive’ angles.

A second merit of mixed-methods designs lies in their facilitation of data triangulation (Bryman, 2016); e.g., when they enable the contrasting of potentially disparate findings from research that draws on group discussions, key-informant and in-depths local knowledge interviews, on the same subject matter.

Finally, mixed-methods approaches also allow for the sequential combination of different research methods (Bryman, 2016; Creswell & Clark, 2011), e.g., when researchers wish to combine techniques or modes of inquiry so that insights from earlier research stages can inform activities during subsequent ones.

All constitutive papers of this thesis draw in one way or another on the above outlined strength of mixed-methods approaches. How this was realised and to which specific ends, is detailed in the appended papers and their summaries in *Chapters 4 and 5*.

3.1.3 Motivating case-based research

My choice of a case-based research approach was motivated by practical and methodological considerations. In practical terms, I seized opportunities to conduct specific case-studies in specific research setting, as they emerged, especially in Myanmar, where it initially proved challenging to establish research partnerships with local universities or organisations (compare *Section 3.2*). From a methodological perspective, my motivation for case-based research arose from its distinguishing characteristic of allowing researchers to investigate specific cases of phenomena intensively, ‘with a view to thus revealing important features about [their] nature’ (Bryman, 2016). To derive such an in-depths understanding was a

key research interest of mine, as I hoped that the knowledge about rural livelihoods that would thus be gained could rather directly inform the work of local development practitioners (including my research collaborators), both in Morocco and Myanmar.

Beyond practise related concerns, one may ask what kind of academic knowledge can be derived from case studies; and whether this knowledge is necessarily bounded to a specific phenomenon in time and place, or abstractable to derive generalised knowledge claims. Prowse (2010, pp. 217, 222) argues that case studies merit lies in enabling researchers to derive generalised understandings of ‘causal mechanism’, by means of ‘conceptual abstraction’. He reasons that critical realist researchers iteratively engage with their empirical data and existing theories, to over time refine and further develop their understanding of causal mechanisms and the circumstances under which they create empirical events, which humans experience (Prowse, 2010).

Prowse’s (2010) reasoning, that general understandings of causal mechanisms can be derived through conceptual abstraction and inquiry into the circumstances under which specific phenomena arise, resonates with similar propositions of land-system scientists. The latter argue that theoretical generalisation, from place-based case studies, allows for the derivation of general insights about land-system dynamics (Meyfroidt et al., 2018). Here, the idea is to derive ‘middle-range theories’, i.e., theories that are limited to a specific domain of application (Bryman, 2016, p. 19), via an outward-moving approach to generalisation (Meyfroidt et al., 2018). This approach departs from reasoning about causation in a limited set of instances (i.e., cases) to eventually results in ‘contextual generalization, i.e., a chain of causal mechanisms which is valid for explaining a relatively well-bounded range of phenomena, and the conditions or contextual factors which trigger, enable, or prevent this causal chain’ (Meyfroidt, 2016, p. 505).

Another approach to generalising from case studies is to identify archetypes or syndromes, which are ‘recurring patterns or combinations of variables, processes, actors, situations, or outcomes’ (Meyfroidt et al., 2018, p. 54). In this case, derived generalisations do not apply to causal mechanisms that give rise to observed phenomena, but rather to features, which empirically observed cases have in common and upon which typologies can therefore be developed (Meyfroidt et al., 2018).

Finally, generalisations from case studies can also be derived through synthesis methods such as meta-analysis, qualitative comparative analysis, or cross-site comparison, which can be applied to a number of context specific empirical case

studies of social-ecological system dynamics, to make ‘generalized knowledge claims’ that are said to hold under ‘a bounded range of conditions’ (Magliocca et al., 2018, p. 3). This approach is not straightforward, however; and its results can be contested, if researchers’ approach to synthesising knowledge from case studies remains implicit rather than being made transparent (Magliocca et al., 2018). This is why Magliocca et al. (2018, p. 3) propose a typology of generalised knowledge claims, and a standardised approach to knowledge synthesis in the field of social-ecological systems research. This approach centres on three dimensions of generalised knowledge claims from case studies: (i) the claims relation to ‘the prior state of knowledge’ on the topic, (ii) the ‘logic of generalisation’ that the claim derives from, and (iii) the employed synthesis ‘methodology’, which analysts synthesising case studies, should make explicit.

3.2 Field sites and field campaigns

3.2.1 From northern Morocco to Myanmar’s northern Chin Hills

In hindsight and upon reflection, my various field stays in Morocco and Myanmar, can be interpreted as a stepwise process of (i) learning to act independently in the field, (ii) getting to know Myanmar, (iii) working more collaboratively with local research partners, and (iv) extending my ‘physical reach’ across the field site in Northern Chin State.

Prior to commencing my PhD studies, I had already engaged in various types of field research, through my professional work and educational programmes. This includes the field campaign that *Paper IV* is based on, which took place as part of my MSc studies, between March and June 2014. The field site for this research campaign was situated in the Meknès –Tafilalet Region (now Fès – Meknès Region) of Northern Morocco, and part of the Meknès-Saïss action site for sustainable intensification, of CGIAR’s Research Program on Dryland Systems. *Paper IV* includes a detailed description of the study site, but important to note here is that it spans an altitudinal and agroecosystem gradient, reaching from a fertile plain into the Zerhoun Massif and is dominated by smallholder production systems (Figure 4).

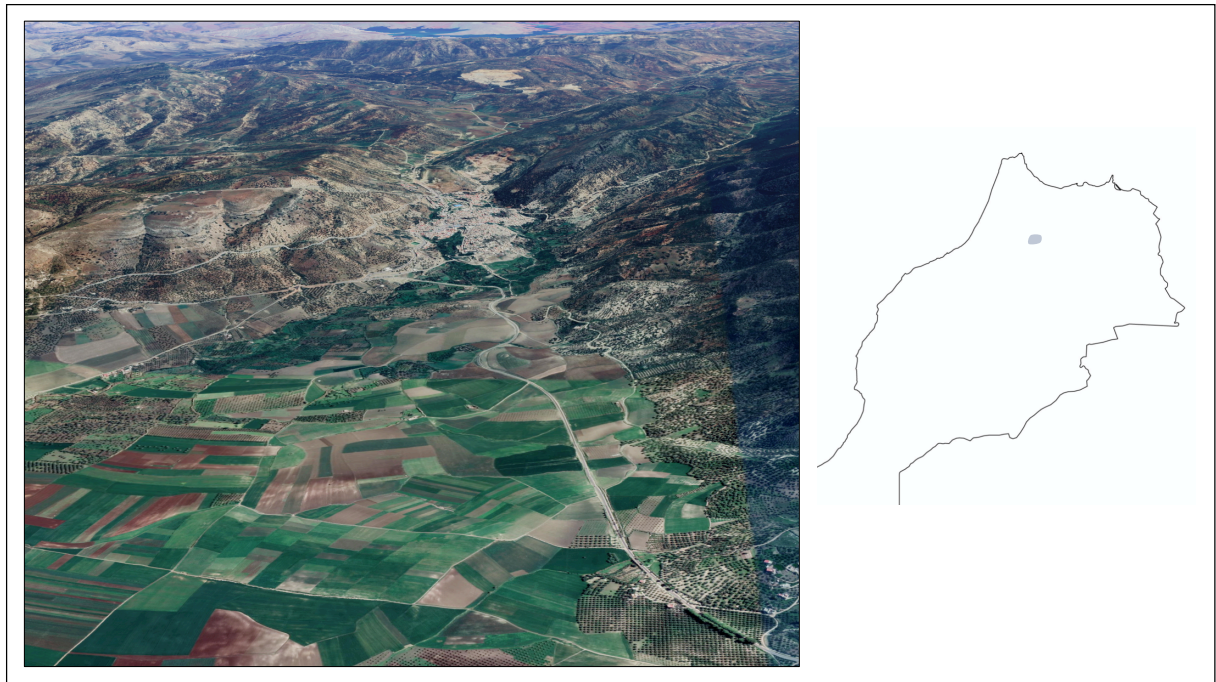


Figure 4. Aerial view of the study area in Northern Morocco (*Paper IV*). The town in the top centre of the image is Moulay Idriss, with irrigated cropland just below it (dark green). In the foreground lies an agricultural plain, from which the ranges of the Zerhoun Massif arise. The shaded area on the inlay map indicates the approximate location of the study site in Morocco. Image: Google Earth Pro, © CNES/Airbus, Maxar Technologies.

The main research methods used during this field campaign were transect walks, in-depth expert- and local-knowledge interviews and focus group discussions (Figure 5). Several locally recruited research assistants aided the study, through their interpretation of interviews and contextual knowledge.



Figure 5. Field work activities in Morocco. The images depict farmers explaining their land-use practices during individual local knowledge (a, c, d) and group interviews (b).

What set my field campaigns in Morocco and Myanmar apart, was that the initial contact to the host and collaborating organisations for my research in Morocco (compare *Chapter 5*) was established by my supervisors. This was different in Myanmar, where no prior research collaboration existed. I therefore had to establish my own collaborations in Myanmar, at the outset of my PhD studies.

This was realised by contacting possible partners via email and meeting various development-related organisations, university employees and staff from local agricultural and forest authorities, during a first scoping trip to Myanmar in March and April 2016. The initial intention was to collaborate with a university partner in Myanmar. Yet, this proved to be difficulties, in the context of ongoing transition processes in the country. Instead, planned to collaborate with researchers from the World Agroforestry Centre, related to their ongoing work on agroforestry alternatives to swidden cultivation, in Chin and Shan State of Myanmar. Unfortunately, this was not feasible for reasons beyond my control. Yet, it was through this contact that I came to know the local organisation Ar Yone Oo Social

Development Association (AYO), which introduced me to the study area in northern Chin State in December 2016 and supported my research there.

Northern Chin State in the west of Myanmar is home to some of the country's poorest communities (which have long been marginalised) and my study area encompassed two types of villages in different landscapes (Figure 6): First, those in the steeply sloped, swidden and forest dominated mountain ranges of the Chin Hills near the Towns Tedim and Tonzang. Second, those situated in the adjacent plain and the eastern foot slopes of the Chin Hills, north of Kalay city, where local households grow monsoon paddy and legumes, pulses and vegetable cash crops during the dry-season winter months. Further details about both of these landscapes and the villages, which were captured through research during my various field campaigns are provided in *Papers I, II and III*.

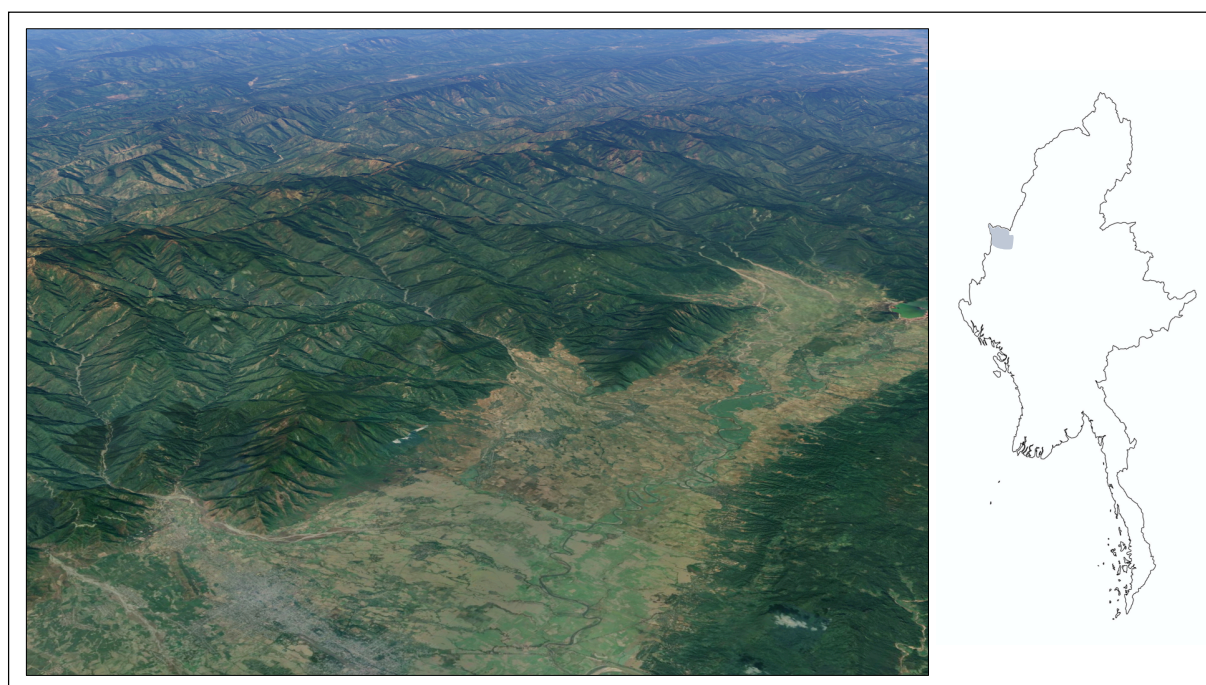


Figure 6. Aerial view of the study area in North-Western Myanmar (*Papers I, II and III*). Visible in the foreground (bottom left) is Kalay city, which is situated in the Kalay Valley. The northern Chin Hills are the mountain ranges rising from the valley (left side). The shaded area on the inlay map indicates the approximate location of the study site in Myanmar. Image: Google Earth Pro, © CNES/Airbus, Landsat/Copernicus, Maxar Technologies.

3.2.2 First field campaign in Chin State

My first major field campaign in Northern Chin State took place in January and February 2017 and served as the basis for *Papers I and II* in this thesis. The work was facilitated by AYO, who helped with logistical arrangements and made introductions to the heads of four rural villages near Tedim, in which the research

took place. The field campaign was realised together with two local field assistants, who aided the research through their interpretation and contribution to data collection during all fieldwork stages. The key research methods and instruments used during this field campaign, where a cross-section household survey implemented with hand-held tablets, as well as field observations, focus group discussions, in-depths interviews with key informants and informal interviews with survey respondents (Figure 7).



Figure 7. Field work activities in Myanmar during the first field campaign. The images depict group discussions (a, c) and household survey interviews (b, d) with residents of the case-study villages. Also shown are preparations for field research activities with the two field assistants, which supported the research (e).

3.2.3 Research interlude in Shan State

Before I returned to Chin State for my second major field campaign, I spent three months with the Myanmar based organisation Myanmar Institute for Integrated Development in Southern Shan State during the monsoon season of 2017. The research that I conducted during this time is not part of this thesis and therefore not described in detail here. The importance of mentioning this research interlude in Shan State lies in the additional insights that I gained during this time, about climate and poverty-related challenges of Myanmar's rural people and possible pathways to secure their land rights under the umbrella of the country's community forestry instructions.

3.2.4 Second field campaign Chin State

My second major field campaign in Northern Chin State took place between January and March 2018 and served as the basis for *Paper III*. A first major difference between this and my former field campaign in the area lay in the geographical reach of my activities, which took place in six different rural villages that were more dispersed and remote from major towns than those included in the first field campaign. Second, the research was also more collaborative in terms of my engagement with AYO, as detailed in *Chapter 5*. All research activities during this field campaign were realised in collaboration with two dedicated staff members from AYO, as well as additional employees of the organisation, who helped in establishing contacts to study communities, with logistical arrangements and the facilitation of selected research activities. The main methods used were participatory causal-diagramming workshops, a structured household survey and in-depths interviews with rural farmers, staff from local agricultural authorities and AYO (Figure 8).



