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Pro-poor Resource Governance under Changing Climates

Addressing vulnerabilities in rural Bangladesh, Bolivia, Brazil, Burkina Faso, Ecuador and India

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Enabling poor rural people to overcome poverty

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Executive Summary

It is now widely known that the natural resources and livelihoods of rural poor people are under increasing pressure. Growing demand for natural resources as well as ongoing and projected climatic changes indicate the necessity for developing and discussing adaptation strategies. This context has contributed to locating the topic of resource governance at the forefront of development agendas. A dynamic debate on governance, and more precisely on pro-poor resource governance, has been triggered.

From 2012 to 2013 the Institute for Advanced Sustainability Studies (IASS) and the International Fund for Agricultural Development (IFAD) committed to a research initiative entitled 'Pro-Poor Resource Governance under Changing Climates' (ProPoorGov), with two main objectives:

- To better understand how vulnerability stems from historically interrelated social and environmental factors;

- To strengthen the link between local and higher levels of policy-making.

IASS and IFAD collaborated with local civil society organisations (CSOs) in six countries: Bangladesh, Bolivia, Brazil, Burkina Faso, Ecuador, and India. Seven case studies were jointly elaborated following a transdisciplinary approach, i.e., a problem-related combination of scientific knowledge with practical knowledge, involving partners from science, practice, civil society and policy. The studies document, analyse and communicate cases of pro-poor resource governance. They address how resource governance determines some of the factors that generate livelihood vulnerability and show to what extent changed institutions affect livelihoods, making them vulnerable to external changes originating in climatic and non-climatic processes.

ProPoorGov has reached four core results:

1st: Climate change vulnerability is influenced by environmental as well as social factors related to how resources are governed.

2nd: Technological solutions adapted to smallholder farmers can improve the livelihoods of poor rural people, but as they are deeply embedded in history and politics, they face significant barriers to scaling up at the local governance level.

3rd: Recognition of community rights, including common property institutions, is an avenue for reducing the vulnerability of poor rural populations. However, if this is not accompanied by other supportive measures, these rights may not be able to initiate a comprehensive development process that ends poverty.

4th: Pro-poor adaptation can imply the redefinition of rights to resources and these processes are manifestly political. In order to reduce vulnerability, resource governance reforms have to consider how poor rural groups interact within those political processes, i.e., to what extent they are represented in and incorporated into decision-making. This leads to a number of conclusions as to how resource governance can be improved through collaboration with local CSOs, namely:

- Poorer actors' bargaining power can be reinforced by promoting collective action capabilities in order to better react to economic and environmental pressures.

- In some problematic cases of resource governance, it can be promising to include multiple actors in a participatory and inclusive deliberative process.

- Tried and tested adaptation measures used traditionally by communities can be supplemented, for example by technological innovation.

- Structural transformations, such as those required by climate change adaptation, call for long-term approaches, i.e., thinking more in terms of generations than in short-term project cycles. Such long-term perspectives usually imply continuous political and financial commitments, which entail the possibility of using public funds.

The multidimensionality of vulnerability requires comprehensive and integrated approaches that build on favourable existing structures. These imply, for example, working with pro-poor CSOs that know the local context, and determining how to address hindrances to pro-poor development.

This publication presents the main results of ProPoorGov and is structured as follows:

Table 1

Overview: structure and content of the publication

Chapter	Title	Content
1	Introduction: Pro-Poor Resource Governance under Changing Climates	Introduces the context of ProPoorGov, partner organisations, research methods and the cases
2	Environmental and Social Vulnerabilities of the Poor under Climate Change Conditions: The *Char* Lands in Bangladesh	Discusses how socially vulnerable people have to settle in newly accreted coastal lands that are highly exposed to environmental hazards and a violent regime when they want to acquire new land. A large project provides infrastructure and land titles.
3	Food Security, Agroecology and the Roadmap to Sustainable Development in Brazil's Semi-arid Region	Discusses how forms of adaptation and strategies for reducing livelihood vulnerability based on 'Coexistence with the Semi-arid Region' discourses in the Brazilian Northeast
4	Alternatives for the Sustainable Development of Alto Beni, Bolivia	Discusses agroforestry systems as an appropriate alternative to Alto Beni's agroecosystem, its relation to vulnerability reduction and the barriers to its widespread adoption
5	Community-based Management of Common Land in Southern Rajasthan, India	Discusses the (re-)establishment of common lands by rural communities to support livelihoods and increase resilience to climate change
6	Resource Governance in Lomerío, Bolivia: Indigenous Territory Management in the Context of an Expanding Primary Sector	Provides a historical account of the creation of the Indigenous Territory of Lomerío, how this process strengthened social organisation and secured livelihoods
7	Addressing Conflicts in a Pastoral Zone under Resource Pressure in Samorogouan, Burkina Faso	Discusses the case of a pastoral zone where natural resources are increasingly degraded and agricultural and pastoral resource users have conflicting claims
8	Natural Resource Governance in the Indigenous Territories of theImbabura Andean Region, Ecuador	Discusses how secure land tenure can assist in reducing vulnerability and overcome structural marginalisation by analysing the cases of three communities in the Andean region of Imbabura
9	Climate Change Impacts, Institutional Resilience and Livelihood Vulnerability: A Comparative Analysis of Climate Change and Adaptation Strategies in Asia, Africa and Latin America	Compares the seven case studies through the lens of Institutional Theory, focusing on adaptation options without disregarding political and property rights issues
10	Conclusion: Advancing Pro-Poor Resource Governance	Presents four core results of ProPoorGov and policy implications for advancing pro-poor governance

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Chapter 1
Introduction: Pro-Poor Resource Governance under Changing Climates

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1.1 Introduction: the context of pro-poor resource governance

1.1.1 Natural resources and livelihoods under pressure

It is now widely known that natural resources are under increasing pressure. Recent studies have indicated that certain planetary boundaries, defined as the ecological limits of a "safe operating space" for humanity, have already been crossed (Rockström et al. 2009). The media and society in general have taken up the issue of the overuse and degradation of natural resources, raising our awareness about how they change the lives of the vast majority of humans, in particular vulnerable populations.

Several tendencies can be identified as sources of this rising pressure on natural resources. Increased demand for food, feed, fibre and fuel due to continued population growth and changing consumption and production patterns are some of the most important factors (FAO 2011). The world food price crisis of 2007–2008 and the political and economic turmoil it brought, revealed the imbalances in the world´s food systems. Furthermore, although changes in climate patterns do not necessarily threaten the natural resource base and may, in principle, generate opportunities for rural people in particular contexts and situations, climate change is expected to have a detrimental effect on many social-ecological systems.

The rural poor are most vulnerable to the ongoing changes. Even though they have always been susceptible to social and environmental changes, rising pressure on resources makes their livelihoods even more vulnerable. This is not only because poor rural communities are highly dependent on natural resources for their livelihoods, but also because the most profound impacts of climate change are projected for the coming decades. The natural resource base is vital to the livelihoods of many rural people, and the agricultural productivity of smallholders depends on well-functioning ecosystems (IFAD and UNEP 2013). To take examples from this study: the indigenous community of Lomerío in eastern Bolivia relies almost exclusively on the management of forest resources as a source of income. In the coastal areas of Bangladesh, smallholder agriculture is highly susceptible to frequent natural hazards such as hurricanes and tidal waves, which disrupt ecosystems and put many livelihoods at risk. And in north-eastern Brazil, rain-fed smallholder family farming is frequently affected by irregular drought cycles, which in most cases lead to severe crop losses and increase food insecurity.

These cases, as well as innumerable others around the world, highlight the necessity of developing and discussing strategies for adapting to changing environments, particularly for the rural poor. Rural communities have historically adapted their livelihoods to numerous changes, for instance, by using different crops depending on climate variability or by migrating when the natural resource base became too degraded. Institutions – understood here as formal and non-formal societal regulations, rules, norms, and cultural practices – are key to understanding how communities react to these changes. Rural people can adapt not only by changing their livelihood strategies, but also by altering the ownership and tenure of and the access to natural resources: a process usually labelled *institutional change* (Ostrom 2005).

More specifically in the case of climatic changes, the need to develop adaptation strategies has been discussed from a variety of angles and perspectives. Much research dedicated to understanding the risks, insecurity and vulnerability associated with climate change focuses on impact and vulnerability assessments based on models and scenario design (Moss et al. 2010). By undertaking integrated assessments, in some cases on a global scale, modellers have addressed physical and environmental factors, which when combined with the human dimension, determine how countries or regions are and will be more exposed to certain climate hazards (Yohe et al. 2006).

Moreover, in assessing options for adapting to climate change in the agricultural sector, many studies have focused on technical solutions. These entail, for instance, improvements to crop varieties, more climate-resilient agricultural practices, as well as policies that could enable farmers to adopt those practices. These developments have been incorporated into the debate on climate-smart agriculture (IFAD 2012). Among others, managing climate risks has also been addressed through the development of more locally precise weather forecasting, accessible climate services and tailor-made insurance mechanisms (Vermeulen et al. 2012).

Other scholars consider adaptation to be the result of social interactions and analyse how the ability for collective action could help to increase people's adaptive capacity in certain situations. Particularly in cases where rural communities rely on the management of natural resources, this research suggests that the strengthening of governance systems based on collective action, such as institutions for governing commons, could be an avenue to reducing the vulnerability of marginal populations (Adger 2003, Agrawal 2010).

In a similar vein, but with more emphasis on justice and the inequitably distributed consequences of climate change, some scholars have been arguing that the fundamental sources of vulnerability should be tackled when advancing adaptation (Ribot 2010, 2011). In the context of communities that depend on natural resources, this means that equal rights to resources would need to be secured, improving access and tenure security with regard to land and associated natural resources.

This dynamic debate is also reflected in reports published by the International Panel on Climate Change (IPCC), which show an evolving understanding of this issue. The Fifth Assessment Report (AR5) recently released by Working Group II, for instance, devotes greater attention to factors that suggest that differences in vulnerability are shaped by multidimensional inequalities (IPCC 2014). In other words, compared to the previous report of 2007, the AR5 acknowledges more explicitly that differences in socio-economic status explain a great deal of the greater vulnerability observed in some groups such as poor rural people.

1.1.2 Advancing pro-poor governance

In the light of rising pressure on natural resources and the livelihoods of poor rural people, the issue of resource governance has gained prominence in many international debates. Land tenure, in particular, has re-emerged at the core of the rural development agenda (Cotula et al. 2010, Peters 2013). A resource in and of itself, land is usually associated with other natural resources that may form part of a given territory. Land is key because other natural resources (e.g. water, forests, pastures, wildlife, etc.) are usually accessed through land.

Against this backdrop, a dynamic and broader debate on governance (Palmer et al. 2009), and, more precisely, on what defines and how to attain pro-poor resource governance (Mann and Smaller 2010, Zoomers 2011), has been triggered. In this study, pro-poor governance is defined as those systems that either directly involve poor people in the decision-making processes of governance or systems designed by the poor themselves. In this understanding, both should lead to outcomes that favour the poor (Borras and Franco 2010, Johnson and Start 2001). It is therefore necessary to acknowledge the social relations that permeate the negotiations between the poor and other groups, as well as their historical perspectives and political angles.

PRO-POOR GOVERNANCE

Governance systems that either directly involve poor people in the decision-making processes of governance or systems designed by the poor themselves, which lead to outcomes that favour the poor.

Box 1

Source: authors, based on Borras and Franco (2010) and Johnson and Start (2001)

Several important initiatives aimed at pro-poor resource governance have been evolving in the political landscape in recent years, at international, regional and national levels.[1] In Bolivia, for example, a long history of power disputes influenced by agrarian reform movements and indigenous claims to land has advanced legislation aimed at securing communal lands and their associated resources (Bottazzi and Rist 2012). Similar processes geared towards strengthening communal and indigenous territoriality have recently been under way in Ecuador, although in this case, progress has been much less evident (FIAN International 2014). In India, too, an important law recognising the land rights of forest-dwelling communities was approved in 2006. The so-called Forest Rights Act broadly recognised rights and empowered people to manage lands (Gopalakrishnan 2012).

However, these rights often continue to be largely ignored and their implementation has been severely flawed (Council for Social Development 2010). The example of India illustrates the common experience that even when progress in advancing legislation is evident, severe rights violations still occur on a daily basis, as reported by many organisations working on land and natural resources (e.g., Farmlandgrab 2014). The key question remains: how are these regulations put into practice? Access to land and security of tenure are certainly influenced by institutions, but rules alone do not define who wins the game. The conditions under which rules are put into practice are subject to several constraints, including government performance, information asymmetries, and power imbalances. As a result, it is not rare to find blatant gaps between legislation and implementation, raising serious doubts regarding the real capacity of legislation to change social practice (Bardhan 2000). It seems more appropriate to ask who has sufficient bargaining power to structure access to resources and establish institutions for their benefit.

[1] *At international level, some very relevant examples are the* Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security – *the VGGTs – and the* Principles for Responsible Investment in Agriculture and Food Systems – *the CFS-RAI Principles – both endorsed by the Committee on World Food Security (CFS). At regional level, one example is the* Framework and Guideline (F&G) on Land Policy in Africa, *which was developed under the leadership of the African Union Commission (AUC), the African Development Bank (AfDB), and the UN Economic Commission for Africa (UNECA).*

1.2 The Study: Pro-Poor Resource Governance under Changing Climates

In the light of the pressure on resources and livelihoods and the development of pro-poor governance, the Institute for Advanced Sustainability Studies (IASS) and the International Fund for Agricultural Development (IFAD) embarked on a research initiative titled "Pro-poor Resource Governance under Changing Climates" (ProPoorGov) in the period from 2012 to 2013.

The initiative had two main objectives:

- On the content side, to better understand how vulnerability stems from historically interrelated social and environmental factors. It approaches this subject from a governance perspective, focusing on those institutions and structural factors that determine how natural resources are viewed, accessed, managed and used. In some cases, emphasis is placed on the analysis of ongoing coping and adaptation options and the structures that hamper their implementation. Acknowledging the heterogeneity of poor rural groups, the study describes and analyses the power relations found in the different social settings.

- On the policy side, to strengthen the link between local and higher levels of policy-making.

To this end, the IASS and IFAD collaborated with local civil society organisations (CSOs) in six countries: Bangladesh, Bolivia, Brazil, Burkina Faso, Ecuador, and India. Seven case studies were jointly elaborated to document, analyse and communicate cases of pro-poor resource governance. They explore how resource governance determines some of the factors behind livelihood vulnerability and ask to what extent changed institutions affect livelihoods, making them vulnerable to external changes that originate in climatic and non-climatic processes. The latter include social, political, economic and various environmental changes.

