THESIS FOR THE DEGREE OF LICENTIATE OF ENGINEERING

Rural Livelihood Options for "a better and more sustainable future"

Local perspectives from Myanmar and Morocco

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CHALMERS UNIVERSITY OF TECHNOLOGY

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Abstract

In 2015, state leaders adopted the 2030 Agenda for Sustainable Development, to address global inequalities and respond to heightened concern about challenges, arising from contemporary global change. This thesis contributes to addressing these challenges, by extending the knowledge base that rural development stakeholders can draw on to co-construct viable livelihood options for vulnerable rural people. *Paper I* does so on the basis of cross-sectional household survey data and clustering techniques, applied to explore the differentiated livelihood strategies of rural people in Myanmar. Results of this study show that households engaged in six relatively distinct livelihood strategies, which differed in terms of their relative reliance on land-based vis-à-vis other income generation activities and their income poverty implications. These findings imply differentiated vulnerabilities of rural households, e.g. to climate change, shifting land-governance regimes and labour market forces. *Paper II* is based on local knowledge research, exploring the opportunity space for a tree-based adaptation of livelihoods and farming systems in Morocco's drylands. Results of this study show that respondents already maintain a diversity of trees on their farms, but water scarcity, the low profitability of production systems and social conflicts constitute critical barriers to an agroforestry-based climate adaptation. *Paper II* further demonstrates the utility of local knowledge in climate adaptation research, showing that local knowledge methods facilitate inquiry into the contextual variability of livelihood contexts, technology-adoption barriers and extension priorities that farmers perceive. Brought together, both papers contribute to realising the vision of "a better and more sustainable future" for rural people.

Keywords: Rural Livelihoods, Swidden Farming, Remittances, Agroforestry, Climate Adaptation, Technology Adoption, Cluster Analysis, Local Agroecological Knowledge

Appended Publications

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).

Conceptualisation, L.K., M.P., U.M.P. and M.R.J.; Data curation, L.K.; Formal analysis, L.K.; Investigation, L.K.; Methodology, L.K., M.P., U.M.P. and M.R.J.; Visualisation, L.K. and M.R.J.; Writing – original draft, L.K.; Writing – review and editing, M.P., U.M.P. and M.R.J.

Paper II

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).

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Related Publications by the Author

The following publications by the author are not included in this licentiate thesis. They are, however, linked to the research projects, which this thesis and the two appended papers reports on.

Pagella, T.; **Kmoch, L.**; Leudeling, E.; Mulia, R.; Sinclair, F. Agroforestry from Mediterranean Partner Countries: Report on possible technology transfer from Mediterranean Partner countries to European countries Den Herder, M., Burgess, P., Eds. 2014.

Kmoch, L. Agroecology for resilient and sustainable livelihoods of natural disaster affected communities in Myanmar. Lessons from the STRONG project approach to farmer field schools (FFS) in Chin State and Sagaing Region; Ar Yone Oo – Social Development Association: Yangon, 2018.

Kmoch, L. Addressing climate vulnerability and farming system challenges with local agroecological knowledge. Insights from collaborative research with rural communties in Chin State and Sagaing Region, Myanmar; Ar Yone Oo – Social Development Association: Yangon, 2018.

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1 Introduction

1.1 Problem Statement: Co-Creating Rural Livelihood Options for "a better and more sustainable future"

1.1.1 The dialectic relationship of societies and the biosphere

Humanity's history is a history of the dialectic relationship of societies and their biophysical environments. From these environments, societies derive goods and services; often through the mobilisation of labour and technologies, which enable humans to extract, convert or redirect stocks and flows of environmental resources. Drawing on these resource stocks and flows, to meet their needs and objectives, successive human societies have thus been able to prosper, but also faced crises (Hedenus, Persson, & Sprei, 2018). That is, because all human activities – to a greater or lesser extend – alter the dynamics of interlinked societal and biophysical processes. But not all such alterations are to the advantage of societies (Hedenus et al., 2018), as biosphere conditions – which societies inevitably require to be conducive to human needs (Steffen et al., 2015) – are contingent on these processes.

1.1.2 Societal affluence and inequalities

Many contemporary societies are technologically highly advanced and affluent in terms of their material and financial possessions and consumption of resources. They are also increasingly interconnected, through flows of humans, materials and information. But not all individuals and societies have access to the same share of possessions and consumables; nor do they equally partake in networked exchanges of materials and information. The advantages and disadvantages that humans and societies thus ultimately derive from the appropriation of environmental resource stocks and flows are, in fact, distributed rather unequally – both among and within societies, which constitute sovereign states; and within families (The United Nations, 2018b).

This inequality is, *inter alia*, manifest in: (i) the World Bank's new classification of countries' economies into low-income, lower middle-income (including Myanmar and Morocco), upper middle-income and high-income economies, on the basis of gross national income per capita (The World Bank, 2018), (ii) in reports about increasing with-in country inequalities in many global regions over the past four decades, and (iii) in great disparities between the relative shares of national income, which the top 1% and bottom 50% of income shares account for, in most countries (Alvaredo, Chancel, Piketty, Saez, & Zucman, 2017). Further, it is

embodied in the "disproportionately higher risk of adverse consequences with global warming of 1.5 °C and beyond", which are borne by "disadvantaged and vulnerable populations, some indigenous peoples, and local communities dependent on agricultural or coastal livelihoods" (Intergovernmental Panel on Climate Change, 2018, p. 11).

1.1.3 Global environmental change

Absolute gains in terms of technological, material and consumption affluence in many societies, and the rapid global population increase in recent decades, have come along with changes in global biosphere processes, and societies' biophysical environments, which are in many regards extreme and concerning (Hedenus et al., 2018; Intergovernmental Panel on Climate Change, 2018; Steffen et al., 2015; The United Nations, 2015). The Intergovernmental Panel on Climate Change (2018, pp. 6, 7, 10) estimates that "human activities […] have caused approximately 1.0°C of global warming […] above pre-industrial levels", established that "impacts on natural and human systems from global warming have already been observed"; and that anticipated further warming will lead to substantial shifts in climate and weather patterns, a shrinking of the climatically suitable ranges of many animal and plant species; and "transformation[s]", and the degradation, damage to, and loss of many aquatic and terrestrial ecosystems. Contemporary levels of human impact on biodiversity and species extinction rates, on biogeochemical flows of phosphorous and nitrogen and on contemporary levels of land-system change, have likewise been associated with "high risks" and "increasing risks" for human societies, respectively (Steffen et al., 2015, p. 736).

1.1.4 Global and local agendas for sustainable rural development

Grounded in a normative objective to address some of the above outlined social inequalities and the extreme poverty of 836 million people; and the conviction 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, in 2015, adopted the 2030 Agenda for Sustainable Development (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 and 169 targets" (The United Nations, 2015, pp. 3, 4), "to achieve a better and more sustainable future for all" (The United Nations, 2018a). In practical terms, this arguably lofty global vision, translates into a concrete need, to address the pressing local challenges and substantial vulnerabilities, which rural people, *inter alia*, in

upland Asia and the north African drylands face today, in consequence of global social and environmental change.

1.1.5 Conducting research for the co-creation of viable rural livelihood options

To meet the vision of "a better and more sustainable future for all" (The United Nations, 2018a), it will be necessary, but not sufficient, to co-create livelihood options and conducive livelihood contexts that enable rural people in the global south, to meet their livelihood needs and objectives, both in the challenging contemporary context of global social and environmental change, and in the future.

It is my firm belief that the co-creation of such livelihood options will require collective efforts of diverse actor groups, who have a stake in rural development processes. That is because different societal groups command over disparate means and opportunity spaces to act, and thus direct rural livelihood trajectories, e.g. in Myanmar and Morocco, towards a "better and more sustainable future" (The United Nations, 2015). A possible contribution that research can make to meeting this normative objective, is to extend the empirical and methodological knowledge base that informs the work of rural development stakeholders. This would assist these stakeholders in their efforts to directly support, or create conducive environments for the livelihoods of rural people. So that, these people can meet their livelihood needs and aspirations – in line with the global Agenda for Sustainable Development (The United Nations, 2015). This is the contribution that I sought to make, with the research that I present in this licentiate thesis.

1.2 Structure of the Dissertation

The remainder of this thesis is structured as follows. *Chapter 2*, introduces the theoretical background of my work, from which I drew to develop the aim, objectives and overarching research questions for this thesis. The latter, together with specific aims, objectives, research questions and motivations for the two research papers in this thesis, are presented in *Chapter 3*. *Chapter 4*, motivates my methodological research approach, and provides an overview of research methods that were applied to obtain the data, which my research papers build on. *Chapter 5* serves to discuss key results and contributions of my research, before the thesis closes with concluding remarks, and an outlook to further research in *Chapter 6*.

2 Theoretical and Conceptual Background

2.1 Reflections on Academic Disciplines and my Use of Theory, Epistemology and Ontology

2.1.1 An "undisciplin[ed] journey"

My academic training, up to and continuing with my PhD studies has been an "undisciplin[ed] journey" (Haider et al., 2018). This journey has been undisciplined in so far as I have, from the beginning of my academic training, been enrolled in educational programs that cross traditional disciplinary boundaries, instead of clearly fitting within a single natural or social science discipline. The fields of my studies in 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 both societal and biophysical objects and processes of human reality. Further, they are united in their – to a greater or lesser extent – "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, once they have already obtained a grounding in "strong disciplinary foundations" (Haider et al., 2018, p. 191).

Upon reflection, I conceive my interdisciplinary research background as a strength; a strength, however, that does not come free from associated challenges. On the one hand, my interdisciplinary academic background means that over the course of my academic training I have been introduced to diverse research traditions and different strands of sustainability and development related literature, by teachers from varied disciplinary backgrounds, at universities in four different countries. Each of these has added to the toolbox of theoretical perspectives, concepts and methods, which I can draw on to develop my own research. On the other hand, my interdisciplinary grounding comes, *inter alia*, with a need to learn – early on – how to effectively navigate the diverse research practices, languages, epistemologies and ontologies that characterise the different disciplinary research fields that I seek to draw on and integrate in my work (Haider et al., 2018). This is a fundamental learning process, which I perceive to constitute both, one of the greatest challenges, and joys of my ongoing graduate studies.