Figure 8. Field activities in Myanmar during the second field campaign. The images depict an interview situation (a), participatory causal-diagramming sessions (b, c, d) and the sharing of preliminary results via posters (e).

3.2.5 Closing cycles in the northern Chin Hills

My latest stay in northern Chin State dates back to December 2019. The research that was conducted during this research campaign is also not part of this study, as the data analysis is still outstanding. Yet, it is worth mentioning for three reasons. First, because this field campaign allowed me to observe the rapid changes that had taken place in the area – especially in Kalay but also Tedim – since my last stay in

the area and thus helped inform my arguments about frontier dynamics in the region for *Paper V*. Second, because the research entailed re-interviewing all households who had been surveyed during my first major field campaign in northern Chin State, and thus provided another opportunity to learn about changes that had since taken place in the area and in its residents' livelihoods. Finally, this field campaign also signified a closing of cycles of my activities in Myanmar to date, as it was conducted in collaboration with staff and students from Kalay University, i.e., a higher education institution in the country, which had been the intention for my thesis research all along.

3.2.6 Research methods and modes of analysis

Table 2 provides an overview of how the different research papers in this thesis relate to the above outlined field campaigns, as well as methods used in the field and for data analysis.

Table 2. Overview of research papers in relationship to the field campaigns, as well as methods used in the field and for data analysis.

Field campaigns	Papers	Field methods	Modes of data analysis
Spring 2014	Paper IV	Key informant interviews Focus group discussions In-depths local knowledge interviews Transect walks and field observations	Extraction, collation and analysis of interconnections among unitary, causal local knowledge statements using the AKT5 software Synthesis and triangulation of data obtained by using various field-research methods
Winter 2016/2017	Paper I Paper II	Structured household survey Focus group discussions Key informant interviews Informal interviews with survey respondents Field observations	Descriptive statistics Cluster analysis (<i>Paper I</i>) Calculation of household and community income budgets Non-parametric statistics Triangulation of data obtained by using various field-research methods
Winter 2018	Paper III	Participatory causal diagramming and knowledge sharing workshops	Synthesis of causal diagrams created during participatory workshops

		<p>Key informant interviews with staff from agricultural state authorities</p> <p>In-depths interviews with rural farmers and AYO staff</p> <p>Structured household survey</p> <p>Field observations</p>	<p>Descriptive statistics</p> <p>Synthesis of key informant and in-depths interviews focused on emergent themes from causal diagrams</p> <p>Triangulation of data obtained by using various field-research methods</p>
Winter 2019	Paper V	Field observations	<p>Synthesis of insights from previous field work in Myanmar</p> <p>Conceptual and narrative literature review</p>

4 Emerging livelihood risks in western Myanmar

4.1 Motivation and rationale for Papers I and II

4.1.1 Connection of Papers I and II

The first and second paper in this thesis build on the same set of income data from 94 rural Chin households. Hence, they are best understood as two interconnected, yet distinct pieces of work. *Paper I* present results from the first steps of analysing the data set, i.e., results from the calculation of households' net aggregate annual income, an assessment of households' income portfolio composition, and a cluster analysis to group households, who were similar in terms of their obtained income shares from similar sources. *Paper II* depend the analysis, by focusing on households' access to and income from specific types of land.

4.1.2 Research idea

The initial idea for the research presented in both papers arose from reflections on publications of academics and civil society organisations on swidden systems and the ongoing land-reform processes in Myanmar. Many of these actors were acutely concerned about the complex legal framework governing land matters in the country; and about the contemporary re-negotiation of this framework in political fora and through de facto land-use decisions being made throughout Myanmar. Of particular concern were two land-sector processes and their implications for rural communities' access to land. First, the drafting of Myanmar's National Land Use Policy (The Republic of the Union of Myanmar, 2016), which was then still ongoing. And second, the country's Farmland and Vacant, Fallow and Virgin Lands Management Laws, which had been enacted in 2012.

What struck me in reading this literature, was how little was known about the extent, character and economic importance of swidden practices for Myanmar's rural communities, despite these concerns. What I perceived was in essence a double failure to recognise upland households' traditional tenure and land-use practices: both from politicians and representatives of state authorities in Myanmar who appeared unwilling to recognise and translate communities' customary land rights into national law, and amongst land-sector stakeholders in Myanmar at large. While the latter had valid grounds to worry about the new land legislations' ramifications, they were nonetheless constrained by a paucity of available information about livelihood and land systems across the country's uplands, to empirically back their concerns and propose alternative land governance arrangements.

4.1.3 Research objectives and rationale

Our objectives with the research presented in *Papers I and II* were therefore to (i) advance knowledge about rural households' livelihood activities, customary tenure and land-use practices in northern Chin State; and (ii) to appraise how reliant different households were on income from off-farm and land-based livelihood activities, as well as on land under different customary tenure and land-use regimes. These objectives were based on a twofold rationale: First, in meeting them we would advance academic knowledge about livelihoods and land systems in an understudied region of upland South-East Asia. Second, our results – if they indeed indicated that households strongly depended on customary tenure and land-use practices – could be used to inform ongoing policy debates and in advocacy activities, in support of Chin communities' legitimate claims to their hitherto customarily governed village land.

4.2 Paper I: Off-farm incomes mitigate absolute poverty

4.2.1 Approach

The choice of an income accounting approach for studying northern Chin households' dependence on land, vis-a-vis other income sources, was based on several reasons. The simplest – but not decisive – one was my prior familiarity with the survey-based household income-accounting methodology that the Poverty and Environment Network (PEN) of the Center for International Forestry Research had launched in 2004, to advance the collection of comparable data about more than 8000 poor rural households' environmental dependence, in 24 countries across Asia, Africa and Latin America (Angelsen et al., 2011; Angelsen et al., 2014; Center for International Forestry Research, 2007). In brief, this methodology entails following a structured approach to appraising rural households' annual income budgets, with a number of different survey instruments.

The first reason that tipped the scale in favour of this methodology was its focus on the collection of household income, rather than consumption expenditure data. Although expenditures are often the preferred indicator for household welfare and poverty studies (Haughton & Khandker, 2009), this was not the case for our research, as it was precisely households' income generation activities, their dependence on different types of land, and the income poverty implications of their livelihood strategies, that we sought to appraise.

The second reason for adopting (and adapting) the PEN methodology, was that researchers using this approach had recently shown that rural Asian households obtained an average share of 22% of their annual income from forests and other

natural areas (Angelsen et al., 2014). Our research approach thus had to be suited to capture income streams from fallows, forests and other natural areas, as well as from agricultural activities, if we were to ensure that it adhered as much as possible to state-of-the-art practice in this research field (Bakkegaard et al., 2016) and did not gravely underestimate critical benefits that households derived from the various types of land, which they could access.

4.2.2 Methodological constraints and adaptations

A limitation of the first field campaign was that we could not include households from comparatively remote villages (e.g., close to the Indian border; more than two hours away from Tedim) in our sample frame, as I lacked permission for overnight stays with rural families, rather than in registered guesthouses. Our sample was thus likely less representative of northern Chin livelihoods at large than it could have been, if we could have reached entirely randomly selected villages. A second limitation of our approach was that we conducted the household survey with long recall periods of up to 12 months (compared to the original PEN methodology, with periods of three months or less), due to practical and financial constraints. We sought to limit possible bias arising thereof, by asking about households' income from specific products during specific seasons, in line with recommended practice for situations in which repeat surveys are infeasible (Angelsen et al., 2011; Bakkegaard et al., 2016).

We also made two other purposeful divergences from common household income accounting practices (Bakkegaard et al., 2016): we collected disaggregated data about income streams from both forest and non-forest trees, as well as from individual plots of private land. These modifications were motivated by our ambition to explore at greater detail than previous studies the shares of households' aggregate income that stem from farm trees and types of land under specific tenure and land-use regimes. The former led to the interesting secondary insight that farm trees, especially in-home gardens, substantially contributed to households' crop (and therewith dietary) diversity and accounted for close to a tenth of households' aggregate gross income from land. The latter, on the other hand, was central to the development of our arguments around access in *Paper II*.

4.2.3 Key results

The first step in analysing the income data was to assess how many households had engaged in (i.e., derived an income from) a range of different income generation activities, assessing how much each of these activities had contributed to the sample's aggregate income during the past 12 months. What the results of this analysis showed, took us by surprise.

Our expectation – informed by existing literature and own observations in the study area – had been that northern Chin households primarily relied on farming and other land-based livelihood activities to meet their basic food, material and energy needs (Figure 9). Results of our analysis also showed that our sample households relied on land, at least in so far that more than four fifths obtained a share of their income from crops, forests and farm trees. The sample's greatest aggregate income share, however, did not stem from land-use activities, but rather from remittances. These accounted for almost a quarter of the sample's aggregate income, closely followed by wages, which summed to nearly a fifth. Crops, forests and farm trees, in contrast, accounted for just a third of the sample's aggregate income.



Figure 9. View across Northern Chin State's mountain ranges, illustrating typical agroecosystems of the area, from which households derive a share of their income through land-based livelihood activities.

The analysis showed that not all households relied equally on income shares from land-based and off-farm oriented income generating activities, however. Only half of all households made part of their living from remittances and wages. A cluster analysis that grouped households based on similarities of their relative income shares from different sources showed that there were six clusters of households, with relatively distinct income portfolios (Figure 10). Households in three of these clusters – representing half of all households – typically derived most of their

income from land-based activities, whereas the other half derived large income shares from off-farm sources.

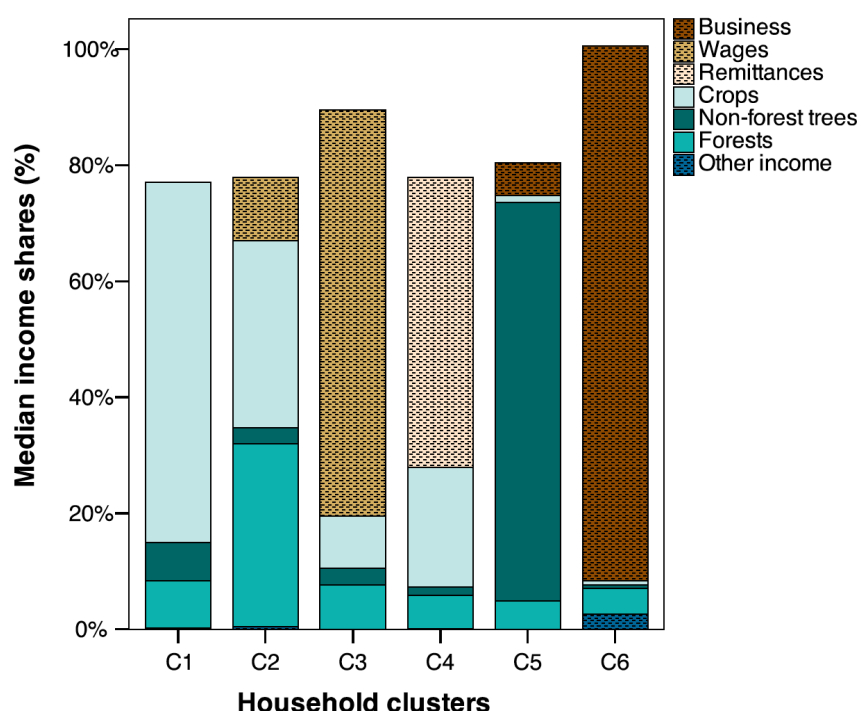


Figure 10. Relative composition of household income portfolios across household clusters. Stacked bars illustrate the median contribution of various income components to income portfolios of the different household clusters. Clusters C1 – C6 represent the following livelihood strategies: C1 (n=17) – relying primarily on own farming activities; C2 (n=26) – making a living off the land, with mixed income from agriculture and forest resources; C3 (n=17) – engaging in wage employment; C4 (n=27) – living from remittances; C5 (n=4) – practicing non-forest tree husbandry; and C6 (n=3) – engaging in self-employed business activities.

The analysis further showed that households' income-portfolio composition not only mattered in terms of their land dependence, but also had income poverty implications (Figure 11). Statistical test revealed that off-farm oriented income generation strategies tended to be more remunerative than land-reliant ones. The median annual household income per adult equivalent unit (AEU) in the poorest household cluster (C1) was less than half of that in the comparatively rich, remittance reliant cluster (C4). The median per capita annual income across all households was 468 thousand Myanmar Kyat, or approximately 1777 international dollars (1000 MMK ~ 3.8 international dollars in 2016); but households representing the richest 25% of all people in the sample, obtained more than 50% of the sample's entire annual income.

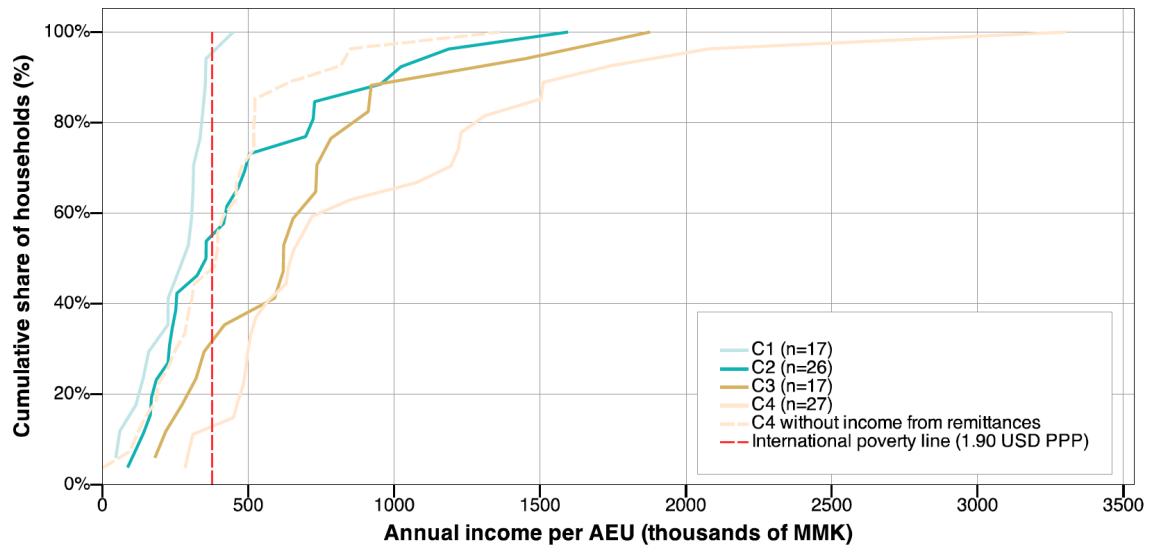


Figure 11. Cumulative density distribution of annual household income per AEU by cluster and in relation to the international poverty line of 1.90 USD PPP. The distribution of annual household income in C4, without income from remittances, is also shown.

Finally, we found that more than half of all households lacked cash to meet their needs, while most others had barely enough to get by. Households land-based livelihood activities were almost entirely subsistence oriented, although some crops, livestock and farm-tree products were sold.

4.2.4 Main insights

The main insight from this study was that Chin households were indeed reliant on land. Yet, the economy of our case study villages was more complex than first anticipated. Off-farm income, i.e., wages and remittances were key mitigators of absolute poverty in the study area and the largest aggregate income shares of the studied communities. Approximately half of all households nonetheless primarily depended on income from land-based activities to meet their needs; and even remittance-receiving households typically derived substantial shares of their income from land.