The present study is structured as follows: the continuation of this initial chapter presents the rationale for working with CSOs (2.1), the main implementation steps and methods (2.2), and the purpose of linking different levels of policy-making (2.3). This chapter also contains summaries of all the case studies (3). Chapters two to eight, which were written jointly by the CSOs and the IASS, present the individual case studies in detail. All of these chapters follow a similar structure (see table 2). Chapter 9 analyses the case studies from the perspective of Institutional Theory. Chapter 10 concludes the publication by synthesising the core results and highlighting policy implications with a view to pro-poor resource governance.

Table 1

Structure of chapters 2 – 8

Section	Description
1. Introduction	Sets the stage
2. Social and environmental changes	Presents major social and environmental changes (including climatic changes)
3. Current adaptations	Describes currently available options for adapting to those changes
4. Discussion	Discusses possible future adaptation strategies and policy implications
5. Conclusion	Synthesises the main lessons learned from the cases

1.2.1 Collaborating with local civil society organisations

A better understanding of the processes that generate vulnerability and strategies to counteract them can benefit from the engagement of local and international organisations in partnerships that are as horizontal as possible. This co-production of knowledge with local CSOs is based on three assumptions:

Assumption 1: Part of the implementation gap of pro-poor resource policies can be explained by discontinuities between local and global actors and scales of governance. In particular, more knowledge is needed on the role bargaining power plays in defining which rules are followed and which ones are disregarded at local level. This knowledge, even when it exists, is often not taken into account in decision-making arenas at national and international level (Haller 2010, Haller et al. 2013).

Assumption 2: Local CSOs have been trying out different strategies to advance pro-poor governance. By working closely with poor rural groups, local CSOs are in a good position when it comes to understanding the local context and factors that might be hindering the implementation of pro-poor policies (Frase et al. 2006, Pokorny et al. 2004). CSOs know local actors, their organisations and formal and informal institutions. More importantly, by pursuing a local political agenda and actively engaging in political processes, CSOs have first-hand experience of power disputes, which gives them insights into the bargaining power of different actors groups.

Assumption 3: Local CSOs are therefore in a privileged position to interlink the different levels of policy-making. The disconnection between legislation and enforcement is not only due to local dynamics that impede implementation, but also to policies that do not fully incorporate local views. CSOs´ rootedness in their respective localities not only means that they have a better understanding of the context than external observers; they also have a better understanding of how to operate in these contexts. Furthermore, contrary to short-term projects, the engagement of CSOs in their localities is long-term. In other words, CSOs may not just know why pro-poor policies are not being implemented; they many also have concrete ideas about how to overcome this state of affairs. Therefore, building knowledge bridges between grassroots levels and international arenas can be extremely useful in advancing better resource governance.

Project Partners: local civil society organisations

Country	Name	Description
Bangladesh	BRAC	A development organisation dedicated to alleviating poverty by empowering the poor
Bolivia 1	Fundación Tierra	An NGO dedicated to developing and lobbying for proposals for the rural sustainable development of indigenous and peasant groups
Bolivia 2	CDE, Faculty of Agronomy/UMSA and Fundación PIAF-El Ceibo	An interdisciplinary research centre at the University of Bern, Switzerland. It has been collaborating with the Faculty of Agronomy of Universidad Mayor San Andrés and Fundación Piaf, a non-profit organisation serving the needs of local cocoa farmers and their families
Brazil	PATAC	A CSO promoting sustainable rural development by strengthening family farming in the Brazilian Semi-arid
Burkina Faso	GRAF	A non-profit organisation and network working on the governance of natural resources, especially land issues
Ecuador	SIPAE	An action-research network working on agrarian policies, food sovereignty and collective economic, social, cultural and labour rights
India	Seva Mandir	An NGO working with the rural, predominantly tribal population in Southern Rajasthan, focusing on collective action

Table 2

Source: the authors' field data and the organisations' websites. A more detailed description of the project partners can be found in Annex 1.

1.2.2 Methods: co-producing knowledge through transdisciplinarity

The contribution of disciplinary science to comprehensive and interconnected challenges such as understanding the origins of vulnerability is limited (Gibbons et al. 1994). Therefore, in recent years there have been calls to supplement the way science is done: instead of just science *for* society, science *with* society has increasingly been called for. Among other approaches, this idea has been elaborated in transdisciplinarity (Hirsch Hadorn et al. 2008). In this study, this term denotes the problem-oriented combination of scientific knowledge with practical knowledge. Transdisciplinary research thus involves partners from science, society, and policy from the outset, i.e. when deciding on research questions and methods, and it aims to co-generate knowledge on the challenges of sustainable development (Lang et al. 2012).

Documenting the knowledge held by CSOs is certainly not a new approach. Researchers frequently collaborate with CSOs to document and analyse part of their work, and these efforts have certainly yielded valuable insights. Nevertheless, such documentation is often steered by researchers, who tend to only consult with CSOs rather than effectively involving them in the research process. While it has some advantages, this approach carries the risk of posing research questions that are pre-defined by certain research agenda or theories, and may lead to findings that may not reflect local contexts and the perceptions of local actors appropriately. By contrast, ProPoorGov involved CSOs in all steps of the research process, from problem identification to the collection, analysis and discussion of data (Rosendahl et al. 2014).

Box 2

Source: authors, based on Hirsch Hadorn et al. (2008) and Lang et al. (2012)

TRANSDISCIPLINARY RESEARCH

Transdisciplinarity denotes the problem-oriented combination of scientific knowledge with practical knowledge. It involves partners from science, society, and policy from the outset of research and aims to co-generate knowledge related to sustainable development challenges.

The implementation of the project can be subdivided into seven main steps. With the exception of the first step, all of them were taken in close collaboration with the CSOs:

i) Identifying partner organisations;
ii) Identifying cases;
iii) Formulating case-specific research questions and boundaries of the cases;
iv) Choosing analytical frameworks;
v) Collecting data;
vi) Elaborating analysis (seven case studies and synthesis analysis);
vii) Discussing and communicating results.

Firstly, guidelines for the selection of partner organisations (phase i) were elaborated by the IASS in consultation with IFAD. Other contacts were also established with persons known from past research experiences. We made clear that the selection guidelines should be interpreted loosely in exploring cases and partners. Partnerships were established after consultations with potential research partners.

For the selection of case studies (phase ii), guidelines served to locate the selected case within the wider topic of research. Those guidelines were presented to, and discussed with, the CSOs. A very high degree of flexibility was adopted; different potential case studies were jointly discussed, leaving the ultimate decision to the local CSOs. This deliberative mode of negotiating furthered a shared and context-sensitive understanding of problems and potential solutions.

The formulation of the research questions that set the boundaries of each case (phase iii) was a key activity. Research staff met with the CSOs in their localities, visited the case study areas and held several rounds of dialogue with the respective organisations in order to reach a consensus on the research questions. Given the plurality of contexts, a set of four topical issues (Box 3) to be covered allowed for some degree of comparability between the case studies.

Box 3

CASE STUDY TOPICAL ISSUES

i) What are the current resource use patterns?

ii) What is (are) peoples' perception(s) of the influence of resource use patterns on livelihoods? How do these differ from one group to another?

iii) What is the natural resource governance regime that underpins resource use patterns? How has this been evolving in recent history?

iv) What capacity do poor rural people have to adapt their livelihoods to changing environments (socio-economic and physical changes, including climate)? By changing resource governance regimes or by other means?

The analytical framework (phase iv) consisted of two tools: i) an adapted Institutional Change Framework based on New Institutionalism in social anthropology (Haller 2010), which was complemented by elements of the ii) Sustainable Livelihoods Framework – SLF (Scoones 1998). While the Institutional Change Framework explores the changes people face from historical, power and tenure perspectives, the SLF balances this by deepening the analysis of individual livelihood strategies. In the cases of Brazil and Bangladesh, CSOs opted to use also other analytical tools with a theoretical basis they were more familiar with. In the remaining cases, the frameworks proposed by the researchers were used in order to ensure a higher level of comparability across the case studies.

It was jointly decided that both researchers and CSOs would participate in data collection (phase v). In all six countries, a combination of quantitative and qualitative approaches to data collection was used, tapping into primary as well as secondary sources, as reproduced in table 2. Additionally, reports on regional climate change projections were elaborated for South America, West Africa and Southern Asia by climate scientists from the respective regions (Alves 2013, Sylla 2013, Vidyunmala 2013).

Data collection procedures

Country	Study sites	Description
Bangladesh	7 *char* lands of the Noakhali District	Collection of climate records and household data, interviews, focus group discussions, participatory observation
Bolivia, Lomerío	6 communities of the Lomerío territory	Collection of climate records and household data, interviews, focus group discussions, participatory observation, participatory mapping
Bolivia, Alto Beni	2 municipalities	Collection of climate records and household data, interviews, focus group discussions, participatory observation
Brazil	2 communities in the territory of Cariri, Seridó and Curimataú, 1 local network of family farmers	Collection of climate records and household data, interviews, focus group discussions, participatory observation
Burkina Faso	16 villages and hamlets in and around the pastoral zone of Samorogouan	Collection of regional socio-economic data, focus group discussions, interviews
Ecuador	3 communities in the Andean region of Imbabura province	Collection of climate records and household data, interviews, focus group discussions, participatory observation, participatory mapping
India	8 villages in Southern Rajasthan	Collection of household data, land records and legal documents, interviews, focus group discussions and participatory mapping

Table 3

Source: authors and case study reports. A more detailed description of the data collection is reproduced in Annex 2.

The analysis (phase vi) was also a joint exercise shared between CSOs and IASS researchers. The teams engaged in substantial dialogues and in an iterative process to elaborate two main products: individual case study reports, which were coordinated by the respective CSOs, and the present final publication.

Documentation and analysis took place in tandem with the communication and discussion of the research (phase vii). At first, (sub-)regional and/or national workshops were held for a wide range of participants: local administrative staff, decision-makers from different government levels, development workers, journalists, and representatives of other civil society organisations. These workshops served not only as opportunities to present and discuss results, but also helped to build bridges between CSOs and decision-makers. Secondly, a final workshop was held at the IFAD headquarters with all the CSOs and other invited stakeholders. This workshop presented and discussed the core results, compared the different cases, and facilitated interaction among the CSOs and between the CSOs and IFAD staff.

1.2.3 Strengthening the capacity of local CSOs by linking it to policy

As mentioned above, one of the goals of ProPoorGov was to link local experiences to policy arenas, thus contributing to the empowerment of partner CSOs. This was achieved in several different ways. Firstly, the project provided financial resources that allowed the CSOs to systematically document and analyse their experiences. This increased their knowledge base, which can be beneficial for future advocacy work. Secondly, it also increased the CSOs' visibility, for example, through the media coverage of events organised within the framework of the project, such as the national workshops. Thirdly, these workshops contributed to an increased reputation of CSOs in the eyes of decision makers. The former frequently remarked that they found the study very useful and acknowledged the role of CSOs in policy design. Some decision-makers also indicated that their view of CSOs had changed from rather disturbing organisations to real contributors to the design of public policies. Fourthly, particularly during the concluding workshop, CSOs were able to establish links not only to other organisations working on similar issues or in similar conditions, but also to IFAD staff. On the basis of these contacts, they made plans for future collaborations, such as the involvement of local organisations in IFAD-funded projects in their localities or joint research projects. Lastly, the project had a capacity-building element, as several young researchers at the CSOs were consciously involved in the study. In sum, CSOs improved their access to decision-making processes and also improved their standing in the eyes of local and national decision-makers and IFAD.

1.3 Presentation of the case studies

Seven case studies were elaborated under the framework of the ProPoorGov project: two in Bolivia (Alto Beni and Lomerío) and one each in Bangladesh, Brazil, Burkina Faso, Ecuador and India. Each case study has generated results and conclusions applicable to its particular context. This section contains summaries of the seven case studies, which are elaborated in more detail in the respective chapters.

1.3.1 Case study Bangladesh: vulnerability in the coastal *char* lands

The *char* lands in the Eastern coast of Bangladesh are an example of how extreme vulnerability to environmental hazards and climate change is compounded by social vulnerability among the poorest and most marginalised groups in society. This case demonstrates how effective governance of natural resources in such an extreme environment depends on comprehensive and long-term support from government and NGOs and international organisations in order to be successful.

In the Bay of Bengal, the continuous process of the relocation and deposition of sediments in rivers and coastal zones leads to the emergence of new lands called *chars*. The natural environment in the region is characterised by this constant process of erosion and accretion of land and threatened by cyclones, related storm surges, tidal flooding, drainage congestion and waterlogging, drought, and salinity intrusion. These threats are exacerbated by the consequences of climate change and climate variability. The people in the region, many of whom have come from areas where they occupied an extremely marginal position in society, face the possibility of losing their land to this massive bank erosion, which results in recurrent population displacements and migratory movements.

Erosion victims usually move to newly accreted *chars*, where they look for opportunities to gain new land. The *chars* are not only exposed to rapid riverbank erosion and poorly connected with the mainland: the conditions for agriculture are unfavourable there due to salinity and flooding; the *chars* are extremely vulnerable to cyclones and storms and offer very harsh living conditions due to a lack of fresh water and fuel; and they have very poor communications and minimal public services provided by the government or NGOs. The migrating landless peasants find themselves in a vulnerable position, which is exploited by different groups (*Bahini*) who illegally assume power over *char* areas and perpetuate their control through violence. The illegal leaders are linked to the political sphere and determine the conditions of the migrants´ settlement. The process of settlement establishes a patron-client relationship and involves forced labour, arbitrary land purchase, and the continuous threat and occasions of physical violence (Adnan 2013).

In some parts of the region, the government has undertaken the *Chars* Development and Settlement Project (CDSP, phase IV co-funded by IFAD). As part of this project, the *Bahini* are expelled using military force, land is formally allocated to the settlers, and a climate-proof infrastructure and different livelihood support measures are provided. As the data collected through interviews, focus groups, and observations showed, the *Bahini* regime was successfully ended by the CDSP in its areas of operation.

The government and local people have different adaptation strategies in this environment: The government reacts by implementing a comprehensive development project, whereas the people´s daily reaction is to maintain and rebuild their livelihoods in these hostile surroundings. They need to adapt not only to the *char* environment as such and its natural hazards, but also to slow-onset, longer-term environmental changes, including climate change. In the *chars,* the already observed climate change impacts include increased temperature and changes in rainfall patterns, causing inter alia, salinisation, floods, higher frequency of tidal waves, and reduced agricultural production (Chakrabarty 2008). This case study clearly shows how the interplay of environmental and social factors results in livelihood vulnerability and low resilience to climate change.