2.1.2 Reflections on my use of literature and theory

The sustainable development related scholarly work, which I primarily draw on in this licentiate thesis, can be grouped into four broad categories, including: (i) the diverse strands of theoretical thinking and research into the dialectic relationship between human societies and their bio-physical environments; (ii) perspectives on vulnerability, coping and adaptation, which are, *inter alia*, grounded in disaster risk reduction and political ecology thinking; (iii) work on professional practice, technology adoption and the role of local knowledge in rural development; and (iv) texts on livelihoods thinking and the sustainable livelihoods framework, which serves as a conceptual lens and thinking took for my research.

My engagement with this broad theoretical base, takes different forms, as further specified in *Sections 2.2-2.4* of this chapter. Some texts primarily inform my general thinking about contemporary global change phenomena and my research field, whereas others serve as a source of theories and concepts, which I directly draw on to formulate e.g. my research questions or contextualise the findings of my research. Generally, though, my research is not motivated by theoretical considerations, but rather empirical and methodological knowledge gaps or societal challenges, which I identify in existing empirical literature or perceive from public debates. Hence, I believe that my engagement with the above outlined literature is best described by what Bryman (2016, p. 19) calls the "publications-as-theory strategy" – where the background literature in a field, rather than specific theories, inform a researcher's work.

Two exceptions to this publications-as-theory strategy are my use of literature on specific research methods, which directly informs e.g. my approaches to obtain and analyse data, and the literature on sustainable livelihoods thinking and the sustainable livelihoods framework. This framework serves as the conceptual lens for my studies, which I use to integrate the diverse perspectives that are embodied in the broader literature base that I draw from. The sustainable livelihoods framework lends itself to this application, as it constitutes a "holistic paradigm for analysing rural development" and facilitates the integration of diverse theories and perspectives on poverty dynamics and human dependence on agroecosystems (Fisher et al., 2013, p. 1109).

2.1.3 Reflections on epistemology and ontology

Reconciling epistemological and ontological tensions

I recognise that there is a perceivable tension embodied in my effort to conduct research that draws on theoretical frameworks and research traditions that do not

all depart from shared epistemological and ontological stances (Turner & Robbins, 2008), and that may by some be seen as incommensurable (Mingers, 2014). Similar tensions may be perceived with regards to my mixed-methods research strategy (compare *Section 4.1*), or my attempt to combine the local knowledge of rural smallholders and academic perspectives in my research studies as, e.g., in *Paper II* in this thesis. My search for a metatheory that would allow me to resolve these tensions has led me to engage with the philosophy of critical realism (Bryman, 2016; Mingers, 2014; Mingers & Standing, 2017).

The ontological domain

Critical realism postulates a reality that exists independent of human beholders, but that is layered (Mingers, 2014), comprising "three ontological domains" (Prowse, 2010, p. 217), which can be described as follows:

> "The empirical domain is that which human experience is limited to, and in which our research data is generated. Our experience of this domain is necessarily filtered by our sociobiographical characteristics and mediated by our conceptual beliefs. The second ontological domain is the actual. This includes the empirical domain, but also includes those events that occur in the world but which nobody experiences. For example, if a tree falls in a forest but is not seen by someone, it occurs in the actual domain. The third ontological domain is the real. This includes both the empirical and the actual, and generative causal mechanisms that create concrete events in the external world." (Prowse, 2010, p. 217)

The ultimate objective of research, then, is to gain an understanding of the generative causal mechanism that "give rise to the actual events that do and do not occur" (Mingers, 2014, p. 16). That is, taking departure from empirically observed events, researchers explore under which contextual circumstances such events would come to, or could be understood to occur (Mingers, 2014).

These causal mechanisms, or powers of objects to cause events, arise as an emergent property of nested, material and non-material systems of interconnected objects (Mingers, 2014). Where these objects are people – or generally speaking, social rather than bio-physical entities – their power lies in their agency, i.e. their capacity to act. This agency or capacity to act is an emergent property of social structures, which critical realists accept to be different from material structures, in so far as humans continuously (re-)produce and transform these structures through their actions, and attribute interpretations and meaning to them (Mingers, 2014). It is this difference between social and biophysical structures that implies, that social and biophysical entities and their emergent properties cannot be studied by

identical means. But they can both be studied from a critical realist perspective, which seeks to understand the generative causal mechanisms that emerge as causal properties from relatively stable structures of social and biophysical entities, respectivly (Mingers, 2014).

The epistemological domain

With regards to the epistemological domain, critical realists recognize knowledge to be the product of "the work of humans" and science "as a social process" during which researchers "draw on existing theories, results, anomalies and conjectures" (Mingers, 2014, p. 20). The work of researchers can thus be understood as an iterative process through which we derive and refine a knowledge of reality, which is always "historically and socially located" (Mingers, 2014, p. 20). It is this acceptance of the "epistemic relativity of science" by critical realists (Mingers, 2014, p. 20), which, in my eyes, helps to resolve the tension between positivist and interpretivist research traditions, and allows for the combination and integration of local and academic knowledge in studies of rural livelihoods.

Critical realism and the research in this thesis

Importantly, the conception of the papers in this thesis has not been informed by explicit critical realist thinking. Rather, I perceive many of the basic premises of critical realists to fit well with the systems perspectives, and epistemological and ontological positions, which I take somewhat intuitively, in my own research. That is why I found it meaningful to introduce some of these critical realist positions here, in order to motivate the validity of integrating theories and concepts from disparate research traditions and bodies of literature in my studies. I will also briefly return to critical realists thinking in *Section 4.1* of this thesis, where I motivate my belief in the validity of combining different research methods to study rural livelihoods, through a mixed-methods research strategy, and to reason about the possibility of deriving generalised knowledge claims (Magliocca et al., 2018) from case study research.

2.2 Theoretical Background

2.2.1 Framing the dialectic relationship of human societies and their bio-physical environments

I opened my problem statement in *Section 1.1* of this thesis with reference to the dialectic relationship of societies and their biophysical environment. From this opening, I proceeded to discuss societies' dependence on stocks and flows of environmental resources, which humans draw on and convert, to sustain themselves. Further, I commented on the circular – rather than one-directional

nature of societies' relationship with their biophysical environment, where humans do not just obtain goods and services from their biophysical environments but, through their actions, also change these environments and global biosphere processes. The following text sections introduce the literature that I draw on to conceptually frame these dynamics.

Social-ecological systems or human-environment interactions?

The academic literature that conceptualises the above described society-biosphere dynamics and interdependencies is rich in terms of theoretical perspective and stems from diverse groups of authors, from both social and natural science 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 "complex adaptive systems", or, in different words, "social-ecological systems" (Walker & Salt, 2006, p. 11). These social-ecological systems are, following this strand of conception, characterised by "thresholds" and "adaptive cycles" (Walker & Salt, 2006, p. 11). That is, these systems can cross tipping points, where they shift from one relatively stable state into another relative stable state, 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 moments 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., lifting people or communities out of a state of vulnerability; or (ii) prevent a system from crossing a threshold, e.g., to prevent the collapse of rural peoples' farming and livelihood systems, due to impacts of global climate change. Another associated key concept in this literature is resilience, defined as a systems capacity to "absorb disturbance, undergo change, and still retain essentially the same function, structure, and feedbacks – the same identity" (Walker & Salt, 2006, p. 62), compared to a pre-perturbance state.

One of the most prominent, albeit by far not the only, framework for the study of social-ecological systems (Binder, Hinkel, Bots, & Pahl-Wostl, 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 of fisheries (Binder et al., 2013; Ostrom, 2009) this framework has been, over time, developed to broaden its possible 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 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 draws attention to the importance of being attentive to the role of power, politics, and resource and land governance agendas of different actors (Cote & Nightingale, 2012), in studies of society-biosphere interdependencies and the dynamic social contexts of rural livelihoods, which influence rural peoples' aspirations, decision-making spaces, and vulnerabilities.

Scholarship in the social sciences, e.g. in the field of political economy and ecology, has contributed much to contemporary understandings of these aspects, so that the corresponding literature is a very useful resource for the conceptualisation of rural peoples' livelihood options and vulnerabilities, as discussed in *Section 2.2.2* of this chapter.

Land-system dynamics, socio-environmental feedbacks and drivers of global change

Systems terminology also features prominently in publications, in the field of land-system science (Global Land Programme, 2016; Rounsevell et al., 2012; Verburg, Erb, Mertz, & Espindola, 2013). Authors in this field engage in research to observe and explain land cover dynamics, and study the dynamics, drivers, impacts and possible future trajectories of land-use across scales, from local to global (Rounsevell et al., 2012; Verburg et al., 2013). It is thanks to more than 20 years of research contributions in this field that the scientific community has seen great advances in understanding of the magnitude, spatial extent and character of transformations and perturbances, which land-systems around the globe have been subjected to, due to global social and environmental change (Verburg et al., 2013).

This body of literature, including central ideas such as the concepts or "proximate causes" and "underlying driving forces" (Geist & Lambin, 2002, p. 143) of land change; 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 rural peoples' dynamic livelihood, and specifically land-system contexts.

Ecosystem services and telecoupling

The conception of environmental goods and services, which people derive from nature, as ecosystem services, is rooted in the confluence of ideas from the disciplines of biology and economics (Binder et al., 2013), long before the publication of the influential Millennium Ecosystem Assessment (Millenium Ecosystem Assessment, 2005). This assessment report, however, introduced the Millennium Ecosystem Services Assessment framework, which distinguishes supporting, provisioning, regulating and cultural services that humans derive from life on earth, and links these services to the constituents of human well-being (Millenium Ecosystem Assessment, 2005). This conception constitutes the basis for my thinking about the economic and non-valued goods and services, which rural people derive from nature, *inter alia*, via their engagement in different land-based livelihood strategies.