The studied households were certainly vulnerable vis-à-vis land-sector reforms, which could restrict their access to formerly customarily governed land. Yet, this was not equally true for all households, as some derived greater land-income shares than others. The latter may thus have been at comparatively lesser risk from land reforms. However, in contrast to solely land dependent households, they were also vulnerable vis-à-vis domestic and international labour market dynamics, due to their proximate dependence on salaries and remittances.

4.3 Paper II: New laws aggravate land-access insecurities

The study of households' access mechanisms and benefits from land in *Paper II*, built on insights from *Paper I* and deepened the analysis of households' reliance on different land types. While Paper I advanced knowledge about Chin households' livelihoods and reliance on land, we were yet to assess in-depth how much income our study communities risk losing, in consequence of Myanmar's new land sector laws. Although the analysis for *Paper I* had established that crops, forest and farm-tree products only accounted for a third of communities' aggregate net income, land access clearly mattered for households' livelihood security. Land-based livelihood activities were after all a source of income for most households, and especially those in the primarily land-reliant clusters, who were typically poorer.

4.3.1 Approach

The basis for analysing households' land access mechanisms and derived benefits from specific types of land in *Paper II*, was laid during my first field campaign, from which the data on households' income sources stemmed. The household survey instrument, which was used to collect this data, had included questions about households' derived income, as well as about their use of technology, market access and labour needs for various land-based livelihood activities. To appraise households' land access mechanisms in *Paper II*, we now drew on data from answers to these latter questions. Further data, about customary rules governing households' access to land within their villages' territories, upon which we based our appraisal of households' customary rights-based access to land, stemmed from a focus group discussion, key-informant interviews with village authorities, and informal interviews with survey respondents, which had also been realised during the first field campaign. The analysis of income streams from different types of land, finally, relied on a classification of communal and privately held plots of land in each village, which was *inter alia* based on aerial image aided discussions, with community residents (Figure 12).



Figure 12. Illustration, indicating the location of different forest, scrub- and cropland types, which households of two case study villages controlled or derived a share of their income from. Image: Google Earth, © CNES/Airbus, Landsat/Copernicus, Maxar Technologies, Data: SIO, NOAA, U.S. Navy, NGA, GEBCO.

4.3.2 Theoretical and conceptual considerations

The decision to assess Chin households' customary tenure practices and access to land by adopting Ribot and Peluso's (2003) access theory and a revised version of Schlager and Ostrom's (1992, p. 249) framework for tenure regime analyses focused on actors' 'diverse bundles of rights' (Sikor et al., 2017), was motivated by two considerations.

First, Sikor et al.'s (2017) framework enables appraisals of complex tenure arrangements, where resource rights may be nested or distributed amongst several actors, as encountered in our Chin case. It does so by maintaining the bundles-of-resource-rights notion, while introducing 'control rights' and 'authoritative rights' as new concepts (Sikor et al., 2017, p. 339). These are *inter alia* useful in discussing communities' de-facto devolution of rights, from the customary domain to state actors, by engaging in externally initiated land-development schemes, which part of our discussion in *Paper II* exemplifies.

In addition, we expected that the access framework (Ribot & Peluso, 2003) better lend itself to the intended analysis, than, e.g., the revised social-ecological systems framework (McGinnis & Ostrom, 2014), which has been used to study interlinkages between land-derived benefit flows, land-use and governance changes in southern Myanmar (Schneider et al., 2020). Primarily this was because our objective was to gain a better understanding of Chin households' land-access

mechanisms and resulting benefits from land, rather than to synthesise insights from more actor oriented and land-use change focused research, which was the case in the study of livelihood-land relations in northern Tanintharyi (Schneider et al., 2020).

4.3.3 Key results

The appraisal of households' economic benefits from different types of land showed that the sample derived its greatest aggregate income shares from current swidden fields and homegardens, followed by privately managed forests and scrublands and communal village forests (Figure 13). Income from paddy fields and semi-permanent gardens only had an ancillary role, as most households lacked access to these types of land. Teak plantations likewise did not (yet) play a role in terms of land-related income streams. They had been established by what survey respondents described as better off households but were still too immature to return a profit.

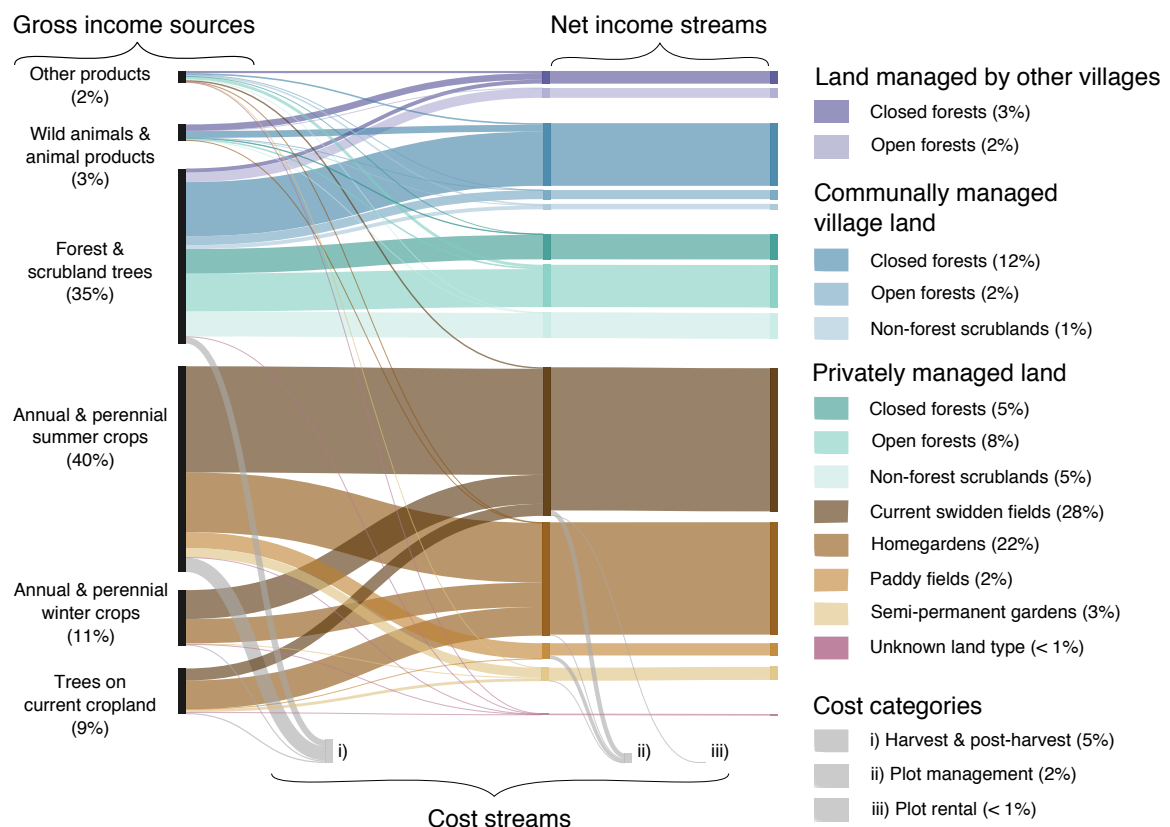


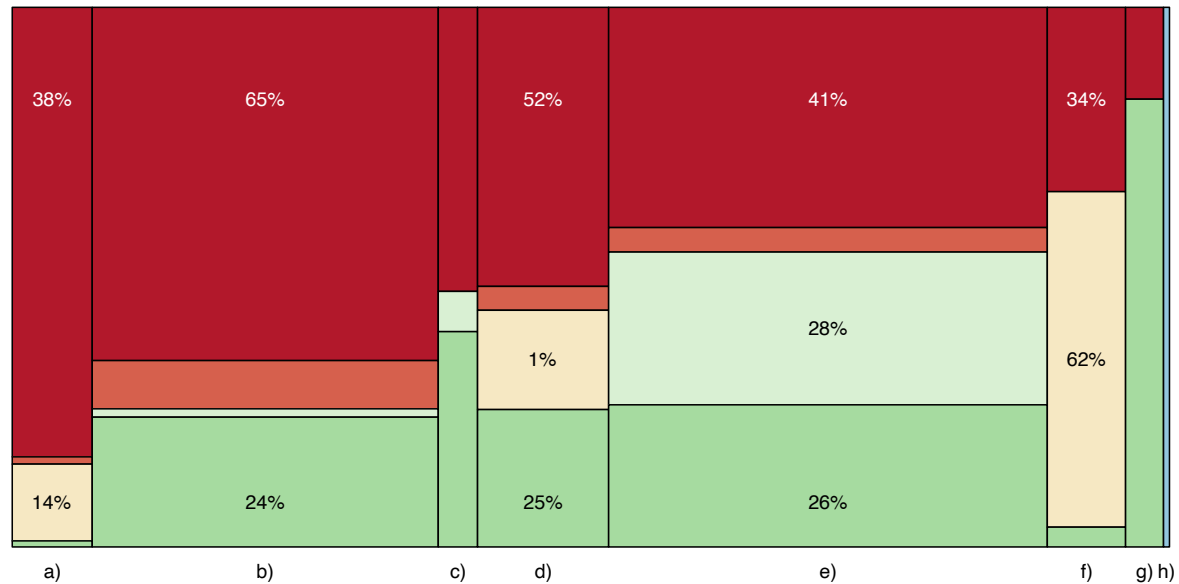
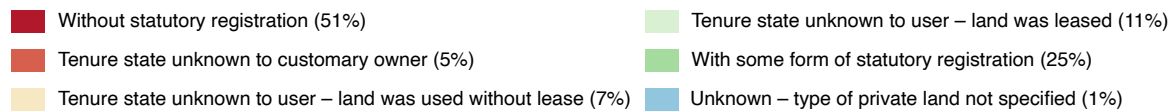
Figure 13. Breakdown of the sample's (n = 94 households) aggregate net income from different types of land. The figure shows households' various gross income sources from land-based livelihood activities (left chart side), cost streams associated with the realisation of economic benefits from these income sources (in grey), as well as aggregated net income streams that the sample realised from areas under different tenure and land-use regimes (right chart side). Percentage values in brackets are shares of the sample's aggregate gross

land-income, broken down by income sources (left) and net income and cost shares associated with different types of land (right), respectively.

Households typically had access to no more than 0.5 ha of privately controlled land per capita (adult equivalent unit). This included primarily homegardens and swidden fields, from which households sourced staple crops and a wide range of vegetables, as well as non-forest scrublands from which a substantial share of fuelwood stemmed. Households' primary fuel source were, however, private and communal forest.

Communities' customary tenure rules principally governed households' access to land, but this did not hold for all privately controlled areas. Paddy fields and plantations were mostly held with some form of statutory registration, whereas much of the remaining customary private land was untitled. More than half of the sample's aggregate income therefore stemmed from land to which households had no legally secured claims (Figure 14). A majority of households was consequently at risk of losing their entire land-derived income, if they were to be denied access to their communities' customarily governed land.

Statutory tenure states



Land categories

- a) Non-forest scrublands (7%)
- b) Homegardens (30%)
- c) Semi-permanent gardens (3%)
- d) Open forests (11%)
- e) Current swidden fields (38%)
- f) Closed forests (7%)
- g) Paddy fields (3%)
- h) Not specified (1%)

Figure 14. Breakdown of the sample's aggregate net income from privately controlled land by statutory tenure states, across different land categories. Percentage values on the chart are relative shares of income from specific land categories. Percentage values in brackets are relative shares of the sample's total income from privately controlled land.

Finally, we established that most households perceived their ease of access to communally managed village land as difficult. This is of particular interest as we also found that the inter-household distribution of access to most private types of land was highly skewed; and that at least some village residents, on the ground of intended land-use changes, had managed to claim private access to formerly community-controlled land. Not only intra-community land access inequalities, but also structural obstacles, i.e., households' lack of market access and physical, human and financial capital, hindered their land access.

4.3.4 Main insights

The principal takeaway from this study was that Chin households' livelihoods were at great risk, as Myanmar's legal land sector framework was at discord with communities' customary tenure and land-use practices. The country's Forest Law (Republic of the Union of Myanmar, 2018a) and its amended Vacant, Fallow and

Virgin Lands Management Law (Republic of the Union of Myanmar, 2018b), in particular, contain provisions that challenge households' customary claims to valuable tree products and criminalise their traditional land-use activities (e.g., swidden farming) on officially forested or vacant land. All studied households, but especially those grouped in the primarily land-dependant clusters (C1, C2 and C5) in *Paper I*, would lose their livelihood basis if these laws were to be enforced to their disadvantage.

4.4 Paper V: Neglect is co-constitutive of resource frontiers

4.4.1 Research idea

The idea for *Paper V*, in contrast to *Papers I and II*, did not stem from reflections on contemporary land-sector policy processes, and the accompanying literature in Myanmar. Rather, it emerged from reflections and conversations with my co-author Mairon Bastos Lima, about James Scott's book 'The Art of Not Being Governed' (Scott, 2010), literature on access theory, state building and resource frontiers, as well as commonalities of our study sites. Both the Chin Hills of Myanmar and the Matopiba region of Brazil are – in their own right – last frontiers, in the sense that they have only recently been framed as last spaces of opportunity for development or conservation. In fact, both of them have been called their nation's very own 'last frontiers'.

What we noted in the literature and in narratives of those who were critical of frontier dynamics that reshaped governance arrangements and material land relations in our study areas, was a tendency to frame the relationship of local communities, state actors and outside investors as one where these communities would fair best, if only the other actors left them alone. Yet, this framing did not fully resonate with our own experiences from engaging with respondents at our field sites. Their narratives, objections and aspirations towards state and outside actors was typically more nuanced. Several respondents during my research for *Papers I and II*, for example, emphatically expressed that it was them – not government actors – who were legitimately entitled to decide about how to use and govern their communities' land. Yet, no one expressed a desire for the state to retreat. Quite on the contrary, many spoke of being abandoned by their government and its institutions. They wished for more engagement, service provision (water, electricity, transport), access to healthcare, extension services, educational opportunities and much else that is required to lead a decent life.

This insight spurred the idea to highlight neglect as an overlooked concept and entry point for studying and analysing resource frontiers. As a means to

operationalise our thought about neglect, as a conceptual lens for frontier-dynamics research, we developed the four-phase framework of neglect in resource frontiers. The basis for this was a review of pertinent literature, as well as our respective in-depths research in Chin State and Matopiba.

4.4.2 The framework

The resulting framework offers a lens for the study of resource frontiers, from the vantage point of communities (Figure 15). It is their rights, needs and aspirations, we argue, that are all too often overlooked or deliberately ignored, where outsiders destroy ‘property systems, political structures, social relations, and life-worlds’, to extract resources and establish their authority (Rasmussen & Lund, 2018, p. 389). We further posit that acts of neglect do more than precede frontier dynamics. They are, so is our thesis, co-constitutive of resource frontiers, and work throughout them in various forms.