1.3.2 Case study Brazil: 'coexistence with the Semi-arid'

The Brazilian Semi-arid region is subject to periodical prolonged droughts, locally known as estiagens or *secas.* These droughts are expected to become more frequent and prolonged, according to climate change projections (Alves 2013). In a region where livelihoods are highly dependent on rain-fed farming, the occurrence of these climatic events has frequently been associated with periods of severe livelihood vulnerability, migration and recurrent poverty for the vast majority of rural families. Droughts and the poverty associated with them have contributed to the image of the Brazilian Semi-arid as a lost region, particularly in other parts of the country.

After around a decade of sufficient rainfall, the region suffered one of the worst droughts in its history from 2011 to early 2014. However, rural populations were significantly less hard hit by this drought in comparison with previous less severe droughts. Traditionally, droughts in the Brazilian Semi-arid have temporarily increased undernourishment rates and generated a massive outflow of migrants, mostly males, to more affluent regions of Brazil, in particular to the urban centres in the south. In this recent drought, neither the food security status of the region was affected – on the contrary, the decline in food insecurity continued unhindered – nor was mass migration observed (MDS 2013). This suggests that some measures were effective in reducing the population's vulnerability and making their livelihoods more secure.

A lot of evidence indicates that a combination of strategies associated with the coexistence with the Semi-arid[2] paradigm (da Silva 2006), which include the construction and use of community-based, small-scale technologies (e.g. water-harvesting cisterns) have made the livelihoods of family farmers more climate-resilient. The Brazilian case study demonstrates that effective strategies for reducing livelihood vulnerability, such as the widespread use of small-scale water-harvesting technologies, are certainly not only a question of technological deployment, but also part of a historical struggle for the empowerment of previously marginalised families. Civil society organisations have been promoting these technologies – water-harvesting cisterns, community seed banks, community microcredits, local seed varieties and animal breeds adapted to the environment, etc. – through participatory methods that do not decouple technical diffusion from the social dimensions of enhancing local capacities.

Undeniably, alternative development discourses and practices – particularly those inspired by 'coexistence with the Semi-arid' and agroecology-based family farming – have supported the diffusion and uptake of technologies, proving that they were neither imposed by external actors nor did they emerge disconnected from local social and economic realities. On the contrary, the technologies were found to be strongly

[2] *'Coexistence with the Semi-arid' is a local development paradigm conceptualised in opposition to a modernisation paradigm referred to as* Combatting the Drought. *The latter is characterised by: i) an emphasis on economic development over a more holistic sustainable development; ii) a technical and fragmented approach to the promotion of this economic development; and iii) an alliance between regional economic and political elites. Silva defines 'Coexistence with the Semi-arid' as "a cultural perspective oriented towards the promotion of the sustainable development in the Brazilian Semi-arid, which aims at improving living conditions and promoting citizenship through appropriated and locally designed socio-economic and technological initiatives that are compatible with the preservation and restoration of natural resources" (da Silva 2006, translation by authors).*

rooted in the history of the region. Moreover, they represented particular acts of resistance and counter-proposals to the predominant development models that favoured large-scale farming using mostly alien technologies that were unsuccessful in bringing sustainable and inclusive rural development to the region.

The accumulation of successful experiences by family farmers and their supporting initiatives is gradually inspiring public policy design and implementation, albeit at different paces. Until now, federal officials and only some regional policy-makers seem more open to these approaches. Other local agents continue to be reluctant to abandon development models based on standard agricultural modernisation and invest in the alternatives. This can be partly explained by barriers to change at local governance level due to the persistence relations of patronage between certain local politicians and rural populations. Dependent on rural social inequalities, local elites have little incentive to foster the widespread adoption of technologies adapted for smallholders. In response to this, family-farmer organisations have managed to reach broader policy-making arenas, and the challenge is now to scale-up 'coexistence with the Semi-arid' and the agroecological transition without forfeiting its principles, approaches and methods, and without devaluing local capacities. In other words, how can government funds and structures at the top be used to the advantage of approaches that clearly originated at the bottom?

1.3.3 Case study Bolivia/Alto Beni: agroforestry and sustainable development in Alto Beni

In the biodiversity hotspot of the mountainous rainforests of the Bolivian Yungas, the most common land-use system is slash-and-burn-based shifting cultivation where the agricultural frontier encroaches continually upon the remaining rainforests. Most agricultural practices are not well adapted to the ecosystem. Monocultures and exposed soils lead to soil erosion and land degradation. The Alto Benian population sees its agriculture-and forestry-based livelihoods threatened as internal and external factors are increasingly degrading the natural resources they depend on. Changes in climate patterns might increase those risks in the long term, although up to now local populations have perceived the danger emanating from such changes as low in comparison with other more pressing threats (Alves 2013).

In this context, agroforestry systems have been promoted and implemented by researchers and development agencies in Alto Beni since the 1980s, making them more than just an experiment in the region. Many farmers have been using agroforestry techniques for years, most of them organised in cooperatives. Agroforestry has reduced their vulnerability to exogenous changes, such as those brought on by a shorter and more unpredictable rainy season. This has been achieved by providing additional income sources, improving soil fertility, ensuring that crops are shaded, and other measures.

While its long-term benefits are widely acknowledged, the adoption of agroforestry remains relatively low in the region, although it is higher than in other parts of the world. Thus, when addressing vulnerability sources in the context of Alto Beni, the question is no longer whether agroforestry can serve as an adaptation option, but how to create incentives and reduce the barriers to its widespread adoption. The short-term costs that shifting to these systems generally involve are often beyond what farmers can afford, even though the benefits yielded in the mid to long term far exceed these initial costs.

However, the study on Alto Beni identified other factors that impede the mainstreaming of agroforestry and other diversified agricultural production systems, which can be addressed at local governance level. They included a lack of concerted action between the different supportive organisations. Dealing with different organisations and projects results in higher transaction costs for farmers, since they have to interact and invest time and energy with different agents when receiving support or implementing a project. This also inhibits the creation of synergies between different public interventions.

In this regard, people from the region indicated the necessity of "integrative support", that is, support that does not consider ad hoc interventions by small projects, but consolidates support in a comprehensive strategy that includes the development of entire value chains. This would require a much higher degree of coordination between the public and private bodies

working to develop the agroforestry system. Given that each organisation has a particular mandate, its own funding sources and target groups, it seems unlikely that greater coordination will happen automatically. Rather, it would require that the organisations in question redefine their role in the local context. Furthermore, agriculture does not just refer to sustainable cultivation, but also to the processing, transport, and commercialisation of agricultural products, among other activities.

In interviews, local organisations also referred to the challenge of creating more financial incentives or establishing disincentives for less sustainable farming methods. Once again, incentives seem to be key, but rather difficult to implement given the local governance dynamics. Payments for ecosystem services financed by carbon credits – as suggested by some farmer groups – face significant resistance from groups that argue for more comprehensive and holistic nature values and against a commercialisation of nature. Environmental subsidies and market development for agroforestry products could be an alternative way of supporting agroforestry systems, incentivising sustainable resource-use systems and raising awareness among consumers. They could finance the initial implementation phase, which is more costly, until the system became established and returns became more evenly distributed. The study concludes that a better understanding of the institutional settings, the organisations and the political economy of incentives and disincentives could shed light on how to develop the integrative support farmers declared necessary for fundamentally changing the Alto Benian landscape, local people´s vulnerabilities and, therefore, their future.

1.3.4 Case study India: (re-)establishment of common property institutions in Southern Rajasthan

In Southern Rajasthan, most people live on less than INR 20 (USD 0.35) per day and more than 90 per cent of the population relies on subsistence agriculture, often combined with animal husbandry. People's livelihoods are highly vulnerable to water scarcity, recurrent droughts, and decreasing agricultural production due to land degradation. Climate change projections predict an increase in temperatures, which may lead to reduced soil moisture and increased water stress with adverse effects on agricultural yields (Kumar et al. 2013). In the perception of local communities, the onset, duration and distribution of the monsoon, which has always been changeable, have become highly unpredictable and erratic.

The vast majority of the rural population, especially the poorest, depends on Common Pool Resources (CPR) for their livelihoods. The very high share of common lands in the region (73 per cent) provides several direct and indirect benefits to local communities such as fodder, grazing space for livestock, fuelwood and Non-Timber Forest Products (NTFPs).

In spite of the large proportion of common land, the availability of natural resources from commons is increasingly limited due to two main processes: firstly, the population of Rajasthan has increased by 21.4 per cent in the period from 2001 to 2011, and it continues to grow. The rising human and livestock populations have resulted in the overuse and degradation of common land. Secondly, common lands are massively encroached upon. These factors are interrelated: due to the rise in population, land holdings have been increasingly fragmented by descent. It has thus become necessary to bring more and more land under cultivation, which has in turn led to a decrease in privately owned pastures. As a consequence, most of the land that was formerly held as commons (forests and revenue lands including village pasture lands under government ownership that are de facto common pool resources) has been illegally encroached upon by individuals, mainly for the purpose of agriculture (81 per cent) and grazing (74 per cent).

Today, nearly 70 per cent of the common land is de facto privatised. This is especially problematic for the poorest of the poor, as these encroachments have reduced the resource base for livestock sustenance and limited marginal farmers' access to land resources. Thus, the poorest lack access to and are deprived of important livelihood assets. It is the powerful and influential people in the community that typically encroach on common lands. Due to their status in society, official positions on village councils, and their links to and bribery of local politicians, they can get away with this. The occupation of more land only adds to their power and influence. Weaker families

also encroach upon common lands, but the plots they occupy are considerably smaller.

Evidence gathered by the study shows that efforts supported by NGOs to (re-)establish CPR sites benefit the community, above all the poor, in the short and long term. Thanks to accompanying measures to reverse land degradation and the negotiation of resource-use rules and benefit-sharing mechanisms, the productivity of the (re-)established CPR sites improved substantially and yielded fodder and other products. The vast majority of the households that participated in the study stated that there have also been wider economic, social, political and institutional gains. Besides fuelwood and Non-Timber Forest Products, the substantial amounts of fodder harvested from community lands (400–500 kg on average per household per year) has played an important role in feeding livestock and reducing household spending and women´s workload. In this way, the communities´ resilience has been increased, also with regard to climate change.

In particular, there have been changes to forest policies and the recent recognition of community rights has empowered people to manage land. Given their previous alienation from the forests by law, tribal communities and activists had campaigned for the recognition of the bona fide and usufruct rights of those communities for more than three decades. In 2006, the national parliament announced the Forest Rights Act (FRA) in a historic decision. It aimed to correct a historical injustice done to tribal and other forest-dwelling communities and redress the traditional rights to individual and collective forest management. This was a major policy shift from traditional, centralised forest management to decentralised reform. Individuals who were occupying forest land on a fixed date were to be conferred rights to it, following a claims procedure. However, these rights continue to be largely ignored and their implementation has been severely flawed.

In cases where such community rights are eventually put into practice, they help to reduce the vulnerability of poor rural populations. Communities can get their land registered and manage it communally. With the support of local organisations, the community jointly decides to clear encroached lands, demarcate them, take land rehabilitation measures, and negotiate access rules and benefit-sharing mechanisms. In this way, they are able to increase their livelihood assets and harvest fodder and other products from the sites. More importantly, even in those cases where the aforementioned conditions are met, the recognition of community rights may not be sufficient to initiate development processes that end poverty. Households may gain resources from community lands such as fodder and fuelwood, which make their livelihoods more resilient, but these resources cannot replace the required additional livelihood options that allow them to escape from chronic poverty. In this regard, community land rights are a very important means of sustaining and improving community livelihoods but not an end in themselves. In order to achieve a more comprehensive development that ends poverty, additional measures are required. In this case, changing the situation would imply, firstly, longer-term support from the organisations that guide this complex process of altering the local power structure and, secondly, alternatives that allow local people to diversify their livelihoods and initiate a more sustainable dynamic development.

1.3.5 Case study Bolivia/Lomerío: control of natural resources in the indigenous territory of Lomerío

Lomerío, which is located in the lowlands of eastern Bolivia, has been inhabited by diverse *Chiquitanos* indigenous groups for many centuries. The forced integration of the indigenous group into institutions by Spaniards and later by the Bolivian State followed political and economic processes that marked the history of the country. That means that throughout the eighteenth, nineteenth and early twentieth centuries, these populations were subject to a number of colonisation attempts, from Jesuit missions to semi-slavery on large farms and in the extraction of rubber. It was only from the 1960s that a more autonomous indigenous political project began to take shape.

The subsequent decades witnessed concerted efforts by the *Chiquitanos*, who, after formalising their organisations, started to resist non-indigenous outsiders with an interest in their resources. This was supported by the growth of indigenous movements and an indigenous political agenda in the country as a whole. The greatest threat, according to the inhabit-

ants of Lomerío, was illegal logging inside what they considered their territory. Their mobilisation, therefore, became a struggle to gain greater control over the territory and its resources and conserve those resources in face of external pressures.

In 1996, changes in Bolivian legislation in favour of recognising community rights allowed the *Chiquitanos* of Lomerío to make a claim for the establishment of an indigenous territory. After a long ten-year process, the Indigenous Territory of Lomerío (TCO) of almost 260 000 hectares was finally recognised by the Bolivian State. This achievement is part of a larger success story, since after a couple of years, the *Chiquitanos* also managed to gain control of local government structures by winning local elections.

The recognition of communal land rights supported numerous processes that reduced the structural vulnerability of the Chiquitano population. Firstly, it fostered social organisation and political mobilisation, increasing the people's access to decision-making not only at local, but also at regional level. It also facilitated the development and implementation of forest management plans with benefits distributed across the 29 communities that form part of the territory. Moreover, through gaining control over these resources, the *Chiquitanos* were able to re-establish and in some cases formalise indigenous rules and practices that value natural elements and impose stricter limits on resource exploitation. In a region where climate change projections predict more erratic rainfall (Alves 2013), this implies better preparedness and less vulnerability. Finally, as satellite images demonstrate, the establishment of the territory countered the expansion of an advancing agricultural frontier onto the margins of their land.

However, despite several advances in terms of institutional change, economic transformation is still very limited. The economic orientation of the region as a whole continues to be fully dependent on the exploitation of natural resources – mining, logging and agriculture. In this context, the recognition of community rights and accompanying social processes are not sufficient to inhibit the resource depletion and unsustainable extractive industries inside the territory. Although it countered the expansion of the agricultural frontier, growing commercial interest in the forest and mining areas, on the part of both outsiders and insiders, is increasing the risk of resources being degraded without generating social and economic benefits for the communities.

1.3.6 Case study Ecuador: redefinition of rights to resources as a political process in Imbabura

Similar to other Andean countries, control over land and associated natural resources has always been central to Ecuadorian history, shaping societal and political relationships, as well as modes of production and national economic orientation. Although substantial changes have happened over the years, some structural characteristics of how natural resources are governed remained relatively stable. For instance, rural indigenous populations tend to be most affected by poverty and marginalisation, in spite of recent and older community-led and national efforts to prevent their structural social vulnerability.