A more recent addition to the conceptual toolbox for thinking about the environmental and geographical origin of goods and services that rural people rely on, is the concept of telecoupling (Liu et al., 2013), which emphasises the but increasingly prevalent interconnections of geographically distant places, e.g. via flows of goods, information, or people who migrate in search of income earning opportunities. The basic observation behind this concept is that sustainability challenges can, in an increasingly teleconnected and globalised world, no longer be understood from perspectives that focus solely on local livelihood and land-use dynamics (Liu et al., 2013). Instead attention has to be extended to the possible effects of contextual driving forces, which affect rural livelihoods in one place, yet emerge from flows between interconnected, but geographically distant sending, receiving and spillover systems (Liu et al., 2013).

2.2.2 Framing rural livelihood vulnerabilities, coping and adaptation

The literature on rural livelihood vulnerabilities, coping and adaptation informs my conceptualisation of the challenges that arise for rural people as a consequence of contemporary social inequalities and global environmental change (compare *Sections 1.1.2* and *1.1.3*).

My grasp of this literature on rural livelihood vulnerabilities, coping and adaption is, however, far less comprehensive, than that on the likewise broad literature on society-biosphere interconnections. Hence, I tend to use this literature in a more ad hoc fashion, to inform my thinking about the vulnerability context or rural livelihoods: i.e., the origins of rural people's vulnerabilities; the determinants of people's command over their livelihood assets and claims; and people's opportunity space to adapt, or cope in the face of change and crisis. Authors, texts and

concepts, which, *inter alia*, influence my thinking in this domain, include contributions from the field of climate science and disaster risk reduction, and from political economy and ecology scholars, which I introduce in the following text sections.

Contributions from the field of climate science and disaster risk reduction

Livelihood vulnerability related concepts from the field of climate science and disaster risk reduction feature, e.g. prominently in the assessment reports of the Intergovernmental Panel on Climate Change (2014). Key concepts from this literature include: (i) hazards, i.e. "the potential occurrence of a natural or human-induced physical event or trend or physical impact", which could negatively affect rural peoples' livelihoods; (ii) exposure, i.e. "the presence of people, livelihoods, species or ecosystems […] or economic, social, or cultural assets […] that could be adversely affected" by hazards; (iii) vulnerability, i.e. "the propensity or predisposition" of, *inter alia*, peoples' livelihoods or land-systems to be "adversely affected"; and (iv) impacts, i.e. the "effects [of hazards] on natural and human systems" (Intergovernmental Panel on Climate Change, 2014, p. 5). These concepts inform my understanding of direct links between disturbance events in rural people's livelihood contexts, and associated impacts on these peoples' livelihoods.

Contributions from political economy and ecology

Complementary concepts from the social science literature, which inform my understanding of social and economic causes of rural peoples' vulnerabilities stem from authors, who work in the fields of political economy, political ecology and on questions of land governance. Examples include the work of Jesse Ribot, who has written on the socially and economically located "root-causes" of peoples' climate vulnerability (J. Ribot, 2014), the role of power, representation and institutional arrangements (J. C. Ribot, 2005) and the concept of access (Jesse Ribot & Peluso, 2003) in resource governance. Other authors have written on the increasingly extended reach of capitalist market forces into distant rural places, and processes of land and resource "territorialisation" in "frontier spaces" (M. B. Rasmussen & Lund, 2018, p. 388), in consequence of which rural people may lose access to the land and resources that their livelihoods depend on. Whereas political ecologists, who have highlighted the role of power and conflicts, which are the expression of struggles concerning the legitimate control over land and natural resources, among different actor groups (Bryant, 1998), introduced questions about the role of politics, and authority over knowledge to the sustainability science research agenda (Turner & Robbins, 2008).

2.2.3 Professional practice, technology adoption and the role of local knowledge in rural development

The third broad strand of literature that informs my thinking about means to co-create viable rural livelihood options and conducive livelihood contexts in the face of contemporary global change processes (compare *Section 1.1.5*), is the literature on professional practice, technology adoption and the role of local knowledge in rural development.

The research, and practical work, of rural development stakeholders, which this literature is concerned with, is characterised by its explicitly transformative agenda. The ultimate aim of research in this field is to address the vulnerabilities and transform the livelihoods, and livelihood contexts of rural people, e.g. through agricultural innovations and the co-creation, adoption and scaling of feasible, and context sensitive livelihood options that enable rural people to meet their needs and aspirations. Hence, this is the body of work that most directly relates to the practical aspect of the engagement with rural people, which is required to meet the global Agenda for Sustainable Development. Yet, for this engagement and practical work to be successful, it thoroughly depends on the theoretical and empirical contributions to knowledge from other research fields, which I have discussed in the previous sections of this chapter.

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

Research and thinking about rural peoples' decision-making on the adoption of agricultural technologies and innovations is diverse, and can be considered to constitute a research field in its own rights. The strand of adoption thinking, which I will introduce here, however, departs from Chambers (1993, p. 60) seminal critique of professional practice in rural development research and extension work, and the "farmer-first" paradigm for the "'third' agriculture". Chambers (1993, p. 60) line of reasoning, in proposing this paradigm was, that technological advances and productivity gains in industrial (the first agriculture) and "green revolution" agriculture (the second agriculture), had been made on the basis of a technology innovation model that relied on a linear and unidirectional research-extension model, where researchers developed technologies under controlled conditions, to subsequently transfer them to farmers and those farmers' standardised production systems, for adoption.

While this research-extension model had worked for a certain agricultural communities and farming systems, it would, according to Chambers (1993, p. 60), not work for 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 ground for his critique was: (i) his perception of the inability of these actors, to adequately account for the complex and risk prone nature of the production systems, of the resource poor he was concerned about; (ii) an overreliance on disciplinary agriculture and forestry research, which did not address thematic in-between disciplines, such as agroforestry; and (iii) researchers reliance on experimental research set-ups that were unable to deal with the complex interactions and need for "multiple simultaneous innovations" to improve farming systems under marginal socio-environmental conditions.

There was, however, a solution to the challenge of non-adoption and rejection of agricultural innovations by resource-poor farmers, and great potential for the sustainable intensification and diversification of these peoples' production systems (Chambers, 1993). This solution, which Chambers (1993, p. 67) proposed, lay in "farmers' priorities and participation" in research and extension processes. Such research would explore farmers' reasons for technology non-adoption, facilitate agricultural innovation with and by rural people, on their own farms, and build on the recognition of rural peoples' priorities, knowledge and analysis of their own farming systems, and innovations which met their self-perceived needs (Chambers, 1993).

Contemporary positions on pathways for technology adoption, scaling and the role of local knowledge in rural development

Contemporary positions on pathways for technology adoption, scaling and the role of local knowledge in rural development, very much resonate with and are in fact often informed by Chambers' (1993) work. 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 world's dryland regions, who struggle with climate induced production risks, such as water scarcity and the consequences of insufficient extension services, and challenging market and governance conditions.

Coe, Sinclair, and Barrios (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, to first derive cross-disciplinary innovative solutions with specific rural people in their specific livelihood contexts, and then to scale promising practices and intervention options that arise from this

process, across systematically identified scaling domains (Coe et al., 2014). Research conducted in such a manner could, according to Coe et al.'s (2014) argument, capitalise on the substantially greater funds that go into rural development practice, rather than research, and on the local knowledge of rural people, e.g. to investigate the fit of innovations within the livelihood system of targeted people and specific livelihood contexts.

Advocates of the integration of local knowledge and academic perspectives in rural livelihood, technology adoption, and climate adaptation research further emphasize 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 agro-ecological contexts"; and (iii) that local knowledge is not evenly distributed amongst rural people, but, *inter alia*, a function of power and social status (Warburton & Martin, 1999, pp. 1, 2). Local peoples' knowledge can also be a tool for the adaptive management of environmental resources, to account for environmental feed-backs and uncertainties that are inherent to environmental processes (Berkes, Colding, & Folke, 2000). Finally, Meijer, Catacutan, Ajayi, Sileshi, and Nieuwenhuis (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' adoption decisions, with regards to technological and agricultural innovations.

2.3 Knowledge Gaps and Converging Research Agendas for Sustainable Rural Development

2.3.1 Converging research agendas for sustainable rural development

The different strands of literature outlined above converge around the normative societal challenge to realise the global political Agenda for Sustainable Development. They do so through their complementary contributions to the current state of knowledge about: (i) the phenomenon and processes of global social and environmental change; (ii) rural peoples' reliance on environmental resources; (iii) the vulnerabilities of rural people, which arise or are exacerbated through the processes of global change; and (iv) means to develop and scale agricultural and livelihood innovations, to address the vulnerabilities of rural people, and support them in meeting their needs and aspirations. Given this overlap of existing bodies of academic work, it is perhaps little surprising that one can also conceive a convergence of future-oriented research agendas in these fields, towards the co-creation of viable livelihood options and conducive livelihood contexts for rural people in the Global South.

Calls for a new research-extension paradigm, new research approaches and the integration of local knowledge in rural development research and practice, from authors in the field of rural agricultural development and livelihoods research, who seek to address the vulnerabilities of poor rural people in the context of global change (compare *Section 2.2.3*), converge with research agendas in the field of land-system change, which are increasingly more oriented towards normative and transformation-oriented objectives. The latter is evident from the gradual shift within the land-systems science community, from observations of the states of land-system and assessments of the drivers of land-change processes, towards a research agenda, which emphasises a need to integrate the diverse knowledges of different stakeholders, academic disciplines and land-management practitioners, in order to affect transformative change, and direct land-systems onto more sustainable pathways (Global Land Programme, 2016).

On the research agenda of the land-system science community are now, *inter alia*, participatory studies with rural development stakeholders, which should combine exploratory thinking and analyses with normative elements and where the research objective goes beyond explorations of different possible land-use options in certain context, to focus instead on the identification of concrete "ways to reach a [normatively] desired endpoint", embodying a sustainable land-use future that involved actors perceive as both viable and desirable (Rounsevell et al., 2012, p. 904). Further, land-system scientists recognise an increasing need for mixed-methods research (compare *Section 4.1*), which combines quantitative and qualitative approaches, e.g., to enrich existing knowledge about land-system dynamics, with insights into "land managers values and preferences". Also required, are case studies (compare *Section 4.1*), which, *inter alia*, advance knowledge about the influence of actors' "surrounding environment" on their land-use decision making (Rounsevell et al., 2012, p. 904).