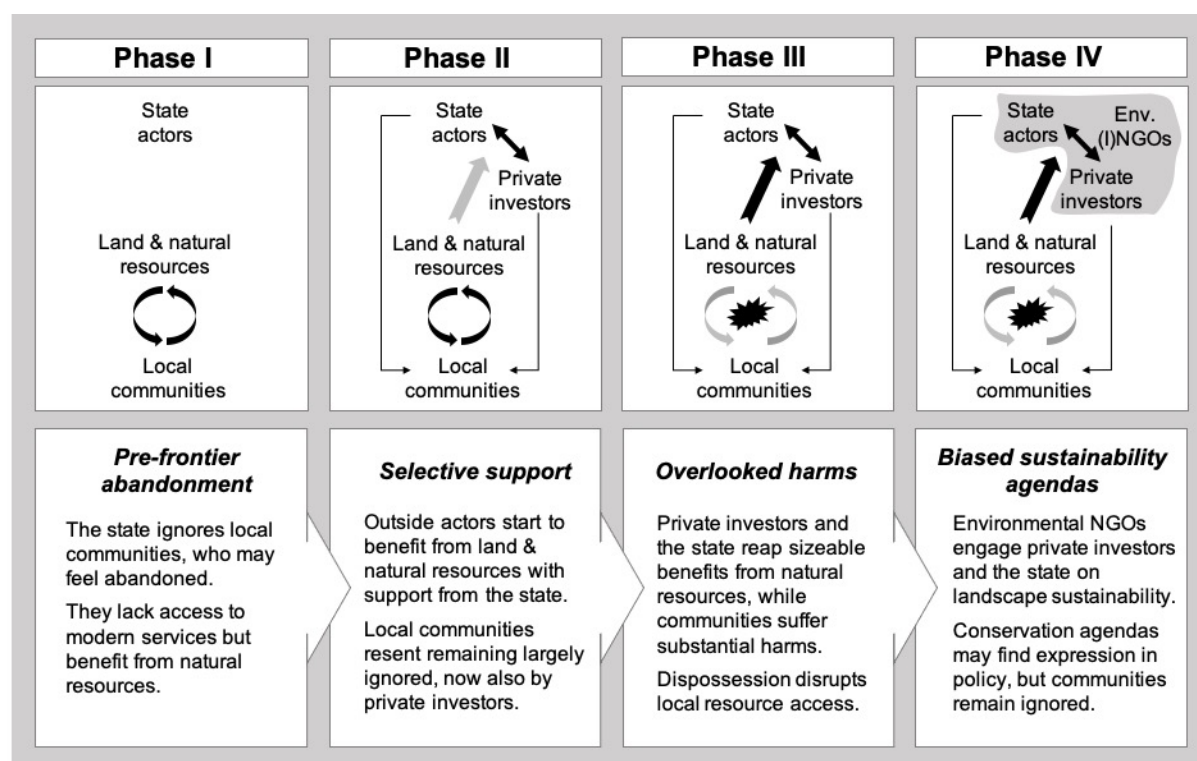


Figure 15. Framework: the four phases of neglect in resource frontiers.

The framework’s first phase captures a typically long phase of what we call *pre-frontier abandonment*. In this phase, communities’ relationship to state actors is characterised by the latter’s absence. They lack access to public services, but not land resources. Private investors enter the scene in the second phase. Resource access dynamics begin to change, as these actors begin to use land resources, with *selective support* from the state. Communities’ needs and aspirations, though, remain ignored. Rural peoples’ situation worsens in the third phase. They lose their

resource access and endure *overlooked harms*, arising from outside actors' land-sector activities. In the fourth phase, finally, they are ignored yet again, as environmentally concerned actors may forge relationships with private investors and the state, but all too often insufficiently engage with rural people and thus advance *biased sustainability agendas*.

4.4.3 Neglect and the emerging Chin Hills frontier

Paper V continues with empirically grounded analyses of frontier dynamics in Matopiba and Chin State. The latter is what contributed to this thesis, which is why my co-author's analysis of the Brazil case is not discussed here.

My empirically grounded analysis of dynamics in Chin State commences with the positioning of the region as one of Myanmar's many frontiers. The Chin Hills are both the country's literal frontier towards India, and a resource frontier in the making, subject to state-driven development initiatives and eyed for their tourism and conservation potential (e.g., Blennerhassett, 2020). I argue that rural Chin peoples' livelihoods, during a phase of *pre-frontier neglect* in post-colonial times until a decade ago, have been marked by human rights abuses and state neglect (Fleming, 2014). This is why a large diaspora has fled the region and the state's people are amongst Myanmar's poorest today (Central Statistical Organisation et al., 2020).

The emergence of frontier dynamics – i.e., the beginning of the phase of *selective support* in Chin State – dates back to the early years of Myanmar's current-time political transition. Multi-party elections under a new constitution (which reserved substantial parliamentary and governmental power for the country's ruling military generals) were held in 2010 (Myint-U, 2012). These elections culminated in a formal change of state leadership, when general Thein Sein took office as the country's new president (Myint-U, 2012). Aung San Suu Kyi, Myanmar's future de-facto state leader, was elected to parliament a few years later. In 2012, when ceasefire negotiations also paved the way for Chin State's gradual opening ever since (Fleming, 2014).

It yet remains to be seen, which specific interests in land resources will eventually mean that the emerging frontier dynamics in Chin State, gain further moment. However, I have already observed change processes unfolding in this region over the entire course of my PhD studies. When I first travelled to Tedim, it was impossible to reach northern Chin State by plane. I flew into Kalay and the drive to Tedim took more than five hours, due to ongoing construction work on the single main road into the northern Chin Hills ongoing at the time (Figure 16). There was

little accommodation to choose from and it was uncertain if the brand-new ATM of a recently opened private bank would be operative when I arrived.



Figure 16. Construction work and travellers on the road from Kalay to destinations in the northern Chin Hills, including Tedim.

Over the course of my subsequent field stays, the road has been progressively paved almost all the way to Tedim, which reduced the former travel time by half. New shops and hotels have opened, and a few more tourists appear to visit, just a few years after a travel book author told me that the region was still too challenging to navigate to recommend tourist stays. Kalay, at the Chin Hills foot slopes, has changed even more rapidly. Many new restaurants, hotels and shops have transformed the character of the city's main road, which has recently been enlarged to twice its former width.

These observations may appear anecdotal. What I witnessed are manifestations of changes taking place across the entire state, though, as discussed at length in *Paper V*. Public spending has been geared towards an expansion of the state's transport infrastructure, including roads, bridges and a newly opened airport. Tax breaks offered to attract outside investors and cash-crop production (elephant foot yam, horticultural crops) is gaining traction, at least near township centres. Neglect in the Chin frontier may not have reached the third phase, that of *overlooked harms*, yet. Rather, one should probably think of neglect in the region in terms of a patchwork of its workings in different phases.

Some of Chin State's most remote villages are still best described as being in Phase I of our framework, including some of the upland case-study villages discussed in *Paper IV*. Their residents suffer from lacking access to public services, persistent farming challenges and insufficiently addressed cyclone impacts. Other parts of Chin State are in Phase II of our framework, and subject to changes as outlined above. These communities' needs are being ignored and the state's and outsiders' interests prioritised, as e.g., exemplified by our analysis in *Paper II*, of new risks arising from land law changes, which are unaccompanied by efforts to secure rural peoples' rights. Yet other rural households already suffer from dispossession and disrupted resources access, e.g., in Chin State's south, where conservation efforts and business ventures proceed without local communities' informed consent. At least some households' in Chin State's north – including a couple of those I interviewed for *Papers I and II* – have already lost access to part of their customary farmland, as secondary roads have been upgraded.

The empirical part of Paper V ends with a discussion of new risks on the horizon for rural Chin livelihoods, should plans for ecotourism enterprises and new national parks in the region go ahead without due attention being paid to the possible harms it can cause for local livelihoods. Our results from *Papers I and IV*, regarding poverty and income insecurities amongst Chin households, highlight the fine balance that has to be struck in this region in coming years, to set course on truly sustainable development trajectories. Rural households aspire to profit more from their land-use activities and require jobs and cash incomes to meet their needs. The Chin Hills harbour biodiversity rich ecosystems, worth protecting for manifold reasons, and which interests state and outside actors will advance in this region, remains to be seen.

4.4.4 Main insights

The key takeaway from our analyses and conceptual propositions in *Paper V* is that rural Chin households face old, as well as new livelihood risks, as their region emerges as one of Myanmar's latest frontiers. This is, *inter alia*, due to various forms of neglect, which Chin State's residents have been subjected to in the past and experience today. Many households are income poor, lack access to basic services and their needs and aspirations are not being prioritised by outside investors and state actors, who rather advance their own agendas. Local communities are thus at risk of being dispossessed of their resources, customary land rights, and not least human dignity.

It remains to be seen along which trajectories the emerging frontier dynamics in the region will eventually unfold. There are grounds to anticipate that coming changes

will not be in line with ambitions for sustainable development. Yet, the course of change in Chin State is being shaped by all stakeholders involved. The conception of our framework (with its potential for critical research) and my empirical analysis of emerging frontier dynamics in the region, are one step in this process. The notion of neglect is inseparably entangled with that of responsibility. By discussion acts of neglect towards communities throughout *Paper V*, we thus also challenge state actors and outside investors to assume responsibility for detrimental outcomes of their actions (and lack thereof) for rural communities.

5 Climate-related risks in Myanmar and Morocco

5.1 From land-access to climate-related livelihood risks

With *Papers III and IV* in this thesis, the analytical focus shifts from land access and governance related livelihood risks to those associated with extreme weather events and adverse climate change impacts. The initial focus during the data collection and analyses for both papers therefore rested on households' experiences with a cyclone triggered disaster (*Paper III*), broader climatic risks and stressors (*Paper III and IV*), as well as options and barriers for a tree-based adaption of their farming systems, to a changing climate (*Paper IV*).

Both papers first and foremost show just how closely rural households' exposure, vulnerability and options to cope with climate extremes are entangled with their broader livelihood and social-ecological systems contexts. Households' livelihood and agricultural success were not only hampered by climate-related hazards, but to a large extent were consequences of their limited asset endowment and off-farm income earning opportunities, land-access inequalities, constrained market access, frequent crop pest and disease outbreaks, as well as an unmet want for comprehensive extension services. Our results indicate that these challenges, in conjunction with climate specific ones, need addressing, to aid households in recovering from their recent disaster experiences (*Paper III*) and to secure their livelihood and production systems vis-à-vis increasing climate-related hazards (*Paper III and IV*).

5.2 Research collaborations and rationales: Papers III and IV

5.2.1 Two practice-oriented research collaborations

Papers III and IV have in common that they are more closely linked to development practice than *Papers I, II and V*. This holds in three regards. First, they are concerned with understanding rural farmers' everyday exposure and vulnerability vis-à-vis climate hazards and stressors. Additionally, *Paper IV* identifies concrete entry points for possible interventions to reduce climate-related livelihood risks in the Moroccan case-study area. Second, both papers were realised in collaboration with non-university research partners, who are respectively engaged in practical development work (*Paper III*) and practice-oriented research (*Paper IV*). Finally, both papers offer insight into farmers' everyday farming and livelihood challenges that rural development interventions could address, in addition to the climate-specific concerns in each location.

5.2.2 Research collaboration in Myanmar

Paper III builds on a research collaboration with Ar Yone Oo Social Development Association, which was partly funded by a small-grant from the Agro-ecological Learning alliance in South East Asia (ALiSEA), which we had jointly applied for. The small-grant scheme aimed at ‘co-funding activities that promote agroecological stakeholder initiatives for sharing experiences, documenting case studies, testing innovative practices [and] disseminating success stories’ (Agro-ecological Learning alliance in South East Asia, 2017, para. 1). The overarching idea for the research that we realised with this grant was therefore broader than that presented in *Paper III*, aiming to document ‘lessons learned’ from AYO’s ongoing STRONG project activities, which sought to support the rehabilitation, and to strengthen the resilience of disaster affected communities in Myanmar’s townships Tedim, Tonzang and Kalay.

To meet this objective, I closely collaborated with two AYO staff members, with whom I conducted small workshops, in-depths interviews and participatory causal-diagramming sessions with farmers from six case study villages and STRONG project staff. Our activities were structured around three questions, which we sought to answer in relation to AYO’s work. First, how residents of the case-study villages were affected, and which livelihood and farming challenges arose, when Cyclone Komen traversed the study area in 2015. Second, how the project’s beneficiaries perceived AYO’s activities, in terms of addressing their recovery needs and everyday farming system challenges. And third – focusing specifically on the project’s farmer field school (FFS) component – which lessons could be learned from the STRONG project, to inform AYO’s ongoing work and similar initiatives in South-East Asia.

The research presented in *Paper III* is thus a first output from this research collaboration and offers insights in answer to the first guiding question presented above. Two additional outputs are short briefs, which present ‘lessons learned’ for development practitioners (Kmoch, 2018a, 2018b), whereas further analysis in answer to the second and third questions above, can yet be realised towards another academic publication. This contextualisation matters, as it explains the sampling strategy for our household survey (we oversampled FFS participants) and one of our motives for using causal-diagramming techniques (which enabled a mapping of AYO activities to households’ farming challenges) in *Paper III*, which may have been different otherwise.

5.2.3 Research collaboration in Morocco

Paper IV builds on a research collaboration with Morocco's Regional Agricultural Research Centre in Meknès (INRA Meknès), which was facilitated by the Moroccan office of the International Center for Agricultural Research in Dry Areas and the World Agroforestry Centre, which hosted me as a Research Fellow at the time. This set-up was an outcome of my personal interest in Morocco and my hosts' ambition for strengthened collaboration between the two CGIAR Research Centers, with focus on the merits of systems perspectives and local knowledge methods in smallholder-centered research.

The latter is important, as it pre-determined my research approach in Morocco. I knew from the field campaign's outset that a livelihoods system perspective would be my theoretical entry point, combined with local knowledge methods for the practical research. The typical research design process, where a research question is formulated before choices about the research approach and methods are being made, was thus reversed. Upon reflection, I do not perceive this as problematic, however, as we formulated research questions that could be meaningfully addressed with these means and had practical and policy relevance.

5.3 Paper III: Poverty and inequalities fuel disaster in Myanmar

5.3.1 Research objective and rationale

Although *Paper III* draws on data from a research collaboration with broader aims, it is framed around a much narrower objective. In analysing the available data for this paper, we sought to understand *how* a few days of intense rainfall and wind during Cyclone Komen's traverse across the study-area in 2015 resulted in a disaster with lasting consequences for households' income and food security.

Our motive for wanting to understand how the disaster unfolded was that we saw this case-study to assess why and in what sense the affected communities were exposed and vulnerable to climate-related hazards. Our rationale was that we would be able to draw conclusions about how to avoid similar outcomes in the future, based on knowledge about why the disaster could unfold as it did. Our work could thus inform policy and practical interventions to secure rural farmers' livelihoods vis-à-vis increasing climate-related livelihood risks, not only in our case study region but also in similar understudied contexts across the uplands of Myanmar.

5.3.2 Conceptual framing

Paper III combines concepts from three sources in order to answer three specific research questions, pertaining to: (i) Komen's differentiated impacts on farming

systems and livelihoods on two strata in the study area; (ii) the way in which the disaster unfolded, through interactions with households' land-use practices, pre-existing vulnerabilities and farming challenges; and (iii) underlying drivers and outcomes of the disaster. First, the conceptualisation of climate-related disaster risk as a function of hazards, exposure and vulnerability (United Nations Office for Disaster Risk Reduction, 2019). Second, key concepts from the Sustainable Livelihoods' Framework (Department for International Development, 1999), to conceptualise exposure and vulnerability in line with the thesis' livelihood systems lens. Third, the concepts of cascading and extensive disasters from the disaster-studies literature (Pescaroli & Alexander, 2015; United Nations Office for Disaster Risk Reduction, 2015), due to their explanatory merit with respect to the disaster's systemic unfolding across time and household livelihood domains.