Climate change impacts are putting even more pressure on natural resources and highlighting how important it is to govern these resources wisely. Local populations, in line with data from climate stations, have indicated that temperatures have generally increased, inducing shifts in the cultivation range of certain crops, and that the distribution of precipitation has become more skewed. Yet, the greatest climate threat to the livelihoods of local populations is posed by the water cycle in higher areas, more specifically by the progressive reduction – and in some cases extinction – of Andean tropical glaciers and the degradation of *páramos*, a type of highland tundra ecosystem that is very important for water absorption and regulation (Rhoades 2007, Skarbo and Vandermolen 2014).

The study on Ecuador investigated three cases where the governance of resources has shaped the vulnerability of poor rural populations and where, in some situations, political action has managed to break their structural marginalisation. *Yuracruz*, the first case, is a marginalised community where most families have insecure livelihoods due to very limited access to fertile land and restricted income options. This situation is substantially aggravated by reported problems with water provision and the people's incapacity to mobi-

lise the political forces required to change the situation in the upper *páramo*. The community already found itself powerless when the former owner of the upstream *páramo* negotiated a limited redistribution of land in the 1960s in order to retain control over the area. It seems that the power distribution has not changed significantly in favour of the *Yuracruz* community since then. Even though many attempts have been made, public agents still decide not to get involved in the open conflict over the *páramo*, for instance, by adopting a legalistic approach. This could be challenged in the light of several provisions under the new constitution, but it would require legal support, political advice and other costly investments, which the community has not been able to mobilise or afford so far.

The cases of El Batán and Morochos, point to how better prepared communities can be in a more favourable position to face another common stressor in the region: a surge in land acquisition by foreigners. In the case of Morochos, different historical developments have allowed the indigenous population to regain control over almost all of what they consider to be their ancestral territory. This has spurred community efforts to define their own rules for land transfers. But in the case of El Batán, the community was not only unable to mobilise itself to profit from the influx of foreigners, but it is also seeing decisions made beyond its sphere of control. This influences internal community dynamics and has already generated conflicts, which are exacerbated by the communication difficulties and cultural differences with the newly arrived foreigners. Foreigners reported that they received no advice on communal institutions or cultural profiles from the companies that manage the land and housing market. They were basically dragged into a long history of conflicts between indigenous people and former farm-owners.

More generally, this study highlights the importance of acknowledging that the redefinition of rights to resources is clearly a political process, with winners and losers, where power plays a decisive role. A pro-poor approach would not only acknowledge the imbalances of power, but also "level the political field" in favour of those who are most vulnerable. In the case of *Yuracruz*, it would require that state officials understand that the vulnerability of a 1,300-strong community should not be increased in exchange for economic benefits that are only felt by the better-off (and less vulnerable) households.

The study also shows that increased land access and tenure security can help to reduce vulnerability. However, in the case of the indigenous communities of Ecuador, regaining control over the totality of their territory, instead of only certain parcels of dismembered land, was a decisive factor. This not only strengthened community ties, but also helped to maintain communal institutions that favoured the sustainable management of land and water. It was the strengthening of this 'indigenous governance system' that facilitated the adaptation of the Morochos community to both pressures on land prices and the management of water catchment zones. Finally, the study demonstrated that political organisations based on ethnic configurations are certainly key to facilitating dialogue and increasing access to local political decisions.

1.3.7 Case study Burkina Faso: resource-use conflicts in the pastoral zone of Samorogouan

The case of the pastoral zone of Samorogouan in south-western Burkina Faso exemplifies a situation of massive dependency and growing pressure on degrading natural resources, combined with poverty, weak institutions, increasing conflicts, and a lack of alternative livelihoods.

Major institutional changes have occurred since the 1970s: The pastoral zone was created as an externally financed project that aimed to sedentarise pastoralists and intensify breeding in a comparatively favourable environment after the severe Sahel droughts of the 1970s. Political changes led to the withdrawal of the external funder, the implementation of the project was never completed. Even today, the demarcation and status of the zone is unclear. In the following years, the region experienced significant population growth coupled with an influx of migrants from other parts of the country and from the neighbouring Cote d'Ivoire. The arrival of migrants and the state policy of promoting cotton production led to changes in agricultural practices, livelihoods and land use. Under the influence of the agricultural migrants, the pasto-

ralists also started engaging in agriculture, mainly commercial cotton production, and thus became agro-pastoralists. Conversely, resident and newly arrived farmers began to breed animals in addition to farming. This instigated an accelerating degradation of the natural resources. While the pastoral zone was, before its official creation, covered with dense woody savannahs and plentiful animal species, an estimated 80 to 95 per cent of the land has been transformed into agricultural fields.

These developments, along with an unclear tenure situation, have triggered social conflicts, mainly between autochthonous and migrants or between pastoralists and farmers. The state played a crucial role in the genesis of a situation labelled "anarchic" by the local residents, due to conflicting policies and inconsistent implementation. The situation is likely to be aggravated by future effects of climate change, since Samorogouan is expected to have a hotter and drier climate with more droughts (Sylla 2013). However, the local population of the pastoral zone has not yet felt the effects of climate intensely and does not consider this a key concern. Given the widespread poverty and de facto open access to resources, the different actor groups have different strategies for adapting to the aforementioned changes.

This case study demonstrates that resource governance is at its core a social issue that encompasses access and tenure rights as well as transparent laws and conflict resolution. In Samorogouan, all stakeholders perceived the need to define the boundaries and status of the pastoral zone and negotiate new tenure and access rights. This process is highly political: interviewees reported on and substantiated the different bargaining power that different actor groups have to voice their perceptions, needs, and demands. For example, they make use of their ethnicity to access political power or make reference to being 'autochthonous' to gain legitimacy. According to them, the state needs to take the lead in reforming the resource governance of the pastoral zone.

The question remains whether the reform of land governance would be sufficient to ensure resilient livelihoods and sustainable development in the region. Similar to the cases of India and Bolivia (Lomerío), longer-term solutions for sustainable and resilient livelihoods are restricted. Given their lack of access to education and income opportunities, and their high dependency on the environmentally and socially precarious cotton production, the people of Samorogouan do not have much room for manoeuvre when it comes to adapting to different processes of change. The development of resilient livelihoods would require assistance in a shift towards alternative and more diversified livelihood options that take account of the projected effects of climate change.

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Annex 1

Source: authors´ field data and the organisations' websites

Project Partners: civil society organisations

Country	Name	Short description
Bangladesh	BRAC	BRAC is a development organisation dedicated to alleviating poverty by empowering the poor. Since its foundation in Bangladesh in 1972, BRAC has extended its activities to the whole country. Its programme focuses on agriculture and food security, microfinance, education, health, legal empowerment and social enterprise. This case study was carried out in collaboration with BRAC's Research and Evaluation Division (RED), an independent research unit within the organisation. This division has been playing an important role in designing BRAC`s development interventions, monitoring progress, documenting achievements, and carrying out impact assessment studies. www.brac.net
Bolivia 1	Fundación Tierra	Fundación Tierra is a Bolivian Non-Governmental Organisation (NGO) dedicated to discussing ideas and developing proposals for the rural sustainable development of indigenous, native and peasant groups. With more than twenty years of experience, Fundación Tierra works through action research and aims to influence policy-making in Bolivia in favour of marginalised and excluded rural populations. It supports indigenous, native and peasant groups by building capacities in management, negotiation, participation and policy incidence. Fundación Tierra research areas include agrarian issues, food security, indigenous rights, democracy and local governance, and the applied action research methodologies favour strong involvement of communities at local level. www.ftierra.org
Bolivia 2	CDE Faculty of Agronomy/ UMSA La Paz and Fundación PIAF-El Ceibo	The Centre for Development and Environment (CDE) is an interdisciplinary research centre of the University of Bern, Switzerland. CDE's overarching goal is to produce and share knowledge for sustainable development cooperation with partners in the Global North and South. Within the scope of this research, CDE has collaborated with the Faculty of Agronomy of the Universidad Mayor de San Andrés (UMSA), located in La Paz, and with Fundación PIAF-El Ceibo. www.cde.unibe.ch Fundación PIAF was created by the Cooperative Association of El Ceibo as a non-profit organisation serving the needs of local cocoa farmers and their families. One of its main activities is providing technical assistance and fostering knowledge sharing among the cocoa producers of Alto Beni. The foundation is also responsible for monitoring compliance with organic agriculture standards, providing microcredit and managing social support programmes, such as health, education and retirement programmes. www.elceibo.org
Brazil	PATAC	PATAC (*Programa de Aplicação de Tecnologias Apropriadas às Comunidades*) is a civil society organisation that has been in existence for more than forty years. It aims to strengthen family farming in the Brazilian Semi-arid region. Cooperating directly with local family-farming organisations, PATAC promotes sustainable rural development in the State of Paraíba in north-eastern Brazil by disseminating agroecological practices and using participative and bottom-up processes. PATAC supports the usage of local and original biodiversity, adapted to environmental conditions, and supports small-scale, low-cost technologies to conserve and store water, fodder and native needs. PATAC´s intervention methods favour the reinforcement of local knowledge and community-driven sustainable development. http://patacparaiba.blogspot.de/p/patac.html
Burkina Faso	GRAF	GRAF (*Groupe de Recherche et d'Action sur le Foncier*) is a non-profit organisation founded in 1999 and a member of LandNet West Africa. GRAF is a network of people interested in land issues such as conflicts and acquisitions, decentralisation, and governance of natural resources. The organisation focuses on research, publication, and advocacy. GRAF aims to conduct research on land issues at local level, involve all stakeholders in a genuinely national debate about the political and legal options regarding land, and acknowledge and use local expertise. In order to integrate diverse perspectives, analyses, and proposals, GRAF brings together researchers, practitioners, and decision-makers. In recent years, GRAF has received significant attention and has been involved in governmental processes. www.graf-bf.org

Project Partners: civil society organisations

Country	Name	Short description
Ecuador	SIPAE	SIPAE (*Sistema de Investigación de la Problemática Agraria en el Ecuador*) is a research network that works on agrarian policies at local and national level. It runs a platform for action-research development, fostering social dialogues, elaborating political proposals, and connecting scientific investigation with the social movements that deal with rural and agrarian problems. SIPAE's mission is to support a socially and environmentally sustainable agriculture in defence of food sovereignty and collective economic, social, cultural and labour rights. It aims to contribute to the different research efforts, articulating and complementing new knowledge in rural and agrarian topics. www.sipae.com
India	Seva Mandir	Seva Mandir is an Indian non-profit organisation founded in 1968 that has been working for 40 years with the rural, predominantly tribal population of the Udaipur district of Southern Rajasthan. Seva Mandir's work centres on efforts to strengthen the sense of collectivity and cooperation among communities with the goal of improving social equity and increasing resilience to climate change. The organisation carries out activities in 626 villages and 56 urban settlements. Seva Mandir supports communities in the (re-)establishment of common lands through often prolonged negotiations in order to free them from privatisation, develop and protect the degraded lands, and put equitable benefit-sharing mechanisms in place. www.sevamandir.org

Annex 2

Data collection procedures

Country	Study sites and selection criteria	Data collection Type	Methods used	Period	Workshops
Bangladesh	7 *char* lands of Noakhali District, selected from CDSP intervention areas and from non-intervention areas with different histories of migration and settlement	**Quantitative:** Climate records and household data collected from secondary and primary sources **Qualitative:** Transcripts of interviews and focus group discussions	In-depth interviews, focus group discussions with selected groups (women and men separately in different localities), key informant interviews, and participatory observation	From December 2012 to June 2013; Several visits on several days by IASS and BRAC researchers	**National Workshop in Dhaka in May 2013:** Participation of representatives from different ministries, CDSP, BRAC, Dhaka University, journalists
Bolivia, Lomerío	6 communities of the Lomerío territory, which were selected on the basis of their main economic activities and historical level of engagement with the territory recognition process	**Quantitative:** Climate records collected from secondary sources and household data **Qualitative:** Transcripts of interviews, focus group discussions, legal and historical documentation Extensive secondary data was used from previous Fundación Tierra research activities in Lomerío (since 2001)	In-depth interviews, focus group discussions with selected groups (local leaders and communities), key informant interviews, participatory observation and participatory mapping (social mapping and GIS-based)	From December 2012 to July 2013; 2 field excursions by IASS researchers, several field excursions by Fundación Tierra researchers Fundación Tierra has supported the main indigenous organisations in Lomerío since 2001 and has thus collected data in the field on numerous occasions.	**Regional Workshop in Santa Cruz de la Tierra, August 2013:** Participation of indigenous organisations, representatives from 8 municipalities and several public and private support organisations (foundations, aid agencies, NGOs, journalists and researchers)
Bolivia, Alto Beni	Municipalities of Palos Blancos and Alto Beni. Stakeholder analysis at regional scale	**Quantitative:** Climate records, collected from secondary sources, and household data **Qualitative:** Transcripts of interviews, focus group discussions, legal and historical documentation Extensive secondary data was used from previous CDE research activities in the region (since 2009).	In-depth interviews, focus group discussions with selected groups (local leaders and communities), key informant interviews, participatory observation	From December 2012 to July 2013, several field excursions by UMSA researchers CDE has studied agroecology in Alto Beni extensively in recent years.	
Brazil	2 communities in the territory of Cariri, Seridó and Curimataú, selected on the basis of their different levels of involvement in local organisations and farming networks and different asset basis (land and water resources); 1 local network of family farmers (Regional Collective) was also studied	**Quantitative:** Climate records and household data, collected from secondary sources **Qualitative:** transcripts of interviews, focus group discussions	In-depth interviews, focus group discussions with local organisations and communities, participatory observation (in the field and during the organisations' activities)	2012 to August 2013, 2 field excursions of IASS researchers, several excursions of PATAC consultant	**Local Workshop in Campina Grande, December 2012:** Participation of approximately 80 farmers and representatives from NGOs and research institutes