2.3.2 Remaining and newly emergent knowledge gaps

Evident from the theoretical and empirical bodies of work that I have introduced in *Section 2.2* of this thesis, and from the converging research agendas of scholars in the respective academic fields, is a need to address emergent methodological and empirical knowledge gap, to enable sustainable rural development in line with the global Agenda for Sustainable Development.

In methodological terms, the resurgent interest in local knowledge and the perspectives of diverse rural development actors, among rural livelihoods and land-system researchers and practitioners (compare *Sections 2.2.3* and *2.3.1*), implies a need for the continued development and refinement of approaches, which allow

for the methodological and analytical integration of local knowledge and stakeholder perspectives, with the expert knowledge of scholars and extension agents from international donor, civil society or governmental organisations.

In empirical terms, knowledge gaps remain, *inter alia*, about livelihoods and the current state and dynamics of land-systems, in geographical areas of Asia that due to limited accessibility have received previously received little scholarly attention. This is the case, e.g., for large tracts of land in upland Myanmar (Erni, 2015; Springate-Baginski, 2017), despite the expansive advances in empirical knowledge that have been made elsewhere in South-East Asia, for example regarding the outstanding impact of commodity crop expansion, and the far-ranging and at times disruptive social, economic and environmental change processes that have affected swidden farmers and upland communities during the past decades (Cramb et al., 2009; Dressler et al., 2017; Erni, 2015; Ferguson, 2014; Fox & Castella, 2013; Heinimann et al., 2017; Kelly, 2011; Rigg, Salamanca, Phongsiri, & Sripun, 2018; van Vliet et al., 2012). Empirical knowledge needs also pertain to the fine-scaled diversity, and the complex dynamics of, land-use systems and under-researched production practices, such as e.g. agroforestry (Daoui & Fatemi, 2014), a better understanding of which is required to address the vulnerabilities of rural people across the African drylands (Coe et al., 2014; van Ginkel et al., 2013), including northern Morocco.

There is further a need to address remaining and newly emergent knowledge gaps about contemporary global change processes, their impacts on vulnerable rural people, and how these vulnerabilities may best be addresses. Such processes include, *inter alia*, ongoing labour-market and climate related national and international migration flows and possibly associated deagrarianisation processes (Chan & Takeda, 2016; Rigg et al., 2018), the global rush for land (Oberlack, Tejada, Messerli, Rist, & Giger, 2016), land-use intensification (L. V. Rasmussen et al., 2018), territorialisation processes in frontier spaces (M. B. Rasmussen & Lund, 2018), and the – once again – increasing share of undernourished people globally, in consequence of, *inter alia*, detrimental climate events.

2.4 Conceptual Framework: Operationalising Sustainable Livelihoods Thinking for Research

2.4.1 Origins of sustainable livelihoods thinking and frameworks

In order to addresses the above outlined knowledge gaps (compare *Section 2.3.2*), I have chosen engage in livelihoods thinking and empirical case-based livelihoods research, which draw upon Chambers' and Conway's (1991, p. 5) seminal

conception (Scoones, 2009) of "sustainable livelihoods" as the complex "means of gaining a living" of rural people in the Global South. I have also made use of over two decades of development and further refinement of sustainable livelihood frameworks, as thinking and operational tools for rural development research and practice (Scoones, 2009), in order to operationalise livelihoods thinking as a conceptual framework for my own research. Specifically, sustainable livelihoods thinking serves me as a conceptual tool for the integration of the diverse strands of theory and literature, which inform my research (compare *Section 2.2*), as well as a conceptual lens for the framing of my research papers and empirical field studies, guiding my approaches to data analysis.

Chambers' and Conway's (1991) original conception of sustainable rural livelihoods roughly dates back to the time, during which Chambers (1993) also published his seminal work on the third agriculture, and his critique of dominant professional practice in rural development research and extension work, of that time (compare *Section 2.2.3*). The development of these ideas and conceptualisations can thus be interpreted in relationship to one another. That is, as an attempt to raise awareness and bring attention to the complexities of rural livelihoods in the Global South. And to conceive of and seize new modes of rural development research and practice, which lived up to the need of having to account for these complexities (Scoones, 2009, p. 172). As such, the roots of sustainably livelihoods thinking under different names, however, reach at least half a century further back in history (Scoones, 2009).

2.4.2 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 to make livelihoods thinking somewhat more tangible, and therefore raised the profile of livelihoods thinking 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 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.

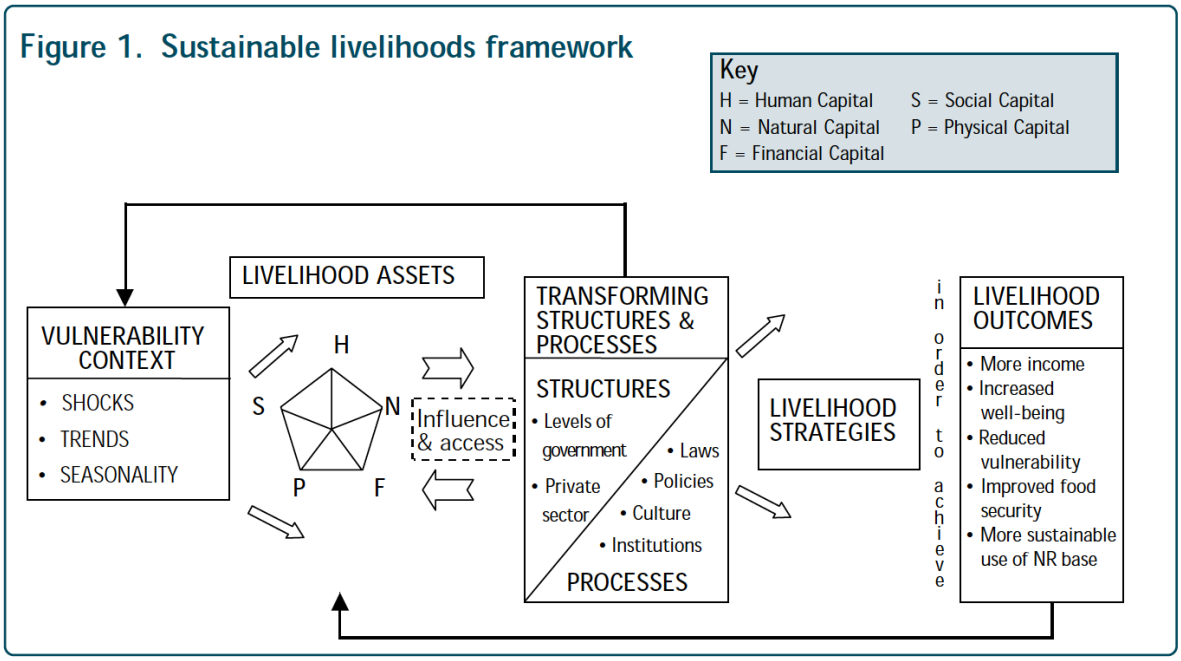

Figure 1. The Sustainable Livelihoods Framework (Department for International Development, 1999, p. 13).

2.4.3 Sustainable livelihoods thinking and concepts in this thesis

Scoones (2009, p. 172) asserts, that "livelihood perspectives start with how different people in different places live". I have built on this line of thinking, when developing the overarching research questions (compare *Section 3.1.2*) and the empirical research approach for this thesis. For the formulation of the overarching research questions, however, I somewhat simplified the conceptual elements of the Sustainable Livelihoods Framework, by conceptually merging rural people's *vulnerability context* and the *transforming structures and processes* in that context, which affect rural people's livelihoods into one category, which I simply refer to as people's livelihood context. Further, I refer explicitly to rural people's needs, aspirations and objectives, which in the livelihood framework are somewhat "hidden" in the space between *livelihood strategies* and *livelihood outcomes*. Finally, I situate rural people's vulnerabilities and opportunity spaces in the emergent space between their livelihoods, livelihood contexts, and livelihood needs, aspirations and objectives.

3 Aim, Objectives and Research Questions

3.1 Overarching Aim, Objectives and Research Questions

3.1.1 Overarching aim and objectives

The contemporary normative, societal challenge, of having to co-create viable livelihood options and conducive livelihood contexts for rural people in the global south (compare *Section 1.1*) and my reflections on existing knowledge gaps and converging research agendas for sustainable rural development (compare *Section 2.3*), motivate my overarching aim, objectives and mixed-methods, case study approach for this thesis.

My overarching aim with this thesis, then, is to contribute to the co-creation of rural livelihood options and conducive livelihood contexts for rural people, in agrarian context in the global south – in line with the global Agenda for Sustainable Development. My overarching research objectives, towards this aim, are to: (i) advance the existing empirical knowledge base about the dynamics of rural livelihoods and land-use practices, and options to positively affect these dynamics, at my case study sites in western Myanmar and northern Morocco; and (ii) to explore the utility of, and means to integrate the local knowledge of rural people in academic livelihoods research. By doing so, I seek to advance the empirical and methodological knowledge base, from which rural development stakeholders can draw in their practical efforts to directly support, or create conducive contexts, for the livelihoods of rural people in the global south.

3.1.2 Overarching research questions

My research in this thesis, is guided by four overarching empirical research questions and associated sub-questions, and one overarching methodological research questions. I have developed these research questions on the basis of the theories and empirical work, which have been introduced in *Chapter 2* of this thesis. Further, I have used the sustainable livelihoods framework both as a tool for thinking that allows me to integrate these different bodies of literature, and as a conceptual lens for the design and realisation of my research.

Specifically, my overarching research questions (*RQ*) were:

1. How do the rural people in my case study areas currently make a living? And how dependant are they on access to land and environmental resources?
    a. Which livelihood activities do these people engage in?
    b. Which capabilities, assets, and claims do these people mobilise to make their living?