5.3.3 Methodological considerations

The mixed-methods approach for the research in *Paper III* loosely built on an established local agroecological knowledge research approach in the agroforestry domain (Walker & Sinclair, 1998), with its accompanying methodology (Dixon et al., 2001) that also informed the field-research process for *Paper IV*. The four-stage local knowledge elicitation process, which the guidelines for this approach stipulate, are shown in Figure 17.

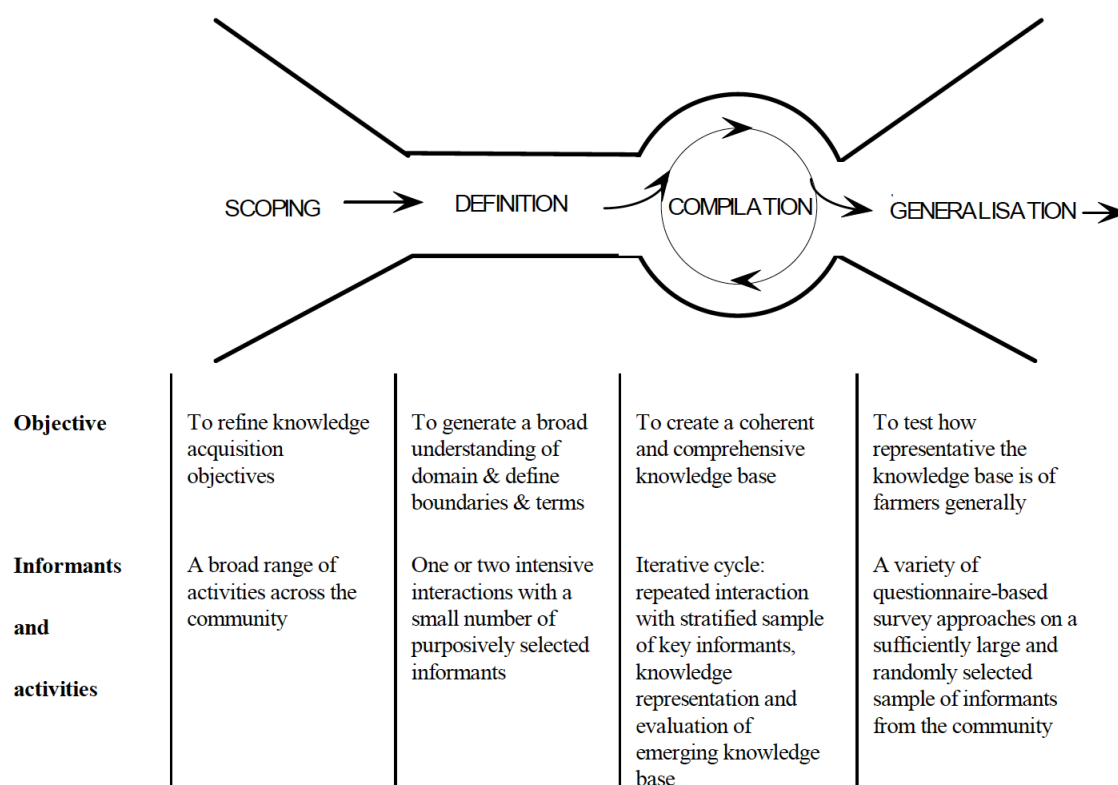


Figure 17. The four stages in the local knowledge elicitation process of the AKT5 methodology (Dixon et al., 2001, p. 11).

Important to note here is that my approach to eliciting rural peoples' knowledge about their farming system challenges, and about local social-ecological system characteristics and dynamics, in *Papers III and IV*, differed. I primarily worked with participatory causal-diagramming sessions, which involved groups of respondents, for the former (Figure 18); whereas in-depths interviews with individuals were my principal means of inquiry for the latter.

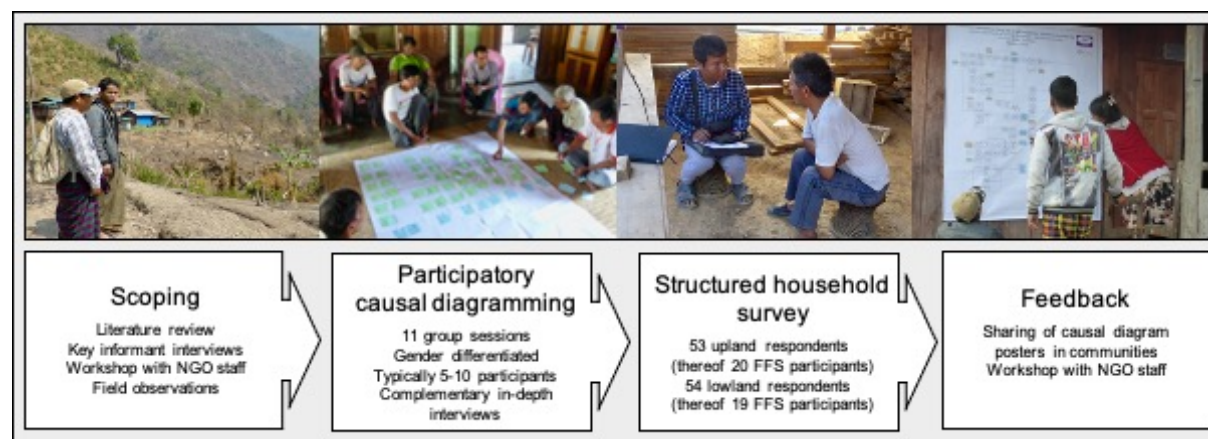


Figure 18. Illustration of the 4-phase, mixed-methods research approach. Shown are four phases of research conducted during the field campaign, i.e., the scoping, participatory causal diagramming, structured household survey and feedback phases.

The methodological guidelines for this approach, as it was originally conceived, stress the importance of working with individuals (Dixon et al., 2001). This is, *inter alia*, based on the rationale that all elicited knowledge should remain attributable to a specific knowledge holder, to pre-empt ethical concerns about possible knowledge extractivism. I did not perceive this as a major concern during the fieldwork for *Paper III*, however. On the one hand, because my participatory diagramming approach enabled me to trace all collated local knowledge back to specific villages and diagramming sessions with known groups of respondents (although not to individuals); and on the other hand, because I did not obtain 'specialist (valuable) knowledge' about commercially interesting resources (e.g., medicinal plants) (Dixon et al., 2001, p. 21), but rather about commonly experienced farming challenges and respondents' disaster experiences.

5.3.4 Key results

Our analysis showed that Cyclone Komen's immediate impact on both strata, i.e., on up- and lowland respondents' farming systems and livelihoods, had been severe but differentiated (Figure 19). The two strata's disparate topographic settings and farming practices (swidden farming in the upland, partially irrigated paddy and winter-crop farming in the lowland) meant that the upland stratum was primarily affected by severe run-off and landslides, whereas the lowland communities were

devastated by severe flash-flooding. Households in both strata lost many of their material assets and farmland that was critical to their livelihoods. Heavy rainfall, wind and damaged roads in the upland and the flash-flood and associated damage to critical infrastructure in the lowland, initially trapped communities' in their villages, some of which were so severely damaged that they were eventually abandoned, when communities relocated to new sites.

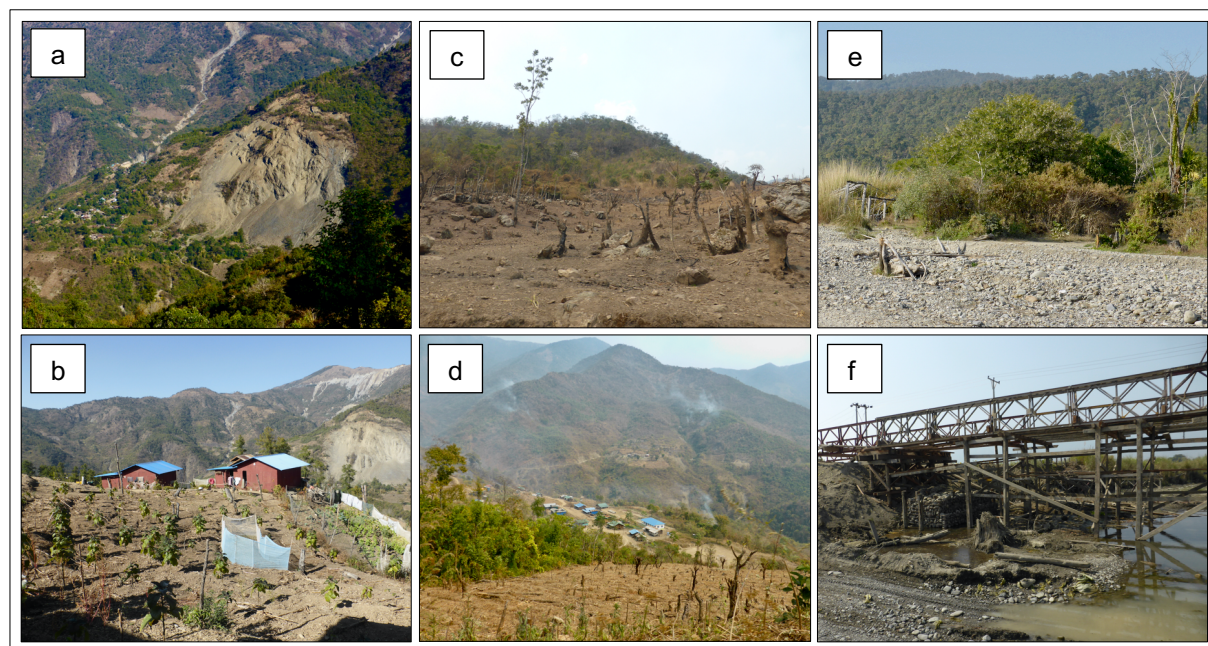
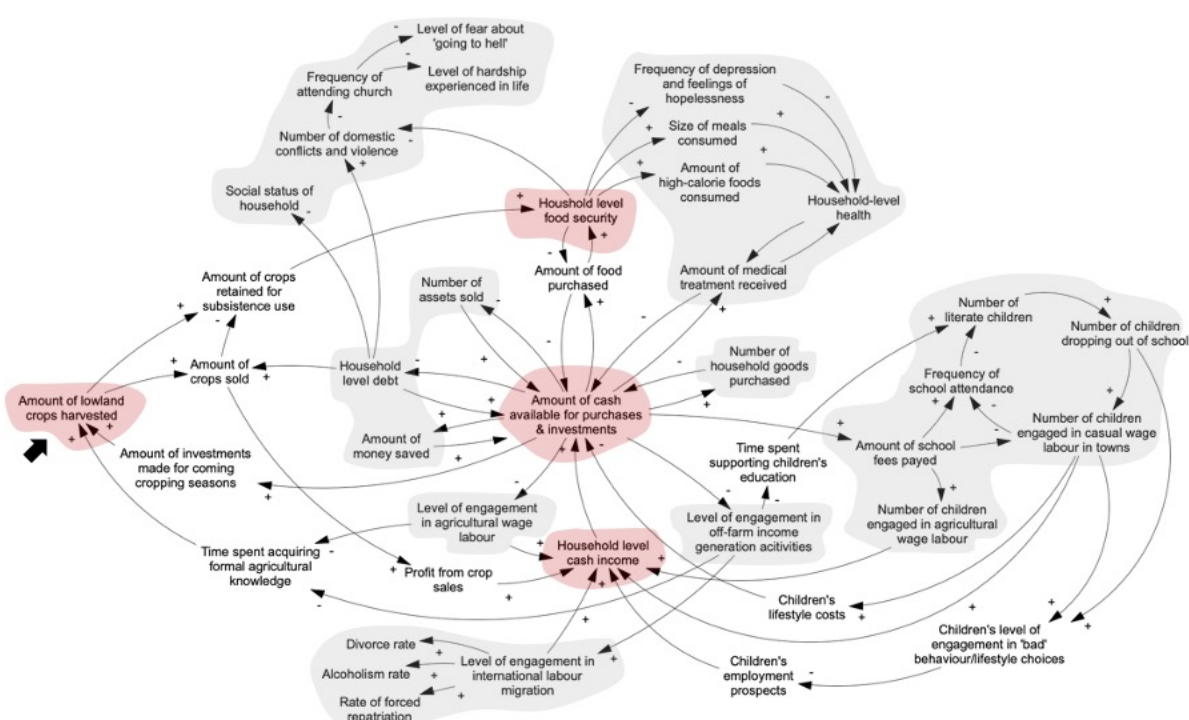


Figure 19. Disaster impacts, relocated villages and newly cleared farmland in both upland and lowland villages. The images depict: (a) a large landslide scar above the former site of Taakmual village in the upland; (b) new houses and a recently established tamarillo stand, on the scarce available farmland at Taakmual village's new site – the landslide scar is visible on the opposite mountain side; (c) rocky and challenging-to-cultivate farmland near Taakzang village's relocation site in the upland; (d) the relocated Taakzang village, with its former location visible in the background; (e) the former site of Tuikhinzang village, with remaining parts of a house on the left side in the lowland; (f) a not yet fully rebuilt bridge, on route to the lowland case-study villages.

The cyclone's immediate impacts were not the worst challenge that arose for households in either stratum. Rather, the disaster truly unfolded as Komen's impacts cascaded over time and substantially disrupted households' farming activities and various livelihood domains. Great challenges in the lowland arose from the destruction of households' current crops and seeds for coming cropping seasons, but in particular from sediment deposits on their fields, which rendered the latter unusable for several cropping seasons. Upland households' farming activities were likewise disrupted, as they lost terraced paddy land near streams in valleys and physical access to their former swidden fields.

The disaster situation worsened in both strata due to interactions of the cyclone hazards with respondents' land-use practices, pre-existing vulnerabilities and farming challenges that the cyclone exacerbated. These factors, which severely hampered respondents' farming success and lead to widespread income-poverty, food-insecurity and debt, included households' chronically limited land access, land degradation processes, climatic stressors, agricultural pests and diseases, and their shortage of physical, social, human and financial capital. Another critical reason for the disasters' cascading was the destruction and lack of redundancy of critical infrastructure, including roads, bridges, and irrigation systems in both studied strata.



5.3.5 Main insights

The principal takeaways from this study are threefold. First, it shows that cascading effects and hazard interactions with persistent vulnerabilities and farming system challenges significantly prolonged the post-Komen disaster. Second, to secure rural households vis-à-vis future climate-related hazards in the study area, will require greater capacity of Myanmar's authorities to provide substantial and timely support for hazard affected households, before a full-blown humanitarian disaster unfolds. Long-term efforts to diversify households' farming practices and livelihoods, increase redundancies (of critical infrastructure, accessible farmland and physical capital) and address persistent farming challenges in the area are likewise required. Finally, we argue that rural peoples' local knowledge and disaster experiences add crucial perspectives in efforts to reduce climate-related risks to rural livelihoods in the study area. Our insights, into strata-specific post-Komen cascading effects, highlight limits of national-level vulnerability assessments and exemplify the merits of contextually grounded appraisals, e.g., with participatory local knowledge methods.