Data collection procedures

Country	Study sites and selection criteria	Data collection Type	Methods used	Period	Workshops
Burkina Faso	16 villages and hamlets in and around the pastoral zone, selected according to their location in different parts of the zone (4 ranches), administrative status, the role they played in the history of the pastoral zone, the predominant livelihood of inhabitants, pressure on land resources, occupation of zones with access to water and livestock retreat	**Quantitative:** Regional socio-economic data, collected from secondary sources **Qualitative:** secondary data (legal, political and historical documents), recorded interviews	Focus group discussions with selected groups (young people, women, and the elderly in different localities), interviews with locals, heads of peasant organisations, involved NGOs, and public officers in selected villages, and interviews with other groups and persons	From December 2012 to June 2013, 2 field excursions of GRAF and IASS researchers, main data collection during a 3-week stay in February and March 2013	**Local Workshop in Samorogouan, May 2013:** Participation of inhabitants from the pastoral zone and adjacent villages, representatives from NGOs, local and federal government **National Workshop in Ouagadougou in June 2013:** Participation by representatives of different stakeholders from the pastoral zone of Samorogouan and other pastoral zones, representatives of all concerned government agencies, NGOs, journalists
Ecuador	3 communities in the Andean region of the Imbabura Province, selected on the basis of their different asset basis and social organisation	**Quantitative:** Climate records and household data, collected from secondary sources **Qualitative:** Transcripts of interviews and focus group discussions, legal and historical documents, maps	In-depth interviews, focus group discussions with selected groups (local leaders and communities), key informant interviews, participatory observation and participatory mapping (social mapping and GIS-based)	From December 2012 to May 2013, 2 field excursions by the IASS, several field excursions by SIPAE researchers. Main data collection during a 5-week stay in April and May 2013	**Local Workshop in Cotacachi, Imbabura, July 2013:** Participation of inhabitants from rural communities, representatives of NGOs, local organisations and local government **National Workshop in Quito, August 2013:** Participation of national government agencies, NGOs, IFAD, aid agencies and researchers
India	8 villages in Southern Rajasthan, selected on the basis of their history of managing CPR: four villages where the (re-)establishment of common land has been successful and sustained, three villages where the attempt failed in the long run, and one village that did not engage in this kind of intervention	**Quantitative:** primary data (215 households surveyed; selected according to stratified random sampling) and secondary data (land records and legal documents from Government Departments) **Qualitative:** interviews	Interviews, 25 focus group discussions and 16 social mappings using Participatory Rural Appraisal techniques	From December 2012 to September 2013, several excursions of Seva Mandir and IASS researchers; additional involvement of 8 Seva Mandir case study authors who are very familiar with the respective villages.	**Regional Workshop in Udaipur, September 2013:** Participation of different NGOs, IFAD, research institutes, universities, and government

Chapter 2

MODIS Land Rapid Response Team, NASA/GSFC Visible Earth (cropped) © Jacques Descloitres

Environmental and Social Vulnerabilities of the Poor under Climate Change Conditions: The *Char* Lands in Bangladesh

Authors: Judith Rosendahl [a, 1] , Md. Mahbubur Rahman [b], Sifat E. Rabbi [b], Andrew Jenkins [b, 2]

ABOUT BRAC

BRAC is a development organisation dedicated to alleviating poverty by empowering the poor. Founded in Bangladesh in 1972, BRAC is currently active across the whole country. Its programme includes agriculture and food security, microfinance, education, health, legal empowerment, and social enterprises.

This case study was carried out in collaboration with BRAC's Research and Evaluation Division (RED), an independent research unit within the framework of the organisation. The division has been playing an important role in designing BRAC's development interventions, monitoring progress, documenting achievements, and undertaking impact assessment studies.

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2.1 Introduction

Bangladesh is characterised by one of the largest deltas in the world, which is formed by a dense network of three major rivers – the Ganges, the Brahmaputra and the Meghna – in addition to 250 other rivers. The land area is mainly low and flat with the exception of the hilly regions in the northeast and southeast. The fertile delta is very densely inhabited (in 2011, 142.3 million people lived on a total area of 147 570 km^2, i.e. 1,033.5 persons/km^2), making Bangladesh the world's most densely populated country.[3]

Since gaining independence in 1971, the country has made major economic and social progress and cut poverty by more than half (IFAD 2012). Nevertheless, Bangladesh remains the third poorest country in South Asia[4] with substantial poverty, inequality and deprivation. According to the Multidimensional Poverty Index (MPI) of 2011, 57.8 per cent of the population is poor. Data from 2007 revealed that 81.3 per cent of Bangladeshis live on less than USD 2 a day and 49.6 per cent survive on less than USD 1.25. Around 44 per cent of Bangladeshis still earn their livelihoods from agriculture, but rural areas are most affected by poverty.

Land is increasingly used for other purposes and agriculture is impaired by extreme weather events and climate change. Bangladesh is subject to frequent natural hazards: severe flooding during the monsoon season causes significant damage to crops and property, with major adverse impacts on rural livelihoods. Furthermore, Bangladesh is considered to be one of the most vulnerable countries to climate change. Projected impacts include sea-level rise, changing rainfall patterns, increasing floods, droughts, storms, heatwaves and cyclones, and shifts in seasonal patterns (Chakrabarty 2008).

The present case study examines the coastal *Char* region, which is particularly affected by natural hazards and climate change. It is also characterised by extreme poverty. Bangladesh's vast river systems carry sediments, most of which originate in the Himalayas, towards the coast of the Bay of Bengal. *Char* lands denote the land areas that result from the accretion of silt through the continual process of erosion and deposition in the major rivers and coastal areas. Thus, old land is constantly being eroded, while new land is constantly being accreted. This case study focuses on these coastal *chars*. Due to the rapid erosion of farmland on the shores of rivers and estuaries, many people become landless and migrate to newly emerged *chars* to rebuild their livelihoods. The region has thus become home to some of the poorest communities in the country and is a zone of multiple social and environmental vulnerabilities that is highly exposed to natural disasters.

About three million people or around 13 per cent of the total population of the exposed coastal districts live on 185 *chars* and islands (Wilde 2011). The livelihoods of people on these *char* lands is frequently threatened by cyclones, related storm surges, tidal flooding, drainage congestion and water logging, drought, salinity intrusion, and erosion. These uncertainties are also compounded by the consequences of climate change and climate variability (Wilde 2011). Furthermore, to occupy land, the settlers often

[3] *This statistic does not consider very small states and city states.*

[4] *Only Afghanistan and Nepal are poorer.*

require the consent of powerful persons who illegally control this public land, and they therefore lack secure land titles. This study examines the multiple vulnerabilities the *char* dwellers face and asks to what extent they are exacerbated by the impacts of climate change and how improved access to natural resources and other services as well as security of tenure can reduce livelihood vulnerability. In some parts of the study area, the 'Char Development and Settlement Project' (CDSP), which is implemented by the Government of Bangladesh with support from IFAD and the Dutch Government, delivers infrastructure and land titles and takes other measures to improve livelihoods. The study also assesses the impact of CDSP on the livelihoods of the *char* dwellers and documents the extent to which vulnerabilities are being reduced.

Incidence of poverty in *chars* compared to national average

	Chars	**National average**
Incidence of poverty (poverty line of USD 1.25)	73%	49.6%

Table 1
Source: IFAD

The study was carried out using a combination of quantitative and qualitative approaches to data collection. Quantitative data on climate and households was collected from secondary and primary sources. For qualitative data, field information was collected through In-depth Interviews (IDI), Focus Group Discussions (FGD), Key Informant Interviews (KII), case studies, and personal observation of the households. The qualitative enquiries focused on livelihoods, perceptions of climate change, and coping strategies after environmental hazards. The study area comprises seven *char* lands in the Noakhali District, which include CDSP intervention areas as well as non-intervention areas with different histories of settlement.

2.2 Environmental, socio-economic and institutional changes

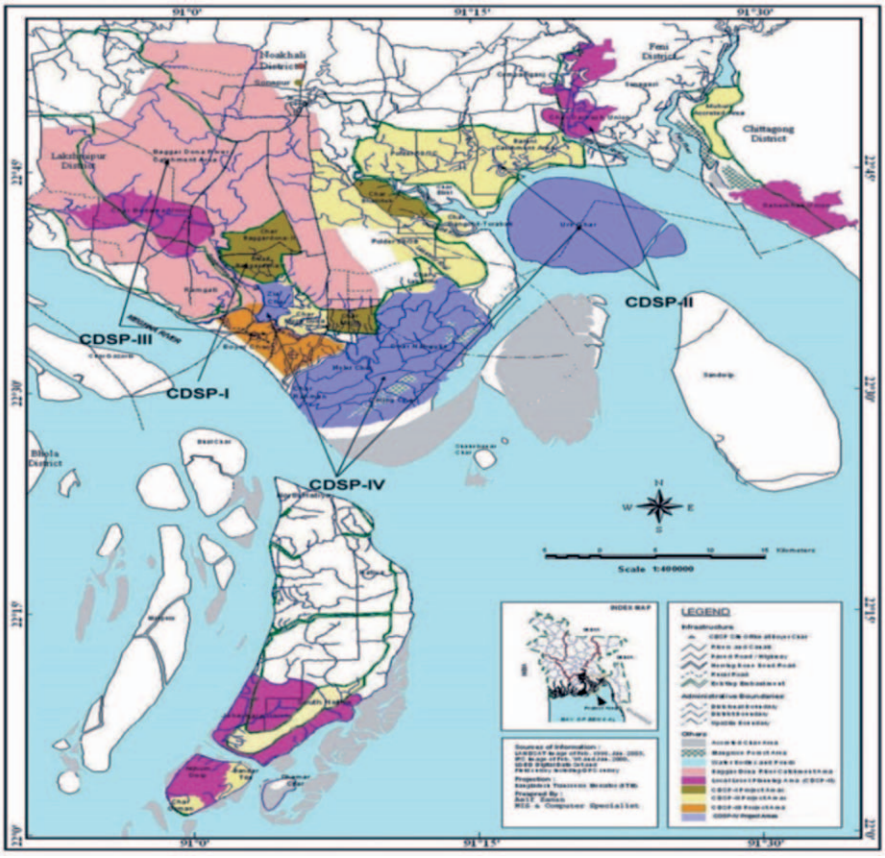
2.2.1 The natural environment in the coastal *char* region of the Noakhali District

Bangladesh's river systems carry sediments, most of which originate in the Himalayas, towards the coast of the Bay of Bengal. *Char* lands result from the accretion of silt through the continual process of erosion and deposition in the major rivers and coastal areas. The *chars* are poorly connected with the mainland and often exposed to rapid riverbank erosion. In 2008 alone, 1 200 km of riverbank were eroded and another 500 km were prone to erosion (Chakrabarty 2008). These areas are characterised by an extensive network of innumerable rivers, creeks and estuaries. In a constant cycle, old land is eroded and new land is accreted. In the lower delta, erosion and accretion are natural processes related to tidal movement. Generally, there is very substantial erosion in the outer bends of rivers and estuaries, while accretion occurs in the inner bends of river channels. As a result, meanders form rapidly. The physical environment is thus very unstable and changes over the seasons and years. Further major natural threats to the region include cyclones, related storm surges, tidal flooding, drainage congestion and water logging, drought, salinity intrusion, and erosion. These uncertainties are compounded by the consequences of climate change and climate variability (Wilde 2011). The study area is located in the Noakhali District of south-eastern Bangladesh, which borders the Meghna estuary and the Bay of Bengal, as well as other districts. The area lies in the wet region of Bangladesh and is exposed to cyclones and storm surges that affect the entire Meghna estuary. It is a tropical monsoon climatic region with three distinct seasons: the rainy season (May to October), winter (November to February) and summer (March to April). The mean annual temperature varies from a minimum of 14.4°C to a maximum of 33°C. Heavy rainfall begins in June and continues up to September. The annual average rainfall is 3,155 mm. The hydrological situation is influenced by the lower Meghna, which enters the sea north of Hatiya Island and is the major outlet for the combined flow of the Ganges, Brahmaputra and Meghna rivers. The study area differs from other parts of the Noakhali District due to the dynamic estuary and its exposed coast with regular tidal inundation and vulnerability to natural hazards. At the same time, the coastal zone provides many opportunities, for example, grasslands, accreted lands for mangrove cultivation, and marine fisheries for shrimp cultivation. The main sources of surface water irrigation are rivers, canals, ponds and ditches used to store water for dry season irrigation. However, salinity problems limit the availability of surface water for irrigation.

The land lies just above sea level, and flooding (caused by drainage congestion) only occurs in the rainy season, with the exception of marginal areas that are also subject to tidal flooding throughout the dry season. The soils in the south become saline during the dry season and overall fertility is medium. Crop selection and cropping patterns largely depend on the topographic position of the land in relation to the depth and duration of seasonal flooding. Lands that are located above the normal inundation level offer a wide range of opportunities for growing both perennial and year-round dryland crops and could be used for urban and rural settlement and industrial purposes.

The continuous deposition of a huge amount of sediments is leading to a natural expansion of the district southwards. The natural process of accretion was speeded up by the construction of two Meghna cross-dams in 1957 and 1964 (Ahmed and Jenkins 1991). The *char* areas of the Noakhali District, which consist of a number of islands in river estuaries and sandbars adjoining the mainland, are intersected by rivers, creeks and sea channels. The process of *char* formation is dynamic, with *char* lands continually emerging, being submerged, and re-emerging over time.

When they first emerge, these new land masses constitute extensive tracts of contiguous lands with no physical structures, settlements, or boundary fences and markers. In a newly formed *char*, there is a progression from a cover of silt to natural vegetation to crop cultivation and finally human settlement. Many *chars* have been the site of large-scale afforestation programmes carried out by the Bangladeshi Forest Department. From the 1970s onwards, the Ministry of Land transferred thousands of hectares of *char* lands in the Noakhali District to this department for afforestation over periods of between ten and twenty years (Adnan, 2011). After about ten years, the *chars* become 'mature', and after ten to fifteen years they are suitable for cultivation and people start to live there.



Graph 1:
CDSP I, II, III and IV areas
Source: CDSP

2.2.2 Migration

Communities living in the eastern delta, especially those in the Noakhali *chars*, face the threat of losing their land to riverbank erosion, which results in recurrent population displacements and migratory movements (Adnan 2013). Those people who lose their lands due to erosion move to newly accreted *chars*, where they look for opportunities to gain new land (Wilde 2011). They have no other choice, because land in Bangladesh is under population pressure and therefore scarce (Islam 2013). It is estimated that at least 20 000 families in Bangladesh become homeless and landless every year due to riverbank erosion (FAO 2010). The *chars* are far away from the district headquarters in Noakhali town and given the lack of access, i.e. roads and other communications, the district administration has very limited control over the *char* lands (Wilde 2011).

The *chars* are not only poorly connected with the mainland and exposed to rapid riverbank erosion; i) conditions for agriculture are unfavourable due to salinity and flooding; ii) they are extremely vulnerable to cyclones and storms and offer settlers very harsh living conditions due to a lack of fresh water and fuel, and iii) they have a very poor communications infrastructure and minimal public services provided by the government or NGOs.