2. Why do these people make their living in these ways?
    a. Which needs and aspirations do these people have, and which objectives do they seek to achieve?
    b. How does the social, ecological and environmental livelihood context of these people shape their self-perceived, and de facto decision-making and action space?
3. Which vulnerabilities are associated with the ways in which these people make their living?
    a. Which events and processes in their livelihood contexts that are potentially detrimental to their needs, aspirations and objectives, are these people exposed to?
    b. How vulnerable are these people to these potentially detrimental events and processes?
4. Which actions or interventions could reduce the livelihood vulnerabilities of these people?
    a. What are the known options to change people's livelihoods or livelihood contexts, in order to reduce people's livelihood vulnerabilities?
    b. Which of these options are aligned with the aspirations, objectives and capabilities of actors with a stake in my case study areas, and thus likely to be realised?
5. How can the local knowledge of rural people and the use of local knowledge methods inform academic research, and the practical work of rural development stakeholders?

I do not empirically address all of these overarching research questions in each of the papers in this thesis. Instead, I departed from the existing knowledge base, to identify the most urgent knowledge gaps about rural people's livelihoods, livelihood contexts and livelihood aspirations, in each of the specific case study settings, at the outset of the research for *Papers I* and *II*. Based on what I found, I then decided which of my overarching research questions I would empirically address, in each of my case studies, respectively. Based on this decision, I could commence to develop specific research questions and methodological approaches for each study, as described in *Sections 3.2* and *4.2* of this thesis.

It is therefore this thesis in its entirety, rather than each of the appended papers individually, which addresses the above outlined overarching research questions and thus makes a contribution to empirical, methodological and agenda setting knowledge, about rural livelihood options for a better and more sustainable future (compare *Chapter 5*), in line with my overarching research aim and objectives.

3.2 Specific Aim, Objectives and Research Questions for Papers I and II

3.2.1 Aim, objectives and research questions for *Paper I*

Aim, objectives and specific research questions

Our main aim with *Paper I*, was to (i) advance the knowledge base, upon which actors with a stake in rural development processes and land-use decision making in upland Myanmar could conceive targeted interventions to improve the livelihoods of rural people; and (ii) anticipate, monitor and evaluate agrarian change processes, in our study area.

Towards this aim, we operationalised the study with a threefold objective: We sought to explore the range of livelihood strategies that households in our study area engaged in, to assess the dependence of these strategies on households' access to land and natural resources, and to compare strategies in terms of the associated income-poverty outcomes for different households. These objectives are closely reflected in the specific research questions, which we formulated for *Paper I*. These were: (i) Which livelihood strategies sustain households in our study area; (ii) how reliant are these strategies on access to land and natural resources vis-a-vis other income sources; and (iii) how do these strategies compare in terms of income-poverty outcomes?

Motivation and connections to my overarching research questions

Our idea for this paper, in relation to the overarching research questions that this dissertation addresses, first arose from reflections on the writing of academics and civil society organisations, who engaged with land matters in Myanmar. Many of these actors expressed their acute concern about the complex legal framework which governs land matters in the country, and about the contemporary re-negotiation of this framework in political for a and through de facto land-use decisions across the country. Specifically, our attention was caught by contributions about possible negative implications of Myanmar's National Land Use Policy (The Republic of the Union of Myanmar, 2016), which was still being drafted at the time, and the country's Farmland and Vacant, Fallow and Virgin Lands Management Laws, which were enacted in 2012, for the land tenure rights of swidden reliant communities in the nation's uplands.

We thought that assessments of the de facto vulnerabilities of communities (*RQ 3*), to shifts in land governance regimes across the country – not just due to these laws, but possibly also driven by domestic and international resource extraction, capital investments or conservation efforts – could not solely build on knowledge about

potential shifts in peoples' livelihood contexts (e.g. due to new land laws). Rather, additional knowledge was required about upland peoples' livelihood strategies (*RQ 1a*), and the dependence of these strategies, on households' access to different types of land and natural resources (*RQ 1b*) – as livelihood vulnerabilities (*RQ 3*) arise from the dialect relationship of people's livelihoods (*RQ 1*) and the context that these livelihoods are embedded in (*RQ 2b*). Insights into which households were reliant on which types of land-based income generation activities, and to what degree, would facilitate more nuanced reflections about households' respective vulnerabilities, in the context of shifting land governance regimes. Yet, such information was not readily available from existing literature.

Additionally, *Paper I* was motivated by our perception of a general scarcity of internationally published research on livelihood (*RQ 1*) and land-system dynamics (*RQ 2b, 3a*) in upland Myanmar. This gap in the literature can be explained with reference to the country's contemporary history. Myanmar's recent history has been shaped by decades of military rule. Only in recent year, since the partial transfer of power from a military regime to democratically elected representatives in Myanmar's parliament in 2015, has it become easier for foreign scholars to conduct research in more remote regions of the country. However, being easy to explain makes the research gap on livelihood and land-system dynamics in Myanmar no less problematic. That is, because – dependant on perspective – Myanmar's current transition phase constitutes a window of opportunity for, or potential threat to, livelihoods and land-use change, due to the associated, increased mobilisation of national and international funds, and the enhanced activity of government agencies, capitalist investors, conservation agents, and rural development stakeholders in the country. Resources that could be directed to affect positive change for Myanmar's uplands communities, on the basis of actionable knowledge about livelihoods (*RQ 1*), local aspirations and livelihood contexts (*RQ 2*), livelihood vulnerabilities (*RQ 3*) and options for rural development interventions (*RQ 4*).

Finally, we saw the potential of an enhanced knowledge base about rural livelihoods (*RQ 1*) in upland Myanmar to inform academic and governmental efforts to monitor, evaluate and synthesise lessons from migration, agrarian change and deagrarianisation processes in the country.

3.2.2 Aim, objectives and research questions for *Paper II*

Aim, objectives and specific research questions

Our purpose with the second paper in my dissertation was to advance the knowledge base, upon which rural development strategies and co-learning activities

could be conceived, to reduce the vulnerability of people in our study area in northern Morocco to the looming threats of water scarcity and food insecurity, in the context of anthropogenic climate change.

Towards this aim, we operationalised the study with one empirical and one methodological objective: Our first, empirical objective was to explore the opportunity space for a tree-based diversification of livelihood and farming systems in northern Morocco. Our second, methodological objective was to explore the utility of drawing on farmers' perceptions and local agroecological knowledge, to identify fine-scale variations in local livelihood and farming system contexts; and to understand farmers' aspirations, and perceived barriers and options for agroforestry interventions, in the study area.

Our specific research questions were: (i) What are the characteristics of current farming systems and agroforestry practices in the study area; (ii) which niches exist for farm-trees and agroforestry practices within these systems; and (iii) what barriers to the maintenance and planting of trees on farms can be identified, on the basis of smallholders' local agroecological knowledge?

Motivation and connections to my overarching research questions

The point of departure for this paper, in relation to the overarching research questions that this dissertation addresses, was thus different from that for *Paper I*. The focus of our empirical investigation for *Paper II* was not primarily to derive an in-depths understanding of people's livelihood strategies and assets (*RQ 1*). Rather, we departed from largely pre-conceived assumptions about this knowledge domain, which we derived from observations, conversations with local researchers, extension agents and scoping activities at the commencement of the study. Further, we drew on existing literature about climate variability, draught experiences and anticipated climate change impacts in Morocco, to inform our assumptions about key vulnerabilities (*RQ 3*) of smallholders dominated agrarian communities, who maintain cereal based farming systems in the countries North.

We were also aware of the Moroccan government's rural development activities under the umbrella of the Plan Maroc Vert, to promote a large-scale conversion of cereal to tree-based smallholder production systems. We perceived this plan to be implemented with insufficient consideration of farmers' own livelihood and land-use aspirations (*RQ 2a*), or nuanced assessments of contextual factors (*RQ 2b*) that could mitigate broadly anticipated benefits of this strategy for specific farmers, given their individual livelihood circumstances (*RQ 1*, *2b*). To address this perceived knowledge gap, our research focus rested, therefore, on the use of local knowledge methods, to explore the friction and dialectic relationship between

farmers' current livelihoods (*RQ 1*), their livelihood and land-use aspirations (*RQ 2a*) and their specific livelihood contexts (*RQ 2b*). Further, we sought to unveil farmers' aspirations and perceived options (*RQ 2a, 4*) for context sensitive agroforestry interventions in the study area. Aspiring, to thus raise an awareness among rural development stakeholders, for the need that we perceived, to develop more nuances tree-based climate adaptation strategies for northern Morocco, and similar dryland contexts.

4 Material and Methods

4.1 Research strategy: A mixed-methods case study approach to rural livelihoods research

4.1.1 Motivating an interdisciplinary, mixed-methods, case study approach to rural livelihoods research

The individual research studies in this thesis, set in upland Myanmar and northern Morocco, have been conducted under the umbrella of an interdisciplinary, mixed-methods, case study approach. The interdisciplinary of this approach, was motivated by the very nature of my research subject – as no single academic discipline alone, could do justice to the complexity of rural livelihoods in the Global South (compare *Section 2.2.*).

Motivating mixed-methods research

The complexity of rural livelihoods, and the interdisciplinary nature my research problem, then, also motivated my choice of a mixed-methods approach to the research in this thesis. One of the strengths of mixed-methods research designs, is that they allow for the integration of different types of data, to address a specific research question or issue of interest, from different perspectives (Creswell & Clark, 2011). Quantitative survey data and complementary insights from in-depth qualitative interviews can, if fruitfully combined, shed light on the livelihood activities of rural people, thus providing an "objective" and a more "interpretive" perspective, on these activities. Another merit of mixed-methods designs lies in their facilitation of data triangulation (Bryman, 2016), as they enable the researcher to, for example, contrast the potentially disparate insights that can be derived from group discussions, key-informant and in-depths local knowledge interviews, on the same subject matter. In addition, mixed-methods strategies allow for the sequential combination of different research methods (Bryman, 2016; Creswell & Clark, 2011), which means that they can be combined so that the use of one method, can inform the design and use of different research methods, during subsequent stages of the research process (compare *Sections 4.2.1 and 4.2.2*).

Motivating case-based research

My choice of a case-based research approach, was motivated by both practical and methodological considerations. In practical terms, I seized the opportunities that presented themselves to me, to conduct a specific case study in specific research settings, in Myanmar and Morocco, respectively. 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 I would thus obtain, could directly inform the work of locally active rural development stakeholders – such as my hosts and gatekeepers to local communities, from a locally operating civil society organisation and a national agricultural research institute in Myanmar and Morocco, respectively (see *Sections 4.2.1 and 4.2.2*).