5.4 Paper IV: Tree-based adaptation, an option for Morocco

5.4.1 Research idea, rationale and objectives

The specific research idea for *Paper IV* emerged from two considerations. First, our knowledge about the looming threats of water scarcity and food insecurity that northern Moroccan agrarian communities face, in consequence of anthropogenic climate change. Second, our awareness of the Moroccan government's rural development activities under the umbrella of the Plan Maroc Vert, which, *inter alia*, aims at promoting a large-scale conversion of cereal to tree-based smallholder production systems, throughout the country.

Although in principle well-directed, we perceived this plan to be implemented with insufficient consideration of farmers' own livelihood and land-use aspirations. Further, we perceived a need for more nuanced assessments of contextual factors and farmers' individual livelihood circumstances, which could stand in the way of broadly anticipated adoption-successes and benefits of this strategy. Our principal aim was to address these knowledge gaps, operationalised with three objectives: First, to explore the opportunity space for a tree-based diversification of livelihoods and farming systems in northern Morocco. Second, to explore the utility of drawing on farmers' perceptions and local agroecological knowledge, to identify fine-scale variations in livelihood and farming system contexts. Third, to understand farmers' aspirations and perceived barriers and options for agroforestry interventions in the study area.

5.4.2 Approach

As mentioned above, the fieldwork and analysis for *Paper IV* followed the methodological guidelines for a well-established local knowledge research approach more closely, than those for *Paper III* (Dixon et al., 2001). In practice, the scoping phase for *Paper IV* served to gain an initial understanding of the agroecological context, farming practices and rural livelihood strategies in the case-study area. This resulted in a robust stratification of local farmers into five distinct strata, who engaged in disparate agricultural practices, under different contextual circumstances, during the definition stage. These included (i) irrigation farmers, (ii) lowland farmers, (iii) lower slope farmers, (iv) mountain farmers, and (v) livestock farmers. A non-probabilistic sample of respondents from each stratum was interviewed to elicit farmers' aspirations, perceptions and knowledges, during the compilation stage. The knowledge generalisation stage, in contrast to *Paper III*, was not comprehensively realised in this study.

5.4.3 Key results

A key empirical finding of this research was that farmers' agroecosystem, i.e., livelihood and social-ecological system contexts, differed substantially – even across the relatively short altitudinal gradient that characterised our study area. This gradient reached from the fertile floodplain west of the local town Moulay Idriss Zerhoun, into the Zerhoun massif. Respondents' accounts of perceived barriers and options for the adoption of agroforestry practices implied that the fine scaled variation of contextual factors across the study site translated into disparate opportunity spaces for farmers' livelihood and land-use decision making. Hence, its recognition was critical to informing efforts seeking to address the effects of climate change, which will affect the regions' rural people in coming decades.

A second key result was that farmers across all strata already engaged in agroforestry practices. They had detailed agroecological knowledge about local farm-tree species, especially concerning their suitability for different site characteristics and their provision of various ecosystem services. Respondents' understanding of the regulating capacity of farm trees was limited, however, and they expressed little concern about potential negative livelihood consequences, should landscape-scale regulating services decline. Their principal interest in a tree-cover expansion was rather driven by economic interests. Respondents showed little interest in planting additional olive trees, which mattered in light of the Moroccan government's push for their large-scale expansion. Crop farmers rather wished to plant fruit trees, to meet subsistence needs and answer to local and regional market demands. Shepherds, in contrast, voiced concern about tree-

planting initiatives, as they clashed with their customary land-access rights (Figure 21).



Figure 21. A local shepherd describes his land-access patterns, during a local knowledge interview in one of the study-area's characteristic agroforestry landscapes.

Finally, an extensive range of adoption barriers and possible entry points for agroforestry interventions were identified across the study site. Water scarcity, the low profitability of production systems and uncontrolled grazing, were perceived as substantial barriers to a tree-based diversification of farmers' agricultural livelihoods (Figure 22). Efforts to improve water and soil related land-management practices, trainings to improve farmers' tree-husbandry skills, social mediation or land-governance amendments, were identified as local priorities and entry points for agroforestry related interventions. This highlighted the importance of social and economic, in addition to technical and environmental barriers to a tree-based

diversification of respondents' production systems.

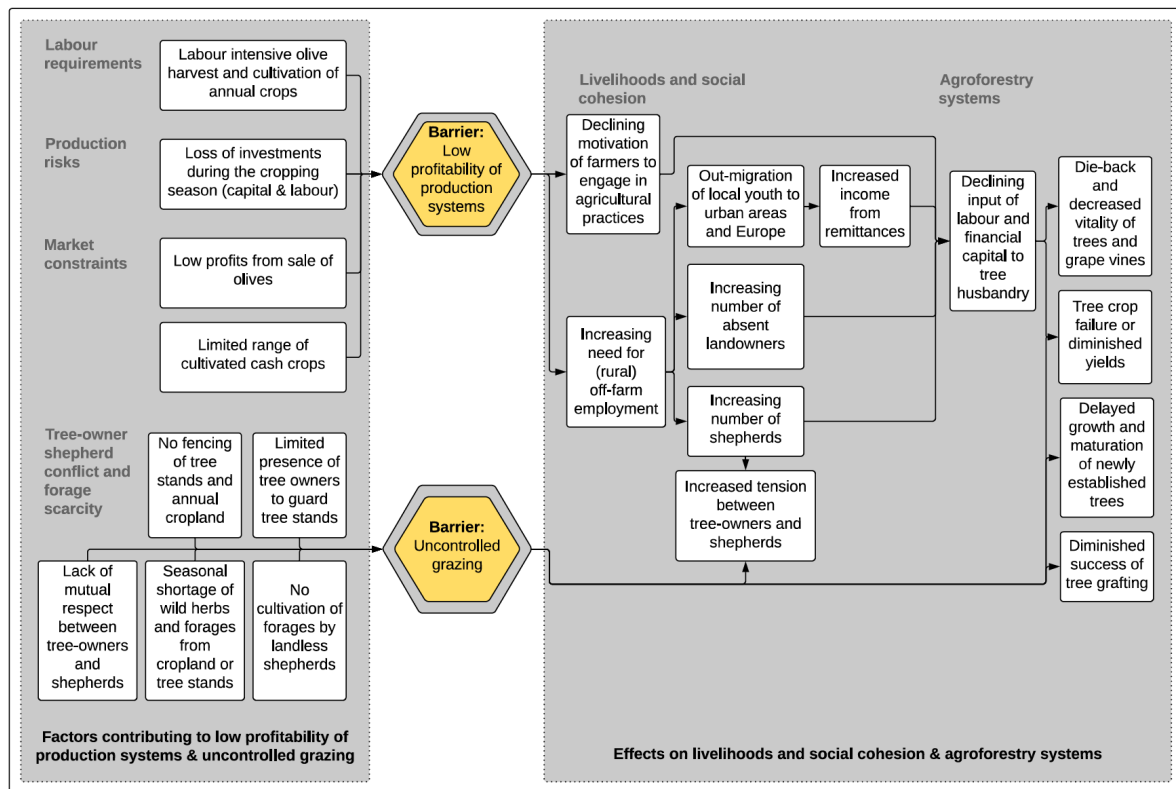


Figure 22. Causal diagram of low farm profitability and uncontrolled grazing as barriers to a tree-based diversification and their effects on livelihoods, communities' social cohesion and agroforestry systems.

5.4.4 Main insights

Our principal takeaway from this study was that local knowledge research methods were well suited to elicit rural peoples' knowledge about their agroforestry practices, aspirations and barriers to a tree-based adaptation of their farming systems. The latter were rooted in strata-specific challenges, that emerged as a function of households' pre-existing livelihoods and farming practices and their specific social-ecological system context. These barriers and the Moroccan governments' promotion of olive trees, unaligned with local farmers' aspirations, were critical obstacles to reducing climate-related livelihood risks, through agroforestry interventions across the study site.

6 Discussion

6.1 Interconnections between the thesis' appended papers

In addition to differences and thematic ties between the thesis' appended papers, which have already been discussed, a few others are noteworthy and therefore presented below.

6.1.1 Thematic ties of Papers I, II, III and V

Interesting to consider in conjunction with insights from *Paper I*, are results in *Paper II*, for instance, which highlight intra-community land-access inequalities and structural obstacles to households' ability to derive benefits from land. The observed land-access inequalities are likely one reason for the income inequalities amongst households, which we discuss in *Paper I*. Households' capital poverty, lack of irrigated and terraces land, market access and limited use of agro-industrial inputs, in contrast, are proximate causes of absolute income poverty in the region, which particularly affected households without remittances and wage incomes.

The predicament of households, whose agricultural success was hampered by overwhelming farming challenges, and who lacked alternative, local income earning options (e.g., salaried work) was also a key insight emerging from *Paper III*. Further noteworthy is that *Paper III* pinpoints land-access inequalities, income shortages, debt and food-insecurity as migration push-factors in northern Chin State – although based on field activities in other, disaster affected, communities.

Other insights, touched on in *Paper II*, e.g., signs of emerging land-use change processes (teak adoption, expanding of horticultural crop production in semi-permanent gardens) and land-markets associated with urbanisation dynamics that I observed in the study area, build a bridge to the frontier dynamics that are discussed in *Paper V*.

6.1.2 Commonalities and differences of Papers III and IV

Beyond those earlier discussed, there are a number of additional commonalities linking *Paper III and IV*, but also differences setting them apart. The first commonality is that both deal with climate-related hazards and disaster risks, which are, however, of a different nature. *Paper III* analyses a cyclone-triggered disaster situation, which was – at least initially – a typical rapid-onset phenomenon. The longer-term disasters, which unfolded due to cascading effects, months after the storm subsided (food-insecurity, degradation and loss of farmers' fields and

livelihoods), are characteristic of slow-onset disasters, however. Droughts, which are the focal climate hazards in *Paper IV* are likewise slow-onset phenomena.

A second commonality is that both papers rely on local knowledge research methods as a principal means of inquiry. This was combined with a household survey in *Paper III*, but not in *Paper IV*. Our findings from *Paper IV* are consequently less readily generalisable across the studied population. We partially addressed this limitation with other means, however, i.e., through three focus group discussions, expert interviews and feed-back sessions with national researchers to triangulate our findings.

The Papers' starting points are a key difference, which sets them apart. *Paper III* traced respondents' disaster experiences, to gain a better understanding of their exposure and vulnerability vis-à-vis climate related hazards. The need to diversify households' farming systems and livelihoods, and for an improved understanding of fine-grained differences in households' social-ecological system contexts, to understand their vulnerability, are key takeaways from this study.

From the outset of *Paper IV*, in contrast, we took these insights for granted. Hence, we took farmers' known vulnerability to droughts as a starting point to investigate tree-based adaptation options to diversify and secure their livelihoods. Yet, respondents' specific social-ecological system contexts are of equal concern in this study as in *Paper III*, since households' adaptation options (or lack thereof) – just as climate-related livelihood risks, which they faced – were determined by their land-use practices, pre-existing vulnerabilities and broader farming system challenges.

6.2 Insights in relation to the thesis' overarching research question

Insights in relation to the thesis' overarching research question (*Which dynamics shape the livelihoods of rural people in the case-study areas, in what sense are they at risk, and how could they become more secure?*) are summarised in Table 3. They pertain to:

Paper I: Households' poverty and dependence on income from land-based livelihood activities, wages and remittances, which leaves them vulnerable and exposed to local land governance, and local to global climate and labour market dynamics.

Paper II: Ongoing national-level land-sector reforms and locally emerging land-change processes that threaten to undermine households' customary tenure and land-use practices, which hitherto principally governed individuals' access to their communities' land.

- Paper III:** Climate-related hazards, cascading effects, extensive disasters, vulnerabilities and persistent farming challenges that undermine households' farming system and drive food-insecurity, poverty and distress migration in Western Myanmar.
- Paper IV:** Climate-related agricultural production risks, water scarcity, profitability and livestock related barriers to a tree-based adaptation of smallholder production systems and entry points for agroforestry and rural development interventions in Northern Morocco.
- Paper V:** Emerging frontier dynamics in Chin State, which may bring much needed public services, income-earning opportunities and warranted conservation efforts to the region, but may also pave the way for dispossession, if households' needs and aspirations remain ignored.

Table 3. Summary of insights in relation to the thesis' overarching research question.

What shapes the livelihoods of rural people in the case-study areas?	
Morocco	<ul style="list-style-type: none"> • Climate change dynamics • Customary land-use and tenure practices • Asset ownership, access to agricultural inputs and labour • Agroecological landscape characteristics • Policy programmes, i.e., the Plan Maroc Vert
Myanmar	<ul style="list-style-type: none"> • Engagement in various livelihood activities • Poverty implications of various livelihood activities • Composition of livelihood activity and income portfolios • Customary access and control over land resources • Customary land-use practices • Changing land-use and governance dynamics • Asset ownership, access to agricultural inputs and labour • Climate change dynamics • Cyclone-triggered disasters • Agroecological landscape characteristics • Decades of marginalisation experiences • Frontier dynamics • Acts of neglect by the state and outside actors
What puts them at risk?	
Morocco	<ul style="list-style-type: none"> • Climate-related hazards, especially droughts and water scarcity • Water-governance related challenges • Land degradation processes • Insufficient profitability of agricultural activities • Land change dynamics (i.e., tree-planting may lead to loss of customary land-access for shepherds)

	<ul style="list-style-type: none"> • Landlessness (shepherds)
Myanmar	<ul style="list-style-type: none"> • Income and asset poverty • Exposure to climate and land-governance related risks through land-dependence • Exposure to labour market related risks through salary and remittance dependence • National land-sector policy reforms • Limited access to land administration authorities • Local land-change dynamics and differentiation processes • Structural land-access barriers • Land-access inequalities • Climate-related hazards including extreme events and extensive disasters • Persistent farming challenges • Structurally rooted vulnerabilities • Chronic food-insecurity • Land-degradation processes • Lack of access to public services and resources • Adverse impacts of external actors' activities • Lost access to natural resources • Dispossession dynamics
How could they become more secure?	
Morocco	<ul style="list-style-type: none"> • Broader portfolios of agroforestry and other adaptation options offered to farmers • Support in overcoming water scarcity, profitability, and livestock related agroforestry adoption barriers • Improved extension services and targeted rural development interventions
Myanmar	<ul style="list-style-type: none"> • Enhanced incomes from land- and off-farm oriented livelihood activities • Improved labour market conditions, vocational training offers and diversified off-farm income earning opportunities • Leveraged remittances for investments and improved livelihoods • Recognised customary tenure and land-use practices • Land rights • Secured access to commons • Overcome structural land-access barriers • Diversified farming systems and livelihoods • Enhanced redundancy of critical assets and infrastructure • Improved extension offers and access to agricultural inputs • Enhanced disaster-response capacity • External actors assuming responsibility for own actions and rural peoples' livelihood security • Prioritisation of local interests and needs

6.3 Insights in relation to the literature and implications for policy, practice and further research

Livelihood – land relations have been in flux across much of Myanmar since I commenced my dissertation research in 2015; and climate change puts ever greater pressure on the country's rural households, as well as on those in northern Morocco. What also advanced is the academic and grey literature in the field. Here, I reflect on implications for policy and practice that arise from my findings and discuss how the knowledge frontier has been pushed, since I began my studies, through my own and others' research.

6.3.1 Forest, land and labour-market dependencies in Chin State and Myanmar

A key insight from *Paper I* is that many northern Chin households are income poor and highly dependent on land-derived income from agricultural crops and forests. Yet, differences among households exist, which is evident from our clustering of households into groups, which showed that many households made a substantial part of their living from remittances and off-farm work.