The population is usually very high in old *chars*. This contrasts with newly emerged *chars*, where the people who settle and develop agriculture are pioneers. The social context and livelihoods of *char* dwellers differ from those on the mainland in terms of settlement patterns, ways of living, the absence of local employment opportunities, exposure to and coping strategies for social and natural hazards, and uneven mobility patterns due to riverbank erosion (Zaman 1991, cited in Mahamud 2011). Due to the remoteness from the mainland, settlers have less – and sometimes no – access to health and education facilities. The poorest people have very limited access to livelihood assets and resources, and increased population pressure exacerbates the situation. As some of the most vulnerable, marginalised and least served communities in Bangladesh, these settlers require the attention of the government and non-governmental organisations.

2.2.3 Land acquisition process

Settlement in new *chars* is a major opportunity for landless people. However, settlement and ascertaining ownership rights to these newly accreted lands have always been complicated, since existing property rights to eroded land are not applicable in the case of newly emerged *char* lands. Modified property laws approved in 1972[5] specified that all newly accreted *char* areas would be considered thereafter as state-owned land called *khas* lands under the Ministry of Land (Siddiqui, 1981). There are two types of *khas*, agricultural and non-agricultural. The government can either retain it for its own use or distribute it to private owners and leaseholders (Siddiqui 1981). Sometimes, the government has taken the initiative to distribute land to landless people. In those cases, selected landless people have received land with possession rights but no selling rights. Allocated *khas* land cannot be transferred for 99 years from the date of registration, except by way of inheritance. If anyone does attempt to transfer the land, it is supposed to be returned to the pool of government *khas* land (Barkat et al. 2000). The *chars* are thus a common resource that has been declared state property and might be turned into private property.

Apart from this formal, government-led process of land allocation to landless people, which is being implemented on a (very) limited scale, in the vast majority of cases, migrating landless peasants are exploited by different groups that illegally assume power over *char* areas. They occupy state property and turn it de facto into private property. In the absence of state institutions in these remote and newly emerged regions, the migrants cannot settle in the new *chars* without the approval of a *Bahini*[6] leader or his brokers. In fact, migrants have tended to settle in these *chars* in a colonising process initiated by different interested parties. The latter exercised control over the new land and used different strategies and

[5] *Presidential Order 135.*

[6] *A Bahini is a group of people with arms and/or clubs who invade and occupy* char *land under a leader.*

means to gain and perpetuate their control. Bahini leaders and other interested persons also obtained the tacit support of local political leaders, administrative officials and rich people.

Bahini are the most powerful protagonists in the area. They distribute land among the settlers, ensure relative security so that land cannot be taken by other people and settlers areBahini are the most powerful protagonists in the area. They distribute land among the settlers, ensure relative security so that land cannot be taken by other people and settlers are protected from attacks by other groups, introduce markets into the locality, and establish communication links to nearby *chars*. In remote areas, all power and patronage is in the hands of the Bahini, which dispose of private armed forces[7] and determine the conditions of settlement. This study found that Bahini leaders maintained good relations with the political parties in their respective constituencies for the purpose of assuming power over the *char* lands. Politicians actually benefit from supporting the Bahini: they thus accumulate social capital that can be used in parliamentary and local government elections. The influential elite live on the mainland, closer to the district administration, and are therefore able to control the land through their alliances. In this way, it has set up commercial hubs in the *char* lands, for example, for fishing or cattle farming.

Char Majid is a comparatively older *char* among the *chars* in the study area. As one respondent from *Char* Majid explained,

> "We came to this *char* because of river erosion. We have no land as there is no living parent, so we were landless people. The government settled us on some land at that time, but the people from the *Bahini* controlled these lands by using their muscle power. We got this land after many quarrels, clashes and the collapse of relations between *Bahini* and local people."

Box 1: Statement of an inhabitant of* Char *Majid

The process of settlement itself proceeds as follows. Initially, male members of landless families appear in the *char* and bargain with the respective Bahini leader to obtain land. The price of land varies depending upon the land's position in relation to adjacent rivers and the possibility of submergence during spring tides. Prospective settlers are scrutinised from the outset. Kinship, political disposition, good relations with local leaders, and neighbourhood relationships all influence the Bahini*'s* decision. If accepted, the new settlers are assured shelter, protection, and a piece of land for which they receive a land entitlement document or card signed by the Bahini leader. In return, the patron expects loyalty and money. Furthermore, this loyalty is often transformed into legal authority when the leaders get themselves elected to government positions such as Union *Parishad* chairman.[8] In this way, their illegal power is turned into legal power and patron-client relationships are formalised. From the settlers' point of view, there is no option but to accept this procedure, since otherwise they would be forced to leave, their homes would be demolished and their livestock looted.

[7] *Groups of violent men, who are partly landless themselves.*

[8] *Union* Parishads *(or Union Councils or Unions) are the smallest rural administrative and local government units in Bangladesh.*

Most *chars* were completely covered by scrub and jungle with wild animals when the migrants first arrived. The Bahini leaders forced them to cut down the jungle in order to acquire the land. Afterwards, they were each given a very small piece of land for which they had to pay between BDT 2 000 (USD 25) and BDT 20 000 (USD 250). The women of landless families play a much greater role in cleaning and cutting down the bushes and trees that adult males, many of whom end up leaving the *chars* to earn wages in urban areas and thus avoid being recruited to the Bahini. The women work together to clear the land; they stay together at night and take care of each other in case of illness. Women have often played a leading role in introducing agricultural practices to the *char* areas.

Boyer *Char*, one of the *chars* examined in our study, is the most south-western part of the sub-district Subarnachar. Phase II of the CDSP was implemented there. One of the respondents from this *char* explained:

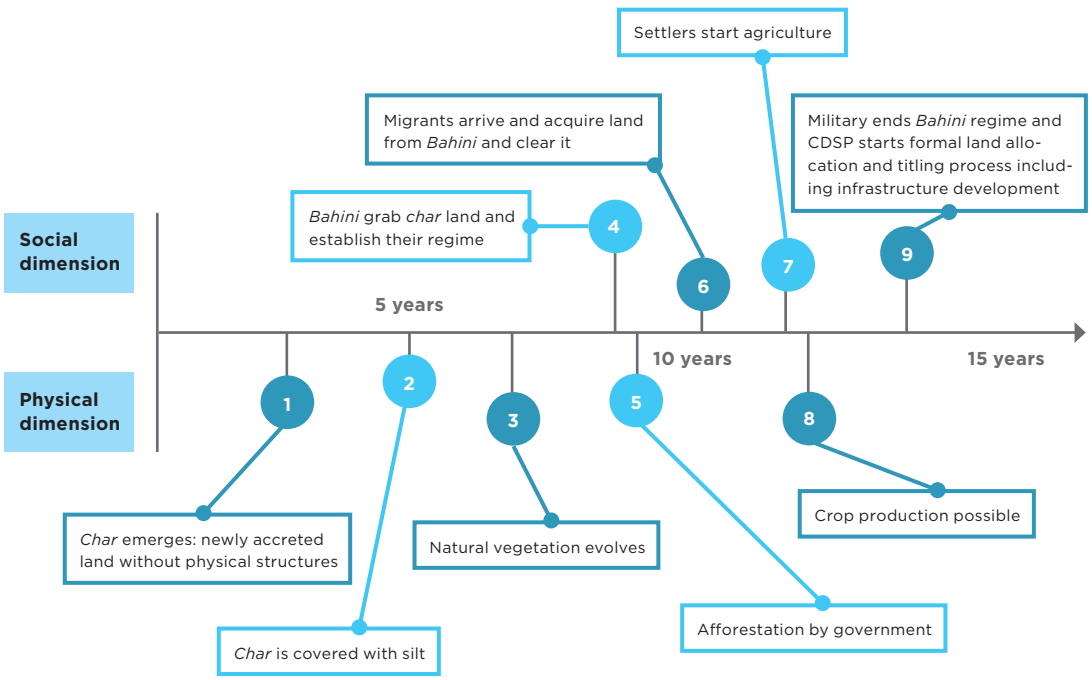
***Box 2: statement of an inhabitant from Boyer* Char**

> "When I came here, the whole *char* was covered in bushes and jungle. There were also foxes, snakes and many beasts here at that time. The foxes often snatched our hens and ducks when we were having lunch on our veranda. It was hard to move in the jungle, because of all the different bushes, and many of us were injured while cutting down the jungle. We built our homesteads by collecting mud from the nearby area and raising the plinths. We planted different types of trees around our homestead."

Even in cases where settlers are able to acquire a piece of land from the Bahini, they are exploited in manifold ways. Firstly, in the process of acquiring land, settlers often have to buy the same piece of land from the same leader two or even three times without receiving a proof of ownership from them. Secondly, after receiving land, the leader randomly collects money, demands a percentage of the harvested crop, subjects the settlers to physical violence (including rapes, torture, and murder) and files legal cases against them. Sometimes, Bahini also call on settlers to fight against their counterpart, i.e. other Bahini that are trying to invade their area. Many landless people have died in the ensuing gun fights. Those who are reluctant to become followers or members of Bahini face humiliations and physical assaults. Thirdly, in cases where the land is subsequently registered by the government, it often turns out that the true area of the land is different from what the settlers assumed or that their land has been registered in another's name.

Apart from the settlers who acquire land either through the illegal *Bahini* process or the formal, government-led allocation process, wealthy and powerful interest groups see the *chars* as an attractive investment opportunity. They acquire land by legal or illegal means, exerting influence on policy-makers and the land administration to establish formal land rights (Adnan 2011). Hossain (1995) stated that "national politicians and bureaucrats are often themselves large landowners and even if they are not, they depend on rich peasants both for political support and to ensure that the countryside remains reasonably tranquil." Many parts of the *chars* have been acquired by well-known private companies by way of orders on official stamp paper that are not legally valid. The land acquisition process is so cumbersome in these areas that settlers are very scared of losing their homesteads. By exercising administrative power, some government officials appear to have acquired land illegally and free of charge with no protests or legal action taken against them.

Furthermore, the government has legally allotted land to businessmen who went on to establish export businesses such as shrimp farms. Both parties legitimise this with references to the export-boosting policies promoted by some international agencies (Adnan 2013). The Bangladesh Military Academy (BMA) also acquired a large area for a training camp in 2013. So, the government has occupied these state lands by exercising its administrative power, and settlers can do nothing other than leave the area. They have no opportunities to complain or find an alternative solution.



Graph 2: Typical* Char *evolvement
Source: field work

2.2.4 Livelihoods

The overall education level is very poor in the study area: 72 per cent of the inhabitants have no formal education and 85 to 90 per cent of household heads have either 'no formal education' or incomplete primary education.

Access to drinking water varies depending on whether the area has been subject to CDSP interventions that included the construction of deep tube wells or not. In the CDSP I area, 99.5 per cent of people have access to tube well water, whereas in a non-intervention area, only 52 per cent have access to tube wells that are located up to 2 km away from their settlements. In these areas, 48 per cent of people collect drinking water by other means: from rivers and ponds, by saving rain water, and, in winter, by digging holes in the bottom of dry ponds. Sanitation facilities, although not fully hygienic, are used by 51 to 71 per cent of the people in CDSP I–III areas, whereas they are only available for 15 to 25 per cent of the people in CDSP IV area (ongoing) and non-intervention areas.

Livelihoods are centred on agriculture in CDSP areas (37–48%) and on manual labour in non-intervention areas (42%). Share cropping, a system where tenants bear all variable costs and also give half of their crops to the landlord, is the dominant form of tenancy in these areas. Other occupations include small business, domestic work, etc. An analysis of household incomes in the different *char* areas found that the average monthly income of most households[9] in CDSP areas ranges from USD 25 to USD 63. In non-intervention areas, income inequalities are salient: 0.5 per cent of the total population (40 households) earns more than 250 USD per month. This suggests a high level of inequality and exploitation related to the control of land settlement in an area effectively outside government control. On average, people spend between 10 and 20 per cent of their monthly household income on repairs following recent natural hazards. This figure applies to 'normal' conditions and does not consider damage caused by major storm surges.

In general, people in *char* areas own very few assets. Around 50 per cent of households have a mobile phone. In CDSP areas, some members of the population possess a table and chair (around 59 per cent in the CDSP I area) and very few people have a radio or a television (22.7 and 8.6 per cent respectively in the CDSP I area). Some of the population in CDSP areas dispose of tools they can use to earn money (ploughs, fishing nets, etc.). However, in non-intervention areas, the number of households with such possessions is very low (0.3 per cent have a plough, 10.4 per cent have a fishing net, and 5.1 per cent own a radio/TV).

In CDSP I–III areas, each household owns 0.6 hectares on average and there are no landless people. In CDSP IV area, where land registration is still ongoing, the average land holding is 0.52 hectares and 9.2 per cent of the population remain landless. In non-intervention areas, the average land holding is 0.49 hectares, but distribution is very uneven, with 1.4 per cent of the population owning 3 hectares or more. In all of these areas, agricultural production on generally small plots is limited, as agricultural activities are seriously affected by the combined effects of soil and water salinity, the lack of adequate irrigation systems, the incidence of pests and diseases, rainfall variability, the risk of cyclones, tidal surges, sudden floods, and drought, as well as a lack of agricultural input, etc. Primarily due to soil salinity in the dry season, only one paddy crop is produced in the *char* areas during the monsoon period.[10] Appropriate management practices for crop production are absent in many of these areas.

2.2.5 Climate change projections and local peoples' perception of climate change

South Asia is considered to be the world's most vulnerable region to climate change impacts, and Bangladesh is ranked high on the vulnerability list (Kibria 2011). The country is experiencing sea-level rise related to climate change, as well as a long-term fall in land levels related to tectonic plate movement and sediment compaction. Sea-level rise is likely to increase saline intrusion and the frequency of tidal flooding and drainage congestion. It may also have an effect on riverbank erosion. In addition to sea-level rise, the other potential climate change impacts are changing rainfall patterns, increasing floods, droughts, storms, heat waves and cyclones, involving shifts in seasonal patterns (Chakrabarty 2008).

Climate change projections suggest that the annual mean temperature will increase by 3–3.5°C by 2080. Rainfall is projected to increase by 23 per cent by the end of the twenty-first century. While consecutive wet days are set to decrease, high intensity rainfall (Rx > 20mm) is expected to increase.

[9] *The average household size is 5.3 people in non-intervention areas and 5.9 people in CDSP areas, compared to a national average of 4.5 people.*

[10] *This is possible because the high rainfall dilutes the salt in the topsoil during the monsoon, and paddy, especially local varieties, if grown in wet conditions, is generally salt tolerant. In addition to residual soil salinity and resalinisation through capillary rise from saline groundwater, a substantial area of land is tidally affected by saline water, which, for lack of an improved drainage system, remains on the land after the ebb tide.*

The observed climate change impacts in Bangladesh include increased temperatures and some changes in rainfall patterns. This is already having specific effects on some coastal regions, which are facing salinity problems that are expected to grow worse in future. The water salinity map covering the period from 1967 to 1997 shows that this process is already under way (SRDI 1998a). A comparative study of the soil and water salinity maps from 1973 to 1997 shows that soil salinity has increased (SRDI 1998 b, SRDI 1998 c). There is a general increase of salinity in the cultivable land, which extends to rivers up to 100 km inland in summer. The other observed climate change impacts are devastating floods, a higher frequency of tidal waves in the Bay of Bengal, and reduced agricultural output (Chakrabarty 2008).