4.1.2 Deriving "generalised knowledge claims" from case study research

Departing from my choice of a case-based research approach, and the premise that the ultimate objective of research is to advance human knowledge, it is valid to ask what kind of knowledge may be derived from case study research. And weather this knowledge is necessary bounded to a specific phenomenon in time and place, or can be abstracted to derive generalised knowledge claims. These questions are important, not primarily because I myself seek generalise from my case studies for *Paper I* and *II*, but because I see my work as a contribution to the baseline of studies, from which generalisations can be derived through the synthesis work of other researchers.

Case studies, causal mechanisms and "middle-range theories"

Prowse (2010, pp. 217, 222) argues that case studies – from a critical realist perspective – enable researchers to derive generalised understandings of "causal mechanism", by means of "conceptual abstraction". The idea here is that critical realist researchers engage iteratively with their empirical data and existing theory, in order to, over time, refine and further develop their understanding (i.e. theories) about causal mechanisms and the circumstances under which these mechanisms create empirical events, which humans experience (Prowse, 2010).

The idea that understanding of more general causal mechanisms, underlying specific phenomena, can be derived via conceptual abstraction and inquiry into the circumstances under which these phenomena come about (Prowse, 2010), is not all too dissimilar from propositions of land-system scientists, who argue that theoretical generalisation, from place-based case study research, allows for the derivation of general insights about land-system dynamics (Meyfroidt et al., 2018). In the latter case, 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 generalizations that describe chains of causal mechanisms

explaining a well-bounded range of phenomena, as well as the conditions that trigger, enable, or prevent these causal chains" (Meyfroidt, 2016; as cited in Meyfroidt et al., 2018, p. 53).

Other means of generalisation and synthesis methods

I agree with Meyfroidt et al. (2018, p. 54), that the identification of archetypes or syndromes, "i.e. recurring patterns or combinations of variables, processes, actors, situations, or outcomes" is a different, but likewise valid approach to generalising from case studies. In this case, derived generalisations do not apply to causal-mechanisms that give rise to observed phenomena, but rather about features, which empirically observed cases have in common, and upon which typologies can therefore be developed (Meyfroidt et al., 2018).

Synthesis methods such as meta-analysis, qualitative comparative analysis, or cross-site comparison, can likewise be applied to generalise insights from a number of context specific empirical case studies of social-ecological system dynamics, to come up with "generalized knowledge claims" that are said to hold under "a bounded range of conditions" (Magliocca et al., 2018, p. 3). This approach to producing generalised knowledge is however, not straightforward and 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 engaging in synthesis efforts from case studies, should make explicit.

4.2 Approach, Methods and Data in Papers I and II

4.2.1 Approach, methods and data in *Paper I*

Field campaign

Paper I is based on empirical research into the livelihood strategies of 94 rural households from four villages in northern Chin State, Myanmar. Data about these household and villages was obtained during my first prolonged field stay in the Chin Hills, during January and February 2017. I conducted all field work activities together with two locally recruited field assistants, and with support from Are Yone Oo – Social Development Association (AYO); a Myanmar based civil society organisation, who's local staff helped the research team with logistical

arrangements for the study, and introduced the research team to administrative leaders of the studied communities.

Data collection for this study was based on a mixed-methods approach. Different research methods were combined sequentially, so that insights from the first research stages could be used to refine the design of data collection instruments for subsequent stages. Participatory and qualitative methods such as focus group discussions (FGDs) and key informant interviews were used first, followed by the main data collection instrument that we used in this study: a multi-topic household survey, which was administered to a stratified random sample of village households. This survey was comprised of questions formulated to obtain quantitative information about the various activities and income sources of studied households for a 12-months reference period, prior to the field campaign. Additional survey questions captured information about households' socio-demographic characteristics and self-perceived wellbeing. A non-probabilistic sub-sample of survey respondents was further involved in informal conversations with the field research team, which served to complement and enrich our survey derived insights about households' livelihood activities and aspirations. Conversations with the field assistants and AYO staff, throughout, and at the end of my field stay, served as an opportunity for data triangulation, and joint reflection on preliminary research findings.

Data analysis

The pre-processed field data for *Paper I* was analysed with the statistical software package SPSS Statistics Version 23.0.0.3. Cluster analysis techniques were used to classify households into unique groups, based on the relative annual income that households' members had realised, through their engagement in distinct portfolios of income generation activities (i.e. livelihood strategies). This was realised through the step-wise application of two clustering algorithms – agglomerative hierarchical and k-means clustering. Subsequently, we statistically described and compared the identified clusters, in terms of realised relative and absolute household income, via analyses of frequency, central tendency and spread for different income variables. Rank-based non-parametric Kruskal-Wallis H-tests, with post-hoc analysis, were used to test for statistical differences in relative and absolute annual household income, and asset holdings, across clusters.

4.2.2 Approach, methods and data in *Paper II*

Field campaign

Paper II is based on empirical research, drawing on data that was obtained during a four months long field stay in northern Morocco between March and June 2014.

This field stay was conducted with institutional support from the International Centre for Agricultural Research in Dry Areas (ICARDA) and the Centre Régional de la Recherche Agronomique de Meknès. Locally recruited field assistants facilitated and interpreted FGD and in-depths interviews with local farmers, and staff of governmental departments, for this study.

The field campaign for *Paper I* commenced similarly to that for *Paper II*. Scoping activities, including transect walks and field observations, FGD with local farmers and interviews with staff of extension services, were conducted to gain an initial understanding of agroecosystem characteristics, farming practices and rural livelihood strategies in the study area. In contrast to our field campaign for *Paper I*, however, this information was not primarily intended to deepen our basic knowledge about the studied communities, or to refine the study's main research instrument. Rather, scoping activities for *Paper II* were intended to result in a robust stratification of rural people into disparate groups of farmers, who engaged in different agricultural practices, under different contextual circumstances. That is, groups of people who engaged in similar livelihood strategies had already been defined during the scoping activities for this study. The main research activities for *Paper II* could, therefore, be directed at exploring commonalities and differences in aspirations, perceptions and knowledges about local agroecological conditions and livelihood contexts, of people within and across these initially defined groups.

Farmers' aspirations, perceptions and knowledges were explored during an iterative cycle of semi-structured in-depth interviews with respondents from the different strata. Interviewees from each stratum were selected via a non-probabilistic sampling method – snowball sampling – where interview participants were selected following referrals from other respondents or approached at their homesteads, and interviewed if they were able and willing to partake. Interviews were conducted in the local language, with the help of interpreters; and as much as possible outside, on respondents' farms or – in the case of shepherds – on commonly frequented rangelands, so that interviewees could use visual clues to emphasize their observations about local farming practices and agroecological conditions. Repeated interviews with a sub-set of respondents served to deepen the inquiry, and made it possible to capitalise on trust and initial insights, which had been gained during the first interview round.

Data analysis and triangulation

Audio recordings and written notes from completed interviews were analysed with the AKT5 software system (H. Dixon, J. W. Doores, L. Joshi, & F. L. Sinclair, 2001). I.e. respondents' knowledge and perceptions were broken down into small

units of information – unitary statements – which, together with socio-demographic information about the respective respondent, were stored in a database. This data base of formalised knowledge could then be explored with Boolean search strings, to identify themes of common or contrasting knowledge among respondent groups and to explore and visualise these themes in causal-diagrams.

Additional interviews with representatives of local governmental organisations, towards the end of the field campaign, served to obtain complementary knowledge about local policy and extension objectives. FGDs with local farmers, and a meeting with counterparts from local research organisation prior to leaving the study area, allowed us to share and triangulate our preliminary research findings.

5 Results and Contributions

5.1 Summary of Contributions

The research subjects of *Papers I* and *II* in this thesis are the livelihoods, and their interconnection with agroecosystems, of rural people from the Chin Hills in western Myanmar and Mèknes-Tafilalet Region in northern Morocco. We have explored these livelihoods and their land-system interdependencies from two different perspectives, taking a quantitative livelihoods approach and local knowledge perspective, respectively. Based on these studies, and the knowledge synthesis in this licentiate thesis, my co-authors and I make a threefold contribution to knowledge for sustainable rural development.

1. We extend the empirical knowledge base about rural livelihood strategies and their dependence on land, *vis-à-vis* other income sources in upland Myanmar (*Paper I*) and about agricultural livelihood activities, agroforestry practices, agroecosystem contexts, and perceived agroforestry adoption barriers and adaptation options, in northern Morocco (*Paper II*).
2. Further, we advance methodological knowledge for livelihoods research and practice, through a demonstration of the utility of local knowledge in climate adaptation research (*Paper II*) and through reflections about the respective strengths and blind spots of quantitative economic, and local knowledge perspectives, for the study or rural livelihoods, in *Section 5.3* of this thesis.
3. Finally, we derive agenda setting knowledge for livelihoods and rural development research and practice from reflections about the implications of empirical and methodological results of our studies, which we presented in *Papers I* and *II*.

5.2 Key Results and Empirical Contributions of Papers I and II

5.2.1 Key results and empirical contributions of *Paper I*

With this first paper in my dissertation, we aimed to expand the existing knowledge base about livelihood strategies and households' land dependence in rural South-East Asia. This knowledge base stems from decades of empirical research into the patterns, contributing factors, underlying causal mechanisms and effects of agrarian change processes on livelihoods and land-systems across the region – the findings of which have been synthesised in numerous review studies (e.g. Cramb et al., 2009; Dressler et al., 2017; van Vliet et al., 2012).

Key results

A key empirical finding of this study was, that almost all sampled households were – to a degree – land dependant, as they met a range of their basic subsistence needs, such as for food, fuel, livestock fodder or construction material from own

farming activities, or the collection of farm-tree and forest products. Yet, in terms of aggregate income across all households, the study area's rural economy was dominated by income from off-farm livelihood activities – either directly through household members' engagement in wage employment or small-scale business activities, or via remittance payments that were made by households' relatives, who engaged in international or domestic labour markets. Income from this latter category – remittance payments – made the greatest contribution to the sample's aggregate income.