One of the most closely related studies to the research presented in *Paper I*, has been conducted in southern Chin State, to explore possible co-management strategies for Natma Taung National Park (Pyi Soe Aung, 2019). Findings of this study, which pertain to households' income dependence on land, can be compared to those presented in this thesis, although with reservations. Mostly, because the setting of the southern Chin study and its specific design (aimed at comparing household incomes in communities within, at the border and outside this species rich national park) may mean that its results reflect rather unique livelihood and forest-access conditions, compared to those that are typical for Chin State.

A cluster analysis, similar to my own approach, grouped the southern Chin households into four groups, who mostly relied on agriculture, non-farm activities, wages and forests, respectively, to make their living (Pyi Soe Aung, 2019). What sets the results of both analyses apart, is that no remittance dependant cluster was identified in the southern Chin case, and no primarily forest dependant one was found in my own research (Pyi Soe Aung, 2019). The latter was also only present amongst National Park residents, for whom the poverty reducing function of forest products was also greatest (Pyi Soe Aung, 2019). One interpretation of the diverging study results could therefore be that northern Chin forests provide less income earning opportunities for poor households, making them more likely to migrate.

A common finding of both studies is that households who make their living from land as well as other income earning opportunities (i.e., wages in the southern Chin case) fare better in terms of their absolute income, than those who rely on land alone (Pyi Soe Aung, 2019). The southern Chin study thus supports our insights from *Papers I and III*, that off-farm income sources mitigate absolute poverty in Chin State. An implication of both studies is therefore that improving households' access to non-precarious wage employment opportunities (locally and abroad) could be a key element of efforts to reduce the destitution and food insecurity of the State's poorest residents.

What is unique about these studies, in contrast to other recent research on livelihood-land links in Chin State (Boutry et al., 2018; Frissard & Pritts, 2019; Pritchard et al., 2017), is that they comprehensively accounted for forest and environmental income sources and used clustering techniques to gain insight into households' income rather than activity portfolios. In doing so, they fill a knowledge gaps about livelihood strategies and households' forest and environmental dependence in this understudied area of Myanmar. This matter, as the research thereby expands the basis for informed development programming, as well as forest, agriculture and rural development sector activities, of Myanmar's state authorities. Evidence in support of this claim comes in the form of a call for proposals for the 2019 – 2023 Chin Programme, of the multi-donor Livelihoods and Food Security Fund, which cites *Paper I* as one of the few available studies on employment in Chin State.

Studies on households' forest and environmental income dependence in Myanmar at large also remain scarce. Despite forest incomes' recognised importance, especially for some of Myanmar's poorest rural people, who proximately depend on forests products to meet their basic needs, such income remained unaccounted for in the calculation of the country's GDP as of 2016 (Government of the Republic of the Union of Myanmar, 2016). There are also no plans to assess the socio-economic role of forests and environmental resources for rural livelihoods, as part of the five-year project on *National Forest Inventory with a Human Rights Based Approach*, which Myanmar's Forest Department currently implements in collaboration with the Food and Agriculture Organization of the United Nations. For the time being, *Paper I* thus remains one of the few published articles that offer quantitative, albeit only case-based, insights on the economic importance of forests and farm trees for rural communities in upland Myanmar (see also Aung et al., 2015; Khaine et al., 2014; Saung et al., 2020).

With regards to the great importance of remittances for the livelihood security of many northern Chin households, *Paper I and III* (which highlights labour-migration as a disaster coping strategy), corroborate research findings of Chan and Takeda (2016) to the same end. Our findings about migration-push factors arising from social-ecological system dynamics in northern Chin State matter, as they make a modest contribution to addressing a need for research that examines migration push factors and provides system perspectives on the interlinkage of ‘multiple drivers of migration’ and ‘pathways that link these factors’, which are parts of the ‘causal chains that lead to migration’ (Future Earth Round Table, 2019).

Primarily, our results indicate that further in-depth research to understand how migration, remittances and off-farm work affect intra-household labour relations, land-use decisions and land-cover trends, would be warranted in the region. Studies on how remittances and off-farm work could best be leveraged to affect positive livelihood change for Chin households would likewise be relevant. On the one hand, because research on these themes would meet frequently voiced knowledge needs of development practitioners, who I spoke to during my field campaigns. On the other hand, because such work would further an established tradition of research on swidden transformations, migration and off-farm work in South-East Asia (Cramb et al., 2009; Dressler et al., 2017; Erni, 2015; Heinimann et al., 2017; Kelly, 2011; Manivong et al., 2014; Rigg et al., 2018; van Vliet et al., 2012), in a country, where little research of this type has yet been conducted. Finally, such research would also well align with current academic agendas, and research of organisations at the science-policy-practice interface in the field (Center for International Forestry Research, 2020; Cole et al., 2015; Oldekop et al., 2020).

6.3.2 New laws and contested land control in Chin State and Myanmar

Paper II demonstrates just how much and which types of income northern Chin households risk losing, as a consequence of the mismatch between their customary tenure and land-use practices and Myanmar’s land-sector policy framework and laws.

What makes the analysis in *Paper II* rather unique is the combination of income accounting methods and an assessment of access mechanisms that mediate upland households’ access to land. By quantifying the potentially foregone income from ecosystem services from different types of land, *Paper II* addresses a knowledge gap about the possible ramifications of Myanmar’s land-sector laws for Chin peoples’ livelihood security. Previous and concomitantly completed research in Chin State has either primarily appraised the food and income that households obtained from land (Aung et al., 2015; Frissard & Pritts, 2019; Pritchard et al., 2017; Bill Pritchard

et al., 2018; Win, 2005) or documented and discussed communities' customary tenure and land-use practices and how they conflict with formal law (Andersen, 2016; Mark, 2016; Pyi Soe Aung & Pretzsch, 2017). Research linking both strands of inquiry remains scarce, however, except for a couple of other studies (Boutry et al., 2018; Pau, 2016). Yet, the latter do not systematically quantify peoples' income from land in the way that *Paper II* does.

One practical relevance of *Paper II* lies in its utility for land-rights initiatives, who can build on the quantitative evidence that it offers to advocate on behalf of Myanmar's politically underrepresented upland farmers. From a social justice perspective this has become all the more important, as rural peoples' land-access insecurity has been aggravated further, since Myanmar's 2012 land-sector laws first inspired the research for *Paper II*. One key change came through an amendment of the Vacant, Fallow and Virgin Lands Management Law in 2018, to the end that customary land users suddenly faced a threat of imprisonment or substantial monetary fines if they failed to obtain 30-year land-use permits within six months for land that they legitimately considered their own (Mousseau et al., 2020; Republic of the Union of Myanmar, 2018b).

A second insight from *Paper II* is that not only national-level land law changes but also existing land-access inequalities and local land-change processes may spur land-related conflicts and cause an erosion of customary tenure rules in northern Chin State. That this is not only a localised trend but happens across other (especially urbanising) parts of the State, is evident from the research of Boutry et al. (2018) near Hakha and Pyi Soe Aung (2019), who found that southern Chin households no longer adhere as much to their communities' customary rules as they did in the past. The latter study argues that the influence of protected area governance approaches, households' increasing orientation towards commodity markets and an improved physical accessibility of the area, are key drivers of this trend (Pyi Soe Aung, 2019). In light of emerging frontier dynamics, including the establishment of additional national parks in Chin State (as discussed in *Paper V*), it thus seems likely that the recognition of customary tenure rules will continue to decline throughout the entire state.

One implication of this insight for further research is that not only more studies of '[l]icensed' but also '[i]ntimate', '[a]mbient' and '[p]ost-agrarian' exclusion processes may be warranted in Chin State (Hall et al., 2011, p. v). Indeed, this may hold across much of Myanmar, as dispossession processes through legal reforms and land titling have dominated much of the literature in past years. Important new insights about rural livelihood insecurity may therefore be gained from adopting

new lenses to study dispossession dynamics, especially if processes of wealth differentiation within communities, urbanisation trends, conservation efforts and the development of tourism enterprises continue in Chin State, and throughout Myanmar.

In practical terms, the above discussed insights from *Paper II* beg the question what could be done to secure poor rural people in Chin State (and elsewhere in Myanmar) against losing access to their customarily private and communal land. One important step could be to comprehensively document rural peoples' customary tenure practices and landholdings, to invalidate attempts to declare them vacant and make them legible for Myanmar's state authorities. Various pilot initiatives offer lessons on how this could be achieved, e.g., through participatory mapping approaches (Resources Rights for Indigenous Peoples & Universität Bern, 2020; U.S. Agency for international Development, s.d.; Zaehring et al., 2020).

Yet, Boutry et al. (2018) convincingly caution that such efforts are resource intensive and may also be fraught with dangers, as customary tenure practices are dynamically evolving and can therefore not readily be transcribed into potentially static formal law. If stakeholder platforms and participatory maps of customary land holding only achieve ambivalent results or do little more than paving the way for individual land-title application by farmers, they may become toothless for challenging legal provisions against communal land governance and swidden practices in Myanmar. Arguably, they may then rather foster state building and land formalisation processes, as envisaged by those bearing responsibility for Myanmar's contested land sector laws (Bächtold et al., 2020; Woods, 2019). Mark (2016, p. 158), however, argues that state building ambitions may also facilitate the recognition of communities' customary tenure practices, as it may be in the interest of Myanmar's government 'to extend its sovereignty by strengthening property for the greatest numbers of ethnic minority populations' – which in the Chin case may require to 'devis[e] property institutions that can accommodate customary land systems'.

Myanmar's community forestry instructions offer another entry point for securing access to communal land for Myanmar's rural households (Feurer et al., 2018; Prescott et al., 2017; The World Bank, 2019). This option is not discussed at length here, as it has already been broached in *Paper II*. Noteworthy, though, is that my own observations and conversation with actors in Myanmar, who sought to obtain land titles for communities under these instructions, indicate that this is no easy feat. One reason for that is that the registration process can be very drawn out. Other reasons are that Myanmar's authorities may not be willing to transform all

types of forest land into community forests or may prescribe the planting of a substantial number of trees, on communities' hitherto agricultural land.

What this discussion shows, is that securing tenure and improved or at least stable land access for northern Chin State's land poor households is no easily attainable goal. Yet, it would mean to take an important step on a sustainable development pathway for communities in upland Myanmar. After all, Indicator 1.4.2 of the SDGs call for internally agreed-upon ambitions to increase the 'proportion of the adult population [of countries] with documented tenure rights', as well as those 'who perceive their tenure rights as legally secure, regardless of whether these rights are documented' (Land Portal Foundation, 2020, para. 2). If Myanmar's authorities stopped 'maintaining policies that seek to prohibit and often criminalise swidden' farmers and instead took steps to legalise upland communities' access to land, they would not only demonstrate their willingness to achieve the sustainable development goals, but also to learn from swidden experts' call for 'broader landscape approaches [that...] keep farmers on their land' (Dressler et al., 2017).

Finally, and in taking a further step back from policy to academic concerns, Paper II also addresses two research themes on the land system science agenda. First, land-system scientists have argued that their community's research has an important role to play, in identifying sustainability solutions in the land sector (Verburg et al., 2015). This, they elaborate, can *inter alia* be achieved with research that brings swidden farmers' customary land claims and need for land access to the attention of policy makers, and through studies that document land sector policy changes through local-level case studies in the South-East Asian uplands (Verburg et al., 2015). *Paper II* is an example of just that. Second, McSweeney and Coomes (2020, p. 485) recently called upon the land-system science community to answer the question 'Who Owns the Earth'. In order to address this question, they 'encourage [researchers to pay] more explicit attention to land control as an essential complement to existing concerns for land governance and institutions' (McSweeney & Coomes, 2020, p. 484), an aim which *Paper II* also contributes to.

6.3.3 Frontier dynamics in Chin State and Myanmar

The key contribution that *Paper V* makes to this thesis, lies in its framing and discussion of emerging frontier dynamics in Chin State, through the lens of neglect. In doing so, it partly affirms the reasoning of Vicol et al. (2018, p. 451), who argue that the common focus 'on the role of agricultural commercialization and cash crops' to analyse frontier dynamics in South-East Asia's upland regions, may be ill-suited to the Chin context. I certainly contend with their argument that the 'potential of commercial agriculture in household livelihoods in this region' may be

limited (Vicol et al., 2018), at least under current conditions. Insights about substantial structural and asset-related barriers to northern Chin households' subsistence, let alone commercial agricultural success, after all feature in all Papers on Myanmar in this thesis.

These barriers are not only rooted in decades of neglect that people in this region have been subjected to, as discussed in *Paper V*. At least in northern Chin State, they also emerge as a function of poverty-trap dynamics, legal and customary land-access constraints, unaddressed farming challenges, frequent extensive disasters and biophysical landscape characteristics, as I thematise in *Papers II and III*. Yet, this does not mean that there are no commercial opportunities to seize, for Chin State's farmers. As discussed in *Paper V*, one route may lie in an expanded production of horticultural crops to meet locally arising, urbanisation-driven demands, e.g., in Tedim, Hakha and Kalay, as well as those in Indian markets that will become more accessible as Chin State's physical transportation infrastructure develops and additional border crossings open (Ei Ei Thu, 2017). Having witnessed first production changes to this end, during my progressive field campaigns – although as off yet at limited scale – I would therefore be somewhat more cautious than Vicol et al. (2018), in writing future crop-booms in this region off.

What should be clear from line of reasoning that I advance in *Paper V*, is that I fully agree that the emerging frontier dynamics in Chin State are nowhere close to the crop-boom dynamics taking place elsewhere in Myanmar (Hayward et al., 2020; Woods, 2015; Woods, 2019; Zaehring et al., 2020). These dynamics, e.g., the rapid expansion of tissue-culture banana plantations in Kachin State, more closely resemble those that have long been analysed through crop-boom lenses throughout the uplands of South-East Asia (Jepsen et al., 2019). In the specific instance of the banana-boom, interesting insights may therefore arise from comparative analyses with similar, well-studied expansion dynamics of the same crop, e.g., in northern Laos (Friis & Nielsen, 2016). Returning to my own analysis, however, Paper V instead constitutes one piece in the puzzle of establishing Chin State's place in the literature as a not-so-common frontier.

Moving beyond agriculture, I discuss the coupled development of conservation and tourism, as one pathway for frontier dynamics in *Paper V*. This perspective does not feature much in the argument of Vicol et al. (2018) and thus sets the two analyses apart. One reason for this may be that the establishment of additional national parks in Chin State only now appears to go ahead more rapidly (Myat Moe Aung, 2020), although plans for this development are not entirely new (Ei Ei Thu, 2017). No matter if the expansion of conservation areas, tourism and hospitality-

sector enterprises in Chin States comes rapidly or rather slow, it will be key to rural peoples' livelihood security, that it does not happen at the cost of dispossession of their customary land.

Such unfolding dispossession dynamics, where conservation areas are being established, are unfortunately all-too common throughout the world (Rights and Resources Initiative, 2015). Pyi Soe Aung (2019, p. 3) also discusses that previous conservation effort in Chin State, i.e., the creation of Natma Taung National Park, have been conflict-ridden, in consequence of 'the involuntary acquisition of customary land'. Woods' (2019, p. 2018) argument that 'nature conservation at the edge of the state can be re-tooled to achieve state territorial control', although referring to dynamics in south-eastern Myanmar, only adds fuel to these concerns.