The *char* inhabitants perceive changes in temperature, rainfall, and the frequency and intensity of storms, as well as their effects on the local environment. Meteorological data from the study area confirms these perceptions to a large extent. For example, people expressed the view that temperatures have been increasing. They also stated that there have been more temperature extremes: some claimed that they felt very hot during the day and much colder than usual at night. Interviewees indicated that summers have become hotter while winter temperatures have decreased over the last 5 to 7 years. Meteorological data shows that maximum and minimum temperatures have in fact been increasing over the last 32 years.

Rainfall has become more "intermittent and unpredictable" according to the majority of respondents. Once largely confined to distinct rainy seasons with a predictable beginning and end, the respondents claimed that nowadays heavy rains can occur at any time of the year. There were contradictory views on the amount of rainfall, but the majority of respondents reported that rainfall had significantly decreased, which is in line with the meteorological data.

Most respondents thought that the number and intensity of storms had increased, although large surges related to cyclones have not been experienced recently in this area. The respondents noted that during storms wind speeds are higher than before and sometimes accompanied by heavy rain and floods. The frequency of cyclonic storm surges seems actually to have decreased and, thanks to embankments, these areas have experienced less flooding than previously.

Climatic pattern in the *Chars* region

	Observed		Projected
	Records	**Perceptions** (by *char* communities)	
Temperature	Maximum and minimum temperature increased	General increase, hotter summer and colder winter, more extremes	Annual mean temperature will increase by 3.5°C by 2080.
Rainfall	Slightly decreased	Decreased, more intermittent and unpredictable, occurs outside of rainy seasons	Annual mean rainfall will increase by 23% by 2100.
Extreme events	Devastating floods, higher frequency of tidal waves in the Bay of Bengal, less flooding due to embankments	Number and intensity of storms increased, cyclonic storm surges are occurring more frequently	High intensity rainfall (Rx > 20mm) will increase.

Table 2

Source: Maijdi Court weather station and Chakrabaty (2008)

2.3 Adaptation to the changing environment

Section 2 described the natural setting of the *chars*, as well as migration and land acquisition processes and observed and projected climatic changes. It offered insights into the power structures and the multiple social and environmental vulnerabilities of the majority of *char* dwellers. The following section analyses reactions to these circumstances on the part of the government – by undertaking comprehensive development projects in some *char* areas – and ordinary people in their daily efforts to maintain and rebuild their livelihoods in this hostile environment.

In cases where the government takes action to allot *char* land to landless households, it has to tackle the established *Bahini* power structure. For the first time since Bangladesh gained independence, the Land Reclamation Project (LRP) and its successor project, the *Char* Development and Settlement Project (CDSP), have ensured the provision of de jure land titles to landless households on a limited scale.

In 1978 the Government of Bangladesh started the LRP in collaboration with the Dutch Government. Initially, the project aimed to find suitable options for combatting natural hazards (e.g. flooding, erosion and accretion) in order to reclaim land and promote the development of *chars*. As time went on, more emphasis was placed on developing new *char* lands rather than preventing accretion. By the end of the LRP in 1991, both governments decided to continue to pursue the goals of the LRP in two separate projects: the CDSP as land-based project, and the Estuary Development Project (EDP) as a water-based project.

The experiences of settlement and land development gained over the course of the LRP were applied in the first phase of the CDSP, which started in 1994 and ended in 1999. This project aimed to reduce poverty by improving the economic situation and living conditions of the *char* people, especially the poorest segment of the population. After getting off to a successful start, the CDSP has been implemented in four phases: CDSP I (1994–1999), CDSP II (1999–2005), CDSP III (2005–2010) and CDSP IV (2010–2015). The most recent phase is being implemented by the Government of Bangladesh with the support of the Dutch Government and IFAD. CDSP IV focuses on developing better and more secure livelihoods in agriculture, providing legal titles to land, and building climate-resilient infrastructure such as cyclone shelters, dykes, etc. In CDSP III and CDSP IV, five non-governmental organisations (NGOs) came on board to provide 'livelihood support' and raise awareness among the *char* dwellers of how to take preventive measures and cope with natural calamities. As one of these NGOs, BRAC is working on several sub-components. The four CDSP phases were centred on different *chars* in the Noakhali District.

Table 3 *Source: CDSP*

Overview of *Chars* Development and Settlement Project (CDSP)

Intervention	Duration	Financial volume	Main implementing agencies (IAs)	Project components	Area covered (ha)	Approximate land allocation per household (ha/hh)
Land Reclamation Project (LRP)	1977–1991	Dutch guilder (Dfl.): 8,475,810.1	Bangladesh Water Development Board (BWDB)	Survey and study for the development of long-term plan on land reclamation and estuary control in the southeastern delta, including tests of accretion and conservation methods	906	1.02
***Chars* Development and Settlement Project (CDSP) I**	1994–1999	BDT 580 million	**IAs:** BWDB, Ministry of Land (MoL), Local Government Engineering Department (LGED) and 3 local CSOs Donors: The Royal Netherlands Embassy	■ Land distribution ■ Land and water infrastructure ■ Rural infrastructure ■ Productive development ■ Social services coordination ■ Support and studies	6,821	0.50
CDSP II	1999–2005	BDT 123.99 million	**IAs:** BWDB, LGED, Department of Public Health Engineering (DPHE), Department of Agricultural Extensions (DAE), MoL, and 6 CSOs, including BRAC **Donors:** The Royal Netherlands Embassy and World Food Programme (WFP)	■ Land distribution ■ Protective and water management infrastructure ■ Internal infrastructure ■ Water and sanitation ■ Agricultural extension afforestation ■ Livelihood support	62,584	0.61
CDSP III	2005–2010	BDT 1,3 billion	**IAs:** BWDB, LGED, DPHE, MoL, DAE, Finance Division (FD), and 6 CSOs, including BRAC **Donors:** Government of Bangladesh and Government of the Netherlands.	■ Institutional development studies, knowledge management and dissemination ■ Concrete interventions at field level ■ Livelihood support	82,600	0.43
CDSP IV	2010–2015	USD 88.7 million	**IAs:** BWDB, LGED, DPHE, MoL, DAE, FD, and 4 CSOs. **Donors:** Government of Bangladesh, Government of the Netherlands, International Fund for Agricultural Development (IFAD)	■ Protection from climate change and climate resilient infrastructure ■ Land settlement and titling ■ Livelihood support ■ Technical assistance and management support	30,773	0.81 (ongoing)
Total land allocation (LRP and CDSP I-IV)					183,684	0.64 (average)

When the CDSP started, its first task was to reclaim land back from the *Bahini*, often using military force. At later stages of the project, the *Bahini* adapted to this situation and simply shifted their operations to other *chars* before the CDSP started to operate in a given area. The CDSP follows a process of systematic land allocation, which is well structured, very effective and warmly welcomed by the deprived settlers. Allocation is based on de facto occupancy and the following criteria: in an extended family, no more than one married coupled is to receive *khas* land. The land is allocated jointly to both husband and wife or, in the case of a widow or widower, to one person only. At the outset, the CDSP conducts a field investigation of land occupation; it then records the settlers' names, the size and the location of the sites, etc.; after that, it calls on the settlers who have been living on the land to apply for land titles and organises settlement documents in collaboration with the legal authorities. The exact area of land distributed to the settlers has varied within a range of 0.3 to 0.65 hectares per family from one CDSP phase to another.

The *char* dwellers adapt to the different environmental and climatic changes. They frequently experience the rapid onset of natural hazards such as flooding and cyclones, but their capacity to cope with them is limited. A significant proportion of the interviewees do not tend to use cyclone shelters during cyclones or storms. Instead, they stay at home because they feel more secure there and/or because the shelters are often quite far away from where they live, making a journey to the shelter potentially dangerous due to falling trees, strong winds, etc. Moreover, it was reported that without proper maintenance of *Killas* (raised earth mounds on which buildings are built), snakes infest these shelters. When asked why they do not go to the shelter before the storm starts, they explained that in the past warnings reached them via radio but now the storms arrive very abruptly and they usually do not receive a signal in time.

As regards managing their livestock during emergencies, most of the respondents reported that they generally kept their cows and goats on higher ground and hens and ducks inside their houses. Similarly, staple foods are stored in safe places like a drum, a sack, a shelf, or a hole dug in the room.

Apart from rapid-onset disasters, people also need to deal with and adapt to slow-onset and longer term environmental changes, including climate change. According to farmers, irregular rainfall patterns mean that there is inadequate rainfall when crops need it most. The area now experiences heavy rainfall later, when paddy is ripening in the field. Sometimes, it rains continuously for five to seven days and the resulting floods destroy crops. In some areas, crops are swamped by severe tidal flooding, which also affects the livestock. A number of interviewees reported that the effects of tidal flooding have been reduced thanks to embankments. However, they suggested that it takes a longer time for the rainwater to flush out the salinity, which sometimes damages the paddy. Most respondents also indicated that the heat leads to dry spells and the resalinisation of topsoil, which adversely affects or destroys crops. Some people have responded to the poor germination caused by water stress by sowing the same seeds two or three times each year over the last 2 to 3 years.

A majority of respondents reported that they need to invest more money now due to higher production costs as well as a rise in food prices prompted by environmental changes. To make matters worse, they also lose money due to floods that carry away livestock. They feel that the effects of the changing climate on their health – fever and influenza, especially in children – are not being adequately tackled. A few respondents also reported high saline levels in their drinking water, which sometimes results in scabies and other water-borne diseases such as diarrhoea and dysentery.

When asked about the term 'climate change', the majority of male respondents had heard of the term, but did not know what it means, while all the female respondents had never heard of it.

All of this forms part of the *char* dwellers' daily lives and they mostly take it as God-given natural circumstances. Life in the *chars* is a perpetual process of withstanding the forces of nature and reconstructing livelihoods in adverse conditions. Migration is one of a number of adaptation strategies. Instead of making a conscious decision based on a set of options, *char* dwellers are forced to migrate due to the simple fact that their home has been swallowed by erosion. Under

such circumstance, settlers have no option but to move to other *char* areas, which are prone to frequent natural hazards and offer extremely harsh living conditions. Thus migration does not improve the lives of landless families. Before and after migration, the migrants find themselves in extremely precarious circumstances and are very vulnerable not only to environmental, but also to social impacts on their lives and livelihoods. They are forced to enter an exploitative and abusive patron-client relationship with illegal local landlords. In sum, they lack the social, cultural and economic capital that would put them in a better situation. For example, they do not have the financial means to provide themselves with more robust houses or agricultural technologies that are more appropriate to the circumstances (salt-resistant crops, irrigation facilities, etc.). Nor do they have adequate knowledge of these technologies, and they lack an education that would give them other livelihood options and enable them to use legal mechanisms against the *Bahini*. They have no relationships with influential people or access to government authorities.

In this context, climate change exacerbates the existing vulnerabilities of the *char* dwellers. The resulting impacts of dry spells, irregular rainfall patterns, increasing soil salinity, etc. affect the price of food, land, and other goods and services, limiting the migrants' choices and further decreasing their resilience.

In sum, *char* dwellers have very limited short-term coping strategies and no longer term adaptation strategies at all.

Women's savings groups contribute to women´s empowerment. © Judith Rosendahl

For flood protection, houses are constructed on an earth mound. © Judith Rosendahl

Ponds are used for all water purposes: drinking, washing, fish cultivation, etc. © Judith Rosendahl

2.4 Discussion of future adaptation strategies

The experiences gained over the course of the LRP and the CDSP show that, when combined with police protection, government provision of land in accordance with principles that ensure equitable and gender-sensitive allocation creates a much safer social environment in remote *char* areas. The strength of the CDSP lies in its integrated approach to tackling natural and social vulnerabilities that are inextricably linked. The adequate provision of dykes, sluices, roads, cyclone shelters and training to deal with natural disasters substantially increases the *char* dwellers' resilience to natural hazards. The allocation of land titles as well as supplementary social components such as social forestry, women's savings groups, environmental education etc. ensure a safer environment and support livelihoods. The CDSP approach to land governance in the *chars* can therefore be seen as a viable pro-poor adaptation strategy.

However, the scope of the CDSP is limited to certain parts of the *char* lands and only benefits a certain number of people. While this is inherent in the nature of the project, it raises the issue of justice. In order to achieve a long-term improvement in the livelihoods of the poorest *char* people, the different components of the CDSP need to be sustained by government efforts in cooperation with civil society and supported by donor countries and international organisations. A long-term collaborative initiative conceived for a period of more than 30 years is essential. Evidence from this study and other data gathered over the 40-year period of operation of the LRP/CDSP demonstrates, however, that more long-term efforts could succeed in integrating a large percentage of *char* areas and substantially improve the settlers' incomes and living conditions. Their physical security would thus substantially increase and their vulnerability to natural disasters would decrease.

When we consider the extreme poverty, deprivation, insecurity and vulnerability of the *char* people and see the increasing impact of climate change on their lives, it seems clear that the continuation of successful international efforts to bring about substantial improvements in should be given the highest priority.

Discussion of legal documents. *Bahini* often issue illegal land titles. © Judith Rosendahl

2.5 Conclusion

The case of the *char* lands on the east coast of Bangladesh shows how the social vulnerability of the poorest and most marginalised groups of Bangladeshi society is inextricably linked to their extreme vulnerability to environmental hazards and climate change. For that reason, an effective governance of natural resources in such an extreme environment requires a comprehensive and long-term approach in order to be successful.

This chapter described the instability of the natural environment in the *char* region, which is aggravated by climate variability and the consequences of climate change. The people in this region face the threat of losing their land to riverbank erosion, which results in recurrent population displacements and migratory movements. Those people who lose their lands due to erosion move to newly accreted *chars*, where they look for opportunities to gain new land. The *chars* are not only exposed to rapid riverbank erosion and poorly connected with the mainland, they also offer i) unfavourable conditions for agriculture due to salinity and flooding; ii) are extremely vulnerable to cyclones and storms and offer very harsh living conditions due to a lack of fresh water and fuel; and iii) they have very poor communications and minimal public services provided by the government or NGOs. The migrating landless peasants are prone to exploitation by different groups who illegally assume power over *char* areas and perpetuate it through a violent regime. The illegal Bahini leaders are linked to the political sphere and determine the conditions of the migrants' settlement. During the settlement process, a patron-client relationship develops that entails forced labour, arbitrary land purchases, and the constant threat of physical violence. In some parts of the region, the government has carried out the CDSP, which ends this regime, initiates a formal process of land allocation to settlers, and provides a climate-proof infrastructure.