Further, we established that not all studied households were equally dependant on the full range of identified household income sources in the study area. Rather, cluster analysis techniques led us to discern six household groups, who based their livelihoods on relatively distinct portfolios of income generating activities, i.e. livelihood strategies. Three of these livelihood strategies were – in relative terms – particularly dependant on income from land and natural resources, whereas the other three were oriented towards income generation from off-farm activities. These disparate dependencies of studied households on different income sources, suggests that these households are unequally vulnerable to drivers of change that influence their livelihood contexts, such as climate change, shifting land governance regimes or global labour market forces.

Finally, a quantification of households' absolute annual income per adult equivalent unit, and a comparison of median absolute income figures across household clusters, revealed a high prevalence of income poverty in the studied communities. Further, statistical tests demonstrated significant differences in the distributions of households' income poverty levels, across clusters. We found income poverty to be more prevalent among sample households who relied on land-based livelihood strategies, compared to those who engaged in off-farm oriented strategies.

Empirical contributions

The specific empirical contribution of *Paper I* to the existing literature on rural livelihoods in South-East Asia, and thus to the evidence base from which "generalized knowledge claims" (Magliocca et al., 2018, p. 3) can be derived, is twofold:

First, the study derived empirically grounded insights into livelihood strategies and households' economic dependence on land vis-à-vis other income sources, in a hitherto little studied area – Myanmar's western uplands. Thereby, *Paper I* both increased the, as yet, low abundance of studies on these two aspects of livelihood and land-system dynamics in upland Myanmar, and – taking a quantitative rather than primarily qualitative livelihoods approach – also expanded the range of

methodological approaches that have been employed to generate evidence on this subject matter. The study thus adds to the evidence base that can support generalised knowledge claims about livelihood and land-system dynamics in rural Asia, by expanding the geographic scope of conditions under which quantitative livelihood strategy assessments have been conducted (Magliocca et al., 2018), to now encompass the northern Chin Hills of Myanmar.

Secondly, this study adds to the evolving evidence base about rural Asian households' increasing engagement in off-farm wage employment, thereof resulting labour market dependencies and associated remittance flows, as contributing factors to livelihood and land-system dynamics in the region. Highlighting the substantial contribution of remittance income to the specific rural economic setting at our study site in northern Chin State, Myanmar, *Paper I* expands the foundation of academic contributions, which synthesis efforts can draw on, to substantiate knowledge claims about the link between remittance flows and contemporary rural Asian livelihood strategies and land-use practices.

5.2.2 Key results and empirical contributions of *Paper II*

Our aim with *Paper II* was to advance knowledge, for the conception and implementation of co-learning activities and rural development interventions, to reduce the climate vulnerability of dryland smallholders with tree-based adaptation options. Our empirical objective towards this end, was to extend the existing knowledge base on the opportunity space for a tree-based diversification of livelihoods and farming systems at our study site in northern Morocco. We addressed this objective via an exploration of farmers' agricultural livelihood activities, agroforestry practices, agroecosystem contexts, and perceived agroforestry adoption barriers and adaptation options; with a livelihoods research approach, which combined academic and local knowledge perspectives.

Variation in livelihood contexts

A key empirical finding of our study for *Paper II*, was that farmers' agroecosystem or greater livelihood contexts, differed substantially, even across the relatively short altitudinal gradient which characterised our study area, from the fertile floodplain west of the local town Moulay Idriss Zerhoun, into the Zerhoun massif, which characterised our study area. Our study of farmers local agroecological knowledge thus added detail to existing broader scale characterisation of farming system contexts in northern Morocco (Dixon, Gulliver, & Gibbon, 2001). Further, respondents' accounts of perceived barriers and options for the adoption of agroforestry adaptation options, on the basis of their local agroecological knowledge, implied that the fine scale variation in farming system context across

the study site, translated into disparate opportunity spaces for farmers' livelihood and land-use decision making, to address the effects of climate change, which will affect rural communities and agroecosystems, in the study area, in coming decades.

This latter finding supports Coe et al. (2014, p. 74) argument, that researchers and development practitioners will likely be unable to identify readily adoptable and scalable "silver bullet" agroforestry options, to support farmers in their climate adaptation efforts. Successful adaptation strategies will rather depend on robust knowledge about the specific "range of social, economic and ecological context[s]", which mediate individual farmers' opportunity space for livelihood and land-use decision making (Coe et al., 2014, p. 74; Thomas et al., 2018). Knowledge, that can be derived through co-learning research and extension approaches, where possible adaptation options that have initially been identified, will be iteratively developed and targeted to match the specific needs and livelihood contexts of rural people, in order to thus limit the likelihood of potentially detrimental outcomes, of farmers' adoption decisions (Coe et al., 2014, p. 75; Thomas et al., 2018).

Agroforestry practices

A second key empirical finding of our paper was that farmers across all respondent strata in the study area, already engaged in agroforestry practices and were able to share detailed local agroecological knowledge about local farm-tree species and their suitability for different site characteristics, with the research team.

These empirical findings extend the evidence base about contemporary agroforestry practices in Morocco, which remains relatively limited, except for studies of Moroccan flagship practices and farming systems, e.g. for the cultivation of olive and argan fruits, or in the country's oases regions (Daoui & Fatemi, 2014).

Adoption barriers

Finally, *Paper II* resulted in the identification of an extensive range of adoption barriers and possible entry points for the development of agroforestry intervention options, which different strata of farmers perceived to exist, across our study site. Many respondents identified water scarcity, the low profitability of their production systems and uncontrolled grazing, as substantial barriers to a tree-based diversification and adaptation of livelihoods and farming systems in Zerhoun. Efforts to improve water and soil related land-management practices, trainings to improve farmers' tree-husbandry skills, and social mediation or land-governance interventions were identified as possible entry points, and local priorities for agroforestry related rural development interventions. These findings highlight the importance of social and economic – as well as technical or environmental –

barriers to climate adaptation with agroforestry at our specific case study site in northern Morocco. In addition – similar to the findings from our case study for *Paper I* – they can be synthesised to derive generalised knowledge claims (Magliocca et al., 2018), which underlying farmers' adoption decisions, which can inform climate adaptation and rural development processes, across relevant scaling domains (Pagella, Kmoch, Leudeling, Mulia, & Sinclair, 2014; Thomas et al., 2018), in the world's drylands.

5.3 Contributions to Methodological Knowledge

5.3.1 Overview of contributions to methodological knowledge

With *Papers I* and *II*, and the synthesis of methodological insight from our studies, this thesis makes a twofold contribution to methodological knowledge, for livelihoods research and practice. First, it demonstrates the utility of local knowledge methods for climate adaptation research, in *Paper II*. Second, it discusses the merit of different livelihoods research approaches, based on reflections on the respective strengths and blind spots, of the quantitative economic and local knowledge perspectives on rural livelihoods, which we took in our studies for *Papers I* and *II*.

5.3.2 Demonstrating the utility of local knowledge in climate adaptation research

The case study of barriers and options for a tree-based adaptation of rural livelihoods and farming systems in northern Morocco, presented in *Paper II*, demonstrates that local knowledge can complement academic knowledge in at least five different ways.

First, local knowledge obtained from FGD participants and respondents in in-depths interviews with local extension agents, during the scoping stage of our field campaign, enabled us to rapidly classify rural people in the study area into different groups. That is, we used local knowledge and our academically informed judgement, to distinguish farmers who we believed to engage in different livelihood activities, drawing on different means (i.e. livelihood assets and claims) and who we therefore anticipated to command over different knowledge, about livelihoods, livelihood contexts, and agroforestry adoption barriers and opportunities across our study site. The function of local knowledge, in this case, was to fill-in an academic knowledge gap about different livelihood strategies, in the specific context of our study area.

Second, drawing on farmers' local knowledge enabled us to add rich detail to existing, broader-scale characterisations of farming systems and livelihood contexts

in northern Morocco. It is this fine-scaled knowledge of contextual variation that rural development stakeholders require, to understand, which climate adaptation options may be most suitable for which specific farmers, in particular circumstances. An understanding which is crucial both for efforts seeking to adapt known climate adaptation options to specific local contexts and for those seeking to scale locally developed options, across broader scaling domains.

Third, we used farmers' local knowledge to rapidly address an academic knowledge gap about locally suitable tree species, and existing land-use – particularly agroforestry – practices, across the study site, capitalising on both farmers' local classification of tree species and site characteristics, as well as, their practical experiences with tree and crop husbandry in the area.

Fourth, local knowledge methods allowed us to gain knowledge about commonalities and disparities in respondent strata's perceptions about barriers, opportunities and desirability of the maintenance and diversification of trees on their farms. Such knowledge is crucial to unravel and comprehend the tension between farmers livelihoods (activities, assets and claims), livelihood contexts, and livelihood and land-use aspirations: i.e., the underlying causal mechanisms, that determine farmers (non-)adoption of specific climate adaptation options, and thus, the success of respective livelihood adaptation interventions.

Finally, we also drew on local knowledge to explore farmers' ideas about entry-points, for the development of locally suitable agroforestry adaptation options and perceived priorities, for farming related extension and innovation priorities. Methods to gain such knowledge of farmers' perceptions of possible adaptation options and extension priorities are required to meet aspirations for participatory co-creation processes, which develop "agroecological innovations to address challenges across food systems including adaptation to climate change" (Food and Agriculture Organisation of the United Nations, 2018, p. 4).

Our findings in *Paper II*, thus support the position that local knowledge and local knowledge research methods hold great potential for research and rural development efforts that seek to address the vulnerabilities of rural people in the contemporary context of global change (Berkes et al., 2000; Chambers, 1993, 2007; Coe et al., 2014; Rounsevell et al., 2012; Warburton & Martin, 1999).

5.3.3 Contrasting quantitative economic, and local knowledge perspectives on rural livelihoods

By way of contrasting our methodological approaches used in the case studies underlying *Papers I* and *II* in this thesis, I can derive methodological knowledge

about the respective strengths and blind spots of quantitative economic, and local knowledge perspectives on rural livelihoods.