Tourism-related income earning opportunities, which an expansion of protected areas in Chin State could bring with it, could also be an important means for at least some of the States' residents to leave food-insecure and capital-short times behind. The takeaway from this discussion should therefore not be that conservation efforts in Chin State are per-se problematic. In my eyes, the key implication is rather that efforts to engage the region's rural communities in conservation approaches at eye level need to be stepped-up even more. Fortunately, initial moves in this direction have already been made in Myanmar, through recent conservation-sector policy changes (Pyi Soe Aung, 2019). Yet, 'management models [...] to implement community-based conservation approaches' in practice, have only recently entered the conception and trial phase (Pyi Soe Aung, 2019, p. 2). One future strand of Chin-centred research could therefore be to foster further progress along this path, through collaborative research with rural communities, state-authority and other regional stakeholders.

6.3.4 Local knowledge and contextual variation matter in climate adaptation research

Paper III and IV's key commonality is their use of local knowledge methods in climate risk and adaptation research. In taking this approach, they make several contributions. First, they advance empirical knowledge about rural livelihood and social-ecological system dynamics, from which climate risks and farming challenges arise in both case study areas. This matters as it expands the knowledge base upon which place-specific climate adaptation and rural development interventions can be designed and evaluated. Paper III aids much needed detail to pre-existing vulnerability assessments for western Myanmar (Humanitarian Assistance and Resilience Programme Facility & Myanmar Information Management Unit, 2018), advancing knowledge about rural peoples' disparate exposure and vulnerability to

climate hazards. *Paper IV*, on the other hand, shows that pre-existing farming system classifications in Morocco had been too coarse to gain relevant insights about rural farmers' locally disparate aspirations and adaptation needs (Dixon et al., 2001).

The papers' second contribution is that they contribute to the literature that demonstrates the utility of local knowledge approaches in livelihoods-focused climate adaptation research. This matters in two ways. In the national context of Morocco and Myanmar, both studies may raise the profile of local knowledge research approaches and rural communities' detailed agroecological knowledge. They may thus aid the adoption and greater recognition of local knowledge methods in countries, where they are not yet commonplace (Petzold et al., 2020). Further, and in taking a big step back, they also constitute a tiny piece in the big process of bringing rural communities' local knowledge into high-level intergovernmental policy processes and agendas. IPBES' latest assessment report demonstrates a resurgent interest in local knowledge in such spaces (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019). Yet, this does not hold everywhere, as high-level climate change fora have yet to fully integrated local knowledge in a similar manner (Garcia-Del-Amo et al., 2020). This is unfortunate, as outputs from mathematical models remain too coarse to make predictions at the scale 'at which local communities will have to overcome climate change impacts [that...] affect their environment and livelihoods' (Garcia-Del-Amo et al., 2020, p. 68).

There is thus a need for complementary, 'and particularly [...] locally grounded data' (Garcia-Del-Amo et al., 2020, p. 68), which *Papers III and IV* address. Both papers show how local knowledge approaches have great utility in obtaining such data. In particular, they aid in assessing fine-scale variations in rural peoples' livelihood, production system and social-ecological system contexts. Insights about these contexts are of critical importance in climate adaptation efforts, as they help to understand which particular dynamics play out, when farming system challenges persist (*Papers III and IV*), disaster situations unfold (*Paper III*), and climate-adaptation barriers arise (*Paper IV*). They also matter as social-ecological system dynamics do not affect all rural people equally and shape their aspirations, climate adaptation and livelihood diversification options.

This line of reasoning is informed by, speaks to, and – in the case of *Paper IV* – aided recent thought in the field of agronomy. Huge variations in the performance of technologies, which the fields' researchers helped develop, have far too long hampered their adoption by farmers' operating in rather distinct 'social, economic

and ecological context[s]’ (Sinclair & Coe, 2019, p. 1). This is why, so Sinclair and Coe’s (2019, p. 2) argument, a new agronomic paradigm – an ‘options by context (OxC) approach’ – is required. To achieve ‘[l]arge scale impact’, e.g., through rural farmers’ adoption of climate-adaptation options, this approach builds on recognising that ‘soils, climate, farming practices, household characteristics, markets, social capital and policy implementation, vary at a fine scale’ (Sinclair & Coe, 2019, p. 2). Hence, these variations need to be assessed, so the implication for research and practice, e.g., by using local knowledge methods in Morocco and Myanmar, which we do, show and argue for, with *Papers III and IV*.

Of course, local knowledge approaches are not the only means to assess rural peoples’ heterogeneous livelihoods and social-ecological system contexts. For instance, *Paper I* shows that clustering techniques also aid in distinguishing household groups, to assess their different characteristics, options and needs. This also resonates with Berre et al. (2016), who argue that socio-economic – in addition to agroecological – conditions require more attention, in matching farmers with relevant technology options. They further show that different ways to derive ‘typologies allow for the delineation of relatively homogenous [farmer] groups, which are assumed to share similar needs in terms of technologies’ and may in fact best be used in combination (Berre et al., 2016, p. 192). No matter if they are derived through extractive (e.g., statistical clustering) or constructive (e.g., context and local knowledge informed) means (Berre et al., 2016). The takeaway from *Papers III and IV* is thus not that all research for climate adaptation and securing rural livelihoods should draw on local knowledge methods. Rural peoples’ heterogeneous knowledges, characteristics and contexts should rather be accounted for, no matter which of various complementary research modes are chosen. As what should be avoided is ‘risk to farmers’, which arises if contextual factors are being ignored, households’ heterogeneity remains unacknowledged, and ‘one-size fits all’ intervention options are being conceived and evaluated for their fit with supposedly average farmers (Coe et al., 2016, p. 72).

6.3.5 Are farm trees part of the solution in Morocco and Myanmar?

Paper IV is the only one in this thesis which explicitly drew on smallholders’ knowledge to identify entry points for adaptation interventions, with a focus on climate-related risks in northern Morocco. It shows that targeted agroforestry interventions constitute one option for Morocco’s rural smallholder, to diversify their farming systems and livelihoods. Yet, success with such interventions will not be easy to achieve, as interlinked social, technical, environmental, economic and political barriers stand in the way.

That does not rule out agroforestry as part of the solution to secure rural livelihoods in this region, however. Many farmers showed great interest in various trees-based adaptation options, as well as accompanying interventions to achieve locally desirable livelihoods and social-ecological system change. Agroforestry research on mixed olive – durum wheat, and olive – faba bean production systems in northern Morocco further shows, that ‘olive agroforestry is more productive than sole crops and trees’, despite yields from shade-grown legumes and cereals being approximately 50% lower than those from sole cropping systems (Temani et al., 2021, p. 10). These insights imply that research and interventions to address adoption barriers and innovate upon existing agroforestry practices, constitute one pathway to address climate-related risks to smallholder livelihoods in the region.

Innovation upon existing agroforestry and tree growing practices could also be a relevant route to diversified production systems and secured livelihoods in western Myanmar. Research for *Papers I and II* revealed that farm trees are already a common component of Chin households’ land-use systems and farms. Further, my local research partners, as well as several farmers expressed an interest in further developing such practices in the study area. The former with an eye to climate change adaptation and improved rural livelihoods, and the latter primarily as a means to raise their households’ income, reduce agricultural labour needs and thus improve their children’s livelihood prospects. Yet, most did not perceive an expansion of farm trees as feasible, without substantial external support. This was primarily because households’ longer-term production objectives conflicted with a short-term need to grow food – for lack of household, or affordable salaried labour.

This insight fits with results from research in Indonesia and Bangladesh, which found agroforestry to favourably compare with swidden practices in terms of income and tenure-security, but fall short on adoption, for lack of investment capital, knowledge, technical support and cultural values attached to rotation farming (Rahman et al., 2016; Rahman et al., 2017). This implies a need for more targeted support, if Myanmar’s government is to locally realise its declared ambition for agroforestry to ‘contribute to improving the livelihoods and increasing the asset-base of millions of farmers in the [ASEAN] region as well as the supply of food that they produce while also improving the environment and increasing the sector’s resilience to the vagaries of extreme events resulting from a changing climate’ (Catacutan et al., 2018).

6.3.6 Rural people need extension services, access and prioritisation

To move beyond the narrow focus on agroforestry, the papers in this thesis also show that much more than targeted support for a wider adoption of farm-trees will be required, to secure rural livelihoods in Morocco and Myanmar. *Papers III and IV* show for instance, that rural households could benefit from well-targeted development interventions, comprehensive extension services and further research.

Especially, if the latter was directed towards supporting households in seizing context sensitive and individually desirable pathways to overcome their manifold farming challenges, as well as the observed poverty trap dynamics in Myanmar. This fits with recent findings of swidden livelihoods research in North-East India, which highlights that better extension services and ‘a location specific, community based development approach for establishment of an integrated livelihood system within the scope of socio-cultural beliefs of the shifting cultivators’ would be important to improve rural peoples’ situation in this region (Paul et al., 2020, p. 8).

Through my engagement with national researchers and development practitioners both Morocco and Myanmar, I further became aware of the disconnect that still exists between both spheres of work. I met researchers who were unaware of the myriad farming and livelihood challenges which rural households just a few kilometres from their research centres faced; and I came to know development practitioners who were well-aware of such challenges but lacked knowledge about intervention options that would enable them, to support their programs’ target populations in overcoming their climate-related farming challenges.

Finally, all papers in this thesis show that risks to households’ livelihood security in Morocco and Myanmar are far more deeply rooted, than in adverse climate impacts or extension amendable farming challenges alone (*Papers III and IV*). For instance, they also arise when landlessness and land-change dynamics come together, as is the case in Morocco, where tree-planting initiatives could erode shepherds’ customary land-access (*Paper IV*). Another example are upland communities in Myanmar, who may lose their customary land access, in consequence of land-law changes, frontier dynamics and neglect (*Papers II, V*). Finally, they are also rooted in global market dynamics, as in the case of Moroccan farmers who cannot sell their olive oil to Europe (*Paper IV*), or Chin households who rely on remittances to meet their needs (*Paper I*).

That one of the first reported cases of COVID-19 in Myanmar was a US visitor with plans to get married in Tedin township (where much of my research took place) serves to illustrate how closely communities in this ‘remote’ region are tied-

up in global dynamics. The same holds for researchers and students in Kalay, with whom I collaborated in 2019, and whose university now doubles as a quarantine centre. Their studies and work have been on hold since early this year. This serves to illustrate the long way that lies ahead to secure educational access for a privileged share of Chin State's population, not to speak of the majority of its rural residents.

The future of rural people and their livelihoods in Chin State likely does not lie in farming and other land-based livelihood activities alone. New employment and business opportunities will arise, as Myanmar's society changes and frontier dynamics in Chin State unfold. Yet, it seems unlikely that all households will move beyond their proximate land dependency in coming years or even decades. If they do, their activities will still drive land system dynamics. So where could practical interventions and future livelihoods-land-system research be directed, to secure rural people's livelihoods in Morocco and Myanmar?

My insights and experiences of the development research-practice disconnect in both countries speak to the arguments of Coe et al. (2014), who advocate for a greater integration of both strands of activity, as discussed in *Chapter 2*. They also fit with findings of the Ceres2030 program's evidence syntheses, which shows that the research needs of smallholder farmers remain irresponsibly underprioritized (Nature Editorial, 2020). Rural peoples' problems are no longer exactly the same as they have been in the '80s, when Chambers (1983, p. 197) called for 'putting the last first'. Yet, there clearly still exists a large research gap at the interface of rural peoples' needs and interests, academic knowledge production and development practice. It certainly does in parts of Morocco and Myanmar.

This is the most important research gap that I perceive in my thesis' study contexts. It is the one that I aim at addressing in further developing my research; and it appears to fit with one of the directions in which the land-system science community is headed. This community's research agenda (at least in part) has shifted towards more normative and transformation-oriented objectives (Nielsen et al., 2019). Further, it emphasises a need to integrate the diverse knowledges of different stakeholders, academic disciplines and land-management practitioner, in order to affect transformative change, and direct land-systems onto more sustainable pathways (Global Land Programme, 2016). Therewith, it converges with calls for new research paradigms and the integration of local knowledge and pluralistic perspectives in the fields of biodiversity and agricultural research (Ellis et al., 2019; Pascual et al., 2017; Sinclair & Coe, 2019). This leaves me carefully optimistic about prospects for research to aid in efforts to secure rural livelihoods and make humanity's development more sustainable.

7 Conclusion

This thesis' principal objective was to advance knowledge towards attaining the SDGs and securing rural peoples' livelihoods in Morocco and Myanmar. Empirical research to this end was realised with collaborators and research partners in both countries, drawing on three types of systems thinking and a mixed-methods case-based research design. The thesis' five appended papers provide insights in answer to the overarching research question: (i) Which dynamics shape the livelihoods of rural people in the case-study areas, (ii) in what sense are they at risk, and (iii) how could they become more secure?

The study's principal contributions lie in advancing empirical knowledge about the diverse livelihood strategies, land access insecurities, climate-related risks and farming challenges of rural households in a little studied, swidden dominated mountain region of Western Myanmar. Further, it advances empirical knowledge about the characteristics of rural households' livelihoods and farming-system contexts, as well as thereof arising context-specific barriers and options for a tree-based diversification of smallholder production systems in a drought prone region of Northern Morocco. The thesis also aids in advancing local knowledge research methods, by demonstrating their utility in smallholder-oriented climate-risk and adaptation research, in particular in understanding fine-scale variations in rural peoples' livelihood contexts and system dynamics that drive their exposure and vulnerability to climate related risks. The research's conceptual contribution lies in proposing a framework for studying resource frontiers through the lens of neglect and demonstrating its utility by showing how emerging frontier dynamics render rural people in western Myanmar vulnerable to dispossession.

The research's primary implications for policy and practice are fivefold. First, enhanced efforts fostering the creation of dignified income earning opportunities for poor rural people in Northern Chin State are needed, and existing ones – including land-based and labour-market related activities – need securing. Second, Myanmar's land-related policy framework needs adapting, to adequately account for Chin communities' customary tenure and land-use practices, if rural peoples' land-dependant livelihoods in the area are to be secured. Interventions in support of land-poor or landless households, to future-proof and ease their already challenging access to common land resources is also required. Third, structural barriers to households' farming and livelihood success need resolving, and persistent farming challenges need to be addressed, to aid Chin State's rural people in overcoming poverty and food-security trap dynamics, as these drive their

vulnerability to climate-related hazards. In Morocco, extension offers need stepping-up and the range of agroforestry options for smallholders expanding, if more farm-trees are to be planted and maintained in adapting to climate change. Finally, state actors in Myanmar need to assume responsibility for securing rural households' livelihoods against risks – including that of dispossession – as frontier dynamics in the country's North-West emerge.

Avenues for further research lie in exploring remittances' influence and how they could be leveraged to affect positive livelihood- and land-system-change outcomes for rural people in both study areas. Future studies could also explore how Chin communities' customary tenure and land-use practices could best be formalised and land-access for the poorest households improved, or income earning opportunities created. Research could also be directed at identifying locally relevant agroforestry options to aid in adapting to climate change and diversifying smallholder production systems and livelihoods in Morocco and Chin State. Contextually grounded studies, including those adopting local knowledge approaches could further understanding of climate change dynamics and adaptation options in both study context, whereas research towards inclusively developing and co-managing protected areas and land resources with rural communities could be fruitful in western Myanmar. Finally, collaborative research, driven by rural peoples' needs and aspirations, if combined with enhanced policy and practical action, could go a long way in making their livelihoods more sustainable and secure.

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