A quantitative, economic perspective on rural livelihoods

In our study for *Paper I*, we conceptualised – in operational terms – rural livelihood strategies, as the portfolios of the relative magnitude of households' income streams from different income generation activities, over the course of a 12 months period. Once we had established this conceptualisation, we set out to enumerate – i.e. as far as possible objectively measure, in a positivist research tradition (Bryman, 2016) – these income portfolios. To explore and analyse this data, we relied on statistical clustering algorithms. First, we identify groups of households with similar income portfolios, i.e. livelihood strategies. Then, we relied on a mathematical criterion – the minimised sum of squared distances between data points and cluster centres; and our judgement of the utility of the derived cluster solution for the interpretation of our data, to determine the final set of household livelihood strategies, which we distinguished. We also relied on our own judgement and grasp of households' livelihood contexts, to discuss the implications of household groups' engagement in different livelihood strategies, for their vulnerabilities to climate change, shifting land-governance regimes, and (inter)national labour markets.

This approach to livelihood research was intensive, in terms of financial and time resources needed to obtain, pre-process and analyse the data for *Paper I*. What we derived from the research, was a very detailed, but narrow "outside perspective" on our study object – the rural livelihoods of households in our four study villages. A drawback of this research approach, however, was that our main research instrument – a mostly quantitative household survey – was little suited to derive knowledge about respondents' perceptions and understandings of their own, or other households' livelihood strategies and vulnerabilities. We partially addressed this shortcoming, by complementing the main survey instrument for this study with additional means of enquiry, including key informant interviews, FGDs and informal interviews with survey respondents, as discussed in *Section 4.2.1*.

A local knowledge perspective on rural livelihoods

Contrasting this research approach for *Paper I* with our approach to the study for *Paper II*, it becomes clear that with the latter, we derived a perspective that is akin more to "a look over respondents' shoulders" than an "outside perspective", on rural livelihoods. The local knowledge research approach and methods (H. Dixon, J. W. Doores, L. Joshi, & F. Sinclair, 2001), which we relied on for this study, combine – in my eyes – aspects of the positivist research tradition, which is often

associated with the natural sciences, with those of the interpretivist research tradition, which is more common in the social sciences (Bryman, 2016).

On one hand we set out to elicit farmers local agroecological knowledge about, *inter-alia*, their livelihood and farming system contexts. Here the word elicit implies the ambition to derive causal knowledge statements, which can be generalised to other contexts, although the software – which was used to translate respondents' knowledge statements during interviews, into unitary knowledge statement, which are stored in a data base – allows for the qualification of causal knowledge statements, to account for enabling or disabling conditions (H. Dixon, J. W. Doores, L. Joshi, & F. Sinclair, 2001).

On the other hand, we relied on the same methodology to derive and systematise knowledge about, *inter alia*, respondents' perceptions about barriers and options for the maintenance and diversification of trees on their farms. Yet, the local knowledge and perceptions that we derived in this respect was not solely about relatively stable patterns of ecological process, but just as much about socio-economic mechanism that underlie farmers' adoption decisions. Respondents knowledge about the conjunction of socio-economic and biophysical elements to adoption barriers, should here – in my eyes – therefore be understood as necessarily interpretive; so that it is no longer simple to clearly distinguish, which knowledge elements have been "objectively elicited", as opposed to "subjectively derived" or even "created" through the interview process in the field.

Contrasting disparate perspectives on rural livelihoods

A strength of this research approach, then, was that it allowed us to obtain a blend of more objective, as well as interpretive knowledge about rural livelihoods; if not from respondents "inside" perspective, than at least from a perspective resulting from the attempt to align with respondents "line of sight" – hence the "looking over respondents' shoulder" metaphor. Further, this research approach was less resource intensive, than that we employed in our study for *Paper I*. Yet, possible blind spots of the local knowledge approach, which we took in the study for *Paper II*, arise from the comparatively less narrow and systematic data collection process that we engaged in, in this case.

The semi-structured format of our local knowledge interviews, on one hand allowed the respondents to influence the direction of the conversation, and thus direct attention to respondents' very own interpretations of key elements of their livelihoods and livelihood context, or priorities for rural development interventions. This can be an advantage – helping to avoid the potential pitfall of losing focus, in attempting to study the entire complexity of rural livelihoods, and

may mean that the derived academic conceptions of respondents' livelihoods are akin more to respondents' self-conception.

On the other hand, this interview format meant that we did not systematically address all possible aspects, including, *inter alia*, off-farm oriented livelihood activities of income sources, e.g. from remittances or wage employment, of our respondents. Other than in our study for *Paper I*, we can therefore not be sure weather, and to what degree, we may have overlooked the possible effects of such activities or income sources on respondents' livelihoods, livelihood contexts and aspirations and thus in turn, the causal-mechanisms underlying farmers' land-use decision making. Certain results that we present in *Paper II* – e.g. shepherds account of farmers' neglecting the management of their tree stands; or accounts of an increasing need for rural off-farm employment and outmigration of the local youth to Europe – at least warrant a base for speculations about possible effects of such livelihood aspects.

Yet, survey-derived livelihood strategy classifications – such as that, which we have presented in *Paper I* – are also not unambiguous. Research conducted in association with the PEN studies (Arild Angelsen, Helle Overgaard Larsen, Jens Friis Lund, Carsten Smith-Hall, & Sven Wunder, 2011), has demonstrated that different levels of dis-aggregation of income categories, in the enumeration of household income portfolios can result in substantially different findings about the relative magnitude of the contribution of different income generation activities, to households' income portfolios and thus potentially influence thereupon developed classifications of livelihood strategies.

A comparison of the livelihood strategies, which we identified in *Paper I*, with those found by Pritchard et al. (2017) in southern Chin State, further suggests that differences in the livelihood research approaches may have led to divergent findings about the importance of household income from remittances, in the two studies. Taking an income accounting approach, we found remittances to constitute the greatest relative income share in the income portfolios of many of our study households. We therefore distinguished a cluster of households, which engaged in a primarily remittance-oriented livelihood strategy. Pritchard et al. (2017), in contrast, asked their survey respondents to identify the two primary occupational activities of their households' members, during the previous three months. Thus, they based their livelihood classification on household members' most time intensive, rather than remunerative livelihood activities (Pritchard et al., 2017), which is one possible explanation for the discrepancy of our findings.

Implications

The implication arising from this reflection on the relative strengths and blind spots of our contrasting approaches to livelihoods research in *Paper I* and *II* – in my eyes – is not that either of them is more or less rigorous or valid. Rather, each approach serves as a different lens or means to obtain necessarily partial knowledge about the complexity of contemporary rural livelihoods. They can thus either be employed or disregarded, according to the specific objectives, available resources and contextual circumstances of any specific research project, which aims to unveil the causal-mechanisms (Mingers & Standing, 2017) underlying rural livelihood and agroecosystem dynamics.

6 Conclusions and Outlook

6.1 Conclusions

My objectives with the interdisciplinary, mixed-methods research in this thesis were to extend the empirical and methodological knowledge base that rural development stakeholders can draw from, to inform their practical and policy work. I addressed these objectives via research into the livelihoods of rural people, and their interdependencies with agroecosystems at two field sites in Myanmar and Morocco, respectively.

My field work for *Paper I* relied primarily on a cross-sectional household survey, which, *inter alia*, captured data about the income portfolios of rural households from four case study villages. The application of cluster analysis techniques to this data, revealed that households in this study area engaged in six relatively distinct livelihood strategies, which differed substantially, with respect to their reliance on land vis-à-vis off-farm oriented income generation opportunities, and in terms of their income-poverty implications.

The primary contribution of this study, therefor lies in the extension of empirical knowledge about the contemporary state of rural livelihoods, and associated vulnerabilities of rural upland households, in Myanmar.

My field work for *Paper II* was based on a local knowledge approach to rural livelihoods research. I conducted in-depth, local knowledge interviews with rural farmers from five different strata, to explore the utility of respondents' local ecological knowledge, for the conception of tree-based options to address the vulnerabilities of rural people and their farming systems, in northern Morocco. Analysis of my data revealed, that respondents commanded over detailed knowledge about their farming practices, the fine-scaled variation of their livelihood contexts, and thereof arising context-specific barriers to an agroforestry-based adaptation of their production systems to climate change impacts.

The primary contribution of this study, therefore lies in demonstrating the utility of integrating rural peoples' local knowledge, in climate adaptation and rural development research. The study further extends empirical knowledge about rural livelihoods, livelihood contexts and rural peoples' aspirations and priorities for agroforestry related development interventions, in northern Morocco.

Brought together, both papers extend the contemporary empirical knowledge base about the livelihoods, livelihood contexts, vulnerabilities and aspirations of rural people in western Myanmar and northern Morocco. They also point to

opportunities for the integration of local and academic knowledge in rural development and climate adaptation research. Thus, they contribute to the understanding and co-creation of viable rural livelihood options for people in the Global South, in line with my overarching research aim.

6.2 Outlook

The research, presented in this thesis, extends empirical knowledge about contemporary rural livelihoods in western Myanmar and northern Morocco, and contributes to methodological learning for rural development research and practice. But it also raises new empirical research questions, about possible futures for rural agrarian households and their farming systems, given their differentiated vulnerabilities to contemporary global change impacts.

These questions, *inter alia*, pertain to: (i) possible development interventions, which build on rural households' existing land-use practices, to improve the profitability of these households' land-based livelihood activities; and (ii) possible detrimental impacts of global change process, such as extreme weather events, changing climate patterns or shifting land-tenure regimes, on rural households' livelihoods, and (iii) possible development interventions to mediate such impacts. These are, therefore, some of the empirical research questions that I plan to address, during the remainder of my PhD studies.

I will do so, on the basis of empirical data from two field research campaigns in southern Shan State and northern Chin State, which I have recently completed in collaboration with two Myanmar based non-governmental organisations. With this work, I further strive to continue to extend methodological knowledge for rural development, based on the integration of data from cross-sectional household surveys, in-depths interviews, and participatory causal-loop diagramming during my recently completed field campaigns.

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