The chapter also cast light on the different adaptation strategies in this environment. While the government has reacted by implementing a comprehensive development project, the people of the *chars* attempt to maintain and rebuild their livelihoods in these hostile surroundings. They need to adapt not only to the *char* environment as such and the associated natural hazards, but also to longer term environmental changes, including climate change.

The case of the *Chars* Development and Settlement Project (CDSP) is clearly an example of successful land governance and viable pro-poor adaptation strategies. However, it also points to the trade-offs and problems of a project approach, among others the issue of justice and the challenge of sustained success. In order to ensure that the benefits of such a pro-poor adaptation strategy are felt by the entire deprived population of the *char* lands, the project would need to be financed and implemented in the longer term.

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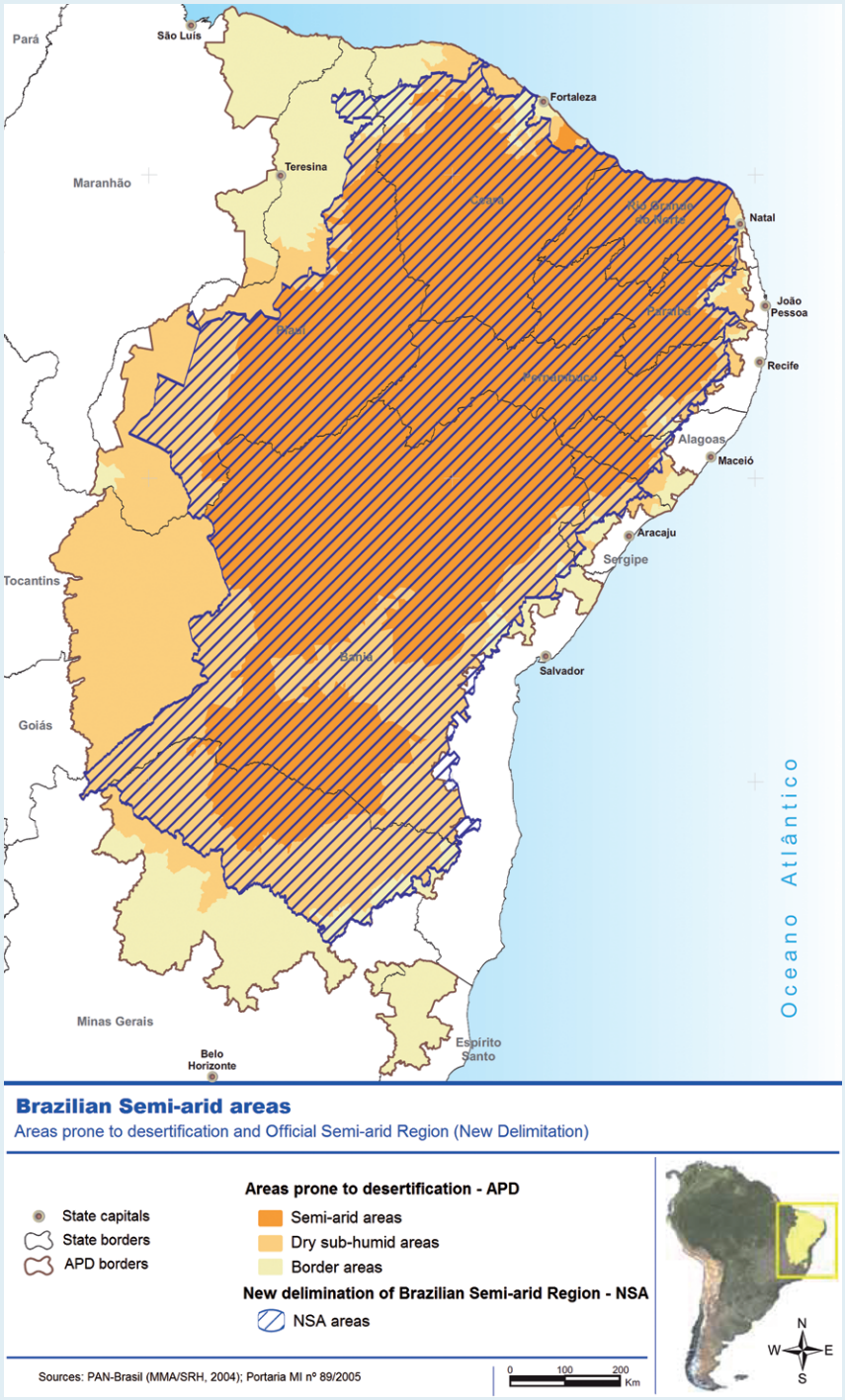
Chapter 3



Graph 1:
The Brazilian Semi-arid region
Source: MMA (2007)

Food Security, Agroecology and the Roadmap to Sustainable Development in Brazil's Semi-arid Region

Authors: Wouter van Oosterhout [a, 1], Matheus Alves Zanella [b], Glória Batista [a], José Waldir [a], Antonio Carlos Pires de Melo [a]

ABOUT PATAC

The Programa de Aplicação de Tecnologias Apropriadas às Comunidades – PATAC (*Programme for the Implementation of Technologies Suitable for Communities*) is a civil society organisation that has worked to strengthen family farming in Brazilian semi-arid regions for forty years.

In cooperation with local family farming organisations, PATAC promotes sustainable rural development in the State of Paraíba in the north-east of Brazil by disseminating agro-ecological practices and using participative and bottom-up processes. PATAC supports the use of local and native biodiversity adapted to environmental conditions and supports small-scale, low-cost technologies to conserve and store water, forage and native seeds. PATAC´s intervention methods favour the reinforcement of local knowledge and community-driven sustainable development.

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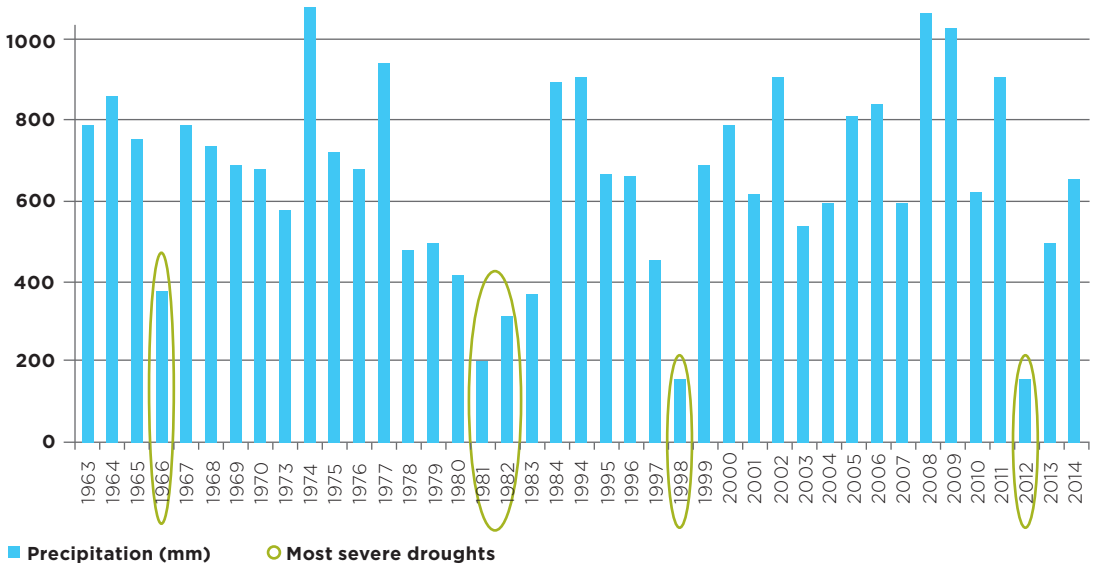
3.1 Introduction

Small-scale or family-based agriculture in the Brazilian semi-arid region is at the crossroads of a series of actual issues and tendencies. Family farmers produce most of the food consumed in the region, but they also belong to the most impoverished and marginalised social segment. Moreover, the ecosystems of the *sertão*, a unique semi-arid biome also known as *caatinga*, are degraded to such an extent that in some regions desertification is at an advanced or even critical stage. Climate change projections for the Semi-arid region suggest that there will be a significant reduction in rainfall, increased frequency and duration of droughts, and a gradual increase in mean temperatures.

It is therefore extremely important to reflect on how these tendencies interact in order to identify the conditions under which family-based agriculture can flourish. Beyond reducing or eliminating the structural marginalisation and vulnerability of family farmers, we need to understand how a stronger family farmer sector could contribute to tackling the great challenges Brazilian society is currently facing: social justice, food security and the sustainable use of its natural resources.

In fact, in recent years there have been some changes in how family farmers try to overcome their structural vulnerability in the rural parts of the Brazilian semi-arid region. This region is subject to periodical prolonged droughts, which are known locally as *estiagens* or *secas*. In a region where livelihoods depend on rain-fed farming, these climatic events frequently threatened the livelihoods of the vast majority of rural families, leading to migration and recurrent poverty.

After approximately a decade of good rainfall, from 2011 to 2014, the Brazilian semi-arid region suffered one of the worst droughts in its history. However, in comparison with previous as severe droughts, this extreme climatic event has not affected rural populations as severely. This suggests that some measures were effective in reducing their vulnerability and making livelihoods more secure.



Graph 2: Annual precipitation in the territory of Cariri, Seridó and Curimataú, Paraíba 1963–2014

Source: National Metereology Institute (INMET), Metereological Database for Teaching and Research (BDMEP)

Precipitation in the territory of Cariri, Seridó and Curimataú was estimated as the average of the two closest stations (Monteiro and Patos, Paraíba State). Data for the periods 1971–1972 and 1985–1993 is not available. Data for 2014 corresponds to January–November.

This chapter explores some of these successful measures in an attempt to understand how some forms of adaptation and strategies for reducing livelihood vulnerability came into place. The influence of emerging discourses and practices originating in historical farmers' resistance movements on these successful strategies is also investigated.

The narratives of 'Coexistence with the Semi-arid Region' and 'Agroecology-based Family Agriculture' have their roots in the historical resistance of family farmers to their social marginalisation. They have contributed to the formulation of counterproposals that, ultimately and in conjunction with new knowledge and priorities, could become a new sustainable development paradigm for the whole semi-arid region in Brazil.

This study looks at the theoretical insights and empirical evidence collected in the territory of Cariri, Seridó and Curimataú, in the State of Paraíba in north-eastern Brazil. Evidence was collected over the course of several fieldwork trips from December 2012 to May 2013 through a combination of participatory observation, interviews and focus groups with local farmers' organisations, advisory non-governmental organisations and the farmers themselves.

The chapter is structured as follows: after the introduction, section 2 provides a historical account of the economic and social fabric of the Brazilian semi-arid region, looking at how the occupation of the territory produced some of its current socio-economic and environmental characteristics. Given the importance of climate events for the region, this section also presents recent climate change projections and their expected impacts on agriculture and livelihoods. Furthermore, it shows how different views of development, which are rooted in how the region developed historically, have framed discourses and strategies for the development of the region.

Section 3 shows, from a farmer's point of view, how elements of structural vulnerability are gradually being overcome. In an analysis of evidence collected in the State of Paraíba, this section presents the principles, methods, technologies and approaches of an emerging rural development proposal as well as day-to-day activities, in order to explore how practices are embedded in alternative discourses and strategies in the region. Section 4 discusses whether these emerging alternatives are viable and how they have helped to reduce vulnerability. The limits to expanding such alternatives are also examined. Section 5 presents the main messages of the study for further research as well as policy implications.

3.2 Environmental, socio-economic and institutional changes

3.2.1 Economic and social fabric of the Brazilian Semi-arid region

The Brazilian semi-arid region extends over 8 federal states in the north-east (Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia) and over part of Minas Gerais. It covers an area of approximately 980 000 square kilometres and is inhabited by more than 22 million people or around 12 per cent of the Brazilian population. It is considered to be a rather humid semi-arid region with average annual rainfall of between 300mm and 800mm. However, due to high evaporation (aridity index), the concentration of rainfall in a relatively short three-month period, and the frequent occurrence of prolonged droughts, the region has always been regarded as arid by local populations (MMA 2007).

Before the arrival of European settlers, the region was inhabited by several nomadic indigenous groups, which used to take refuge in coastal and more humid areas whenever droughts occurred. The gradual occupation of the semi-arid region by settlers started to gain momentum from the second half of the seventeenth century onwards, when the coastal regions were becoming more affluent. As a consequence of the booming sugar trade in coastal areas, its growing population had to be supplied with food products and draught animals from the hinterland. Expeditions for gold and precious stones spurred the development of the fertile land there, which would later become enormous cattle-raising farms. This was a gradual process, and it was only at the end of the eighteenth century – 200 years after the colonisation of Brazil first got under way – that the occupation of the semi-arid region was 'consolidated' with the extinction or expulsion of the indigenous peoples and their lifestyles (Silva 2006).

The colonisation process in the region led to a development model that was initially dominated by large-scale cattle farming based on landlordism. On these large cattle farms, the foundations of family-based agriculture as a subsistence activity of farm workers and cattle breeders were laid. Limited access to fertile soils and water resources is at the origin of the profound social inequality that characterises the region and is omnipresent in public opinion with its images of impoverished people and barren earth (Silva 2006). The concentration of land ownership is evident when we consider that 90 per cent of farms occupy less than 27 per cent of the total agricultural area and are less than 100 hectares in size (IBGE 2006).

Family farming and land concentration

In the Brazilian Semi-arid Region	In the territory of Cariri, Seridó and Curimataú
■ Number of farms: more than 1,700,000 ■ 27% of farms occupy 93% of total farming area ■ 73% of farms occupy 7% of total farming area	■ Number of farms: 8,117 ■ 16% are non-family farms*, occupying 29% of total farming area ■ 84% are family farms, occupying 71% of total farming area

Table 1:
Source: IBGE (2006)

*The government of Brazil defines a family farm according to four variables: i) the area is smaller than four fiscal modules (basic unit of agricultural area, which varies from region to region, but usually assuming 5 to 110 ha); ii) it uses predominantly labour from the family; iii) the family income predominantly originates in economic activities linked to the farm; and iv) the farm is managed by the family (Law No. 11,326).

On these small farms or *sítios*, small farmers survive on family-based agriculture. The farming families cultivate mainly beans, manioc and corn during the short rainy season and supplement this by planting small vegetable gardens and raising small animals like chickens, goats, sheep, and – under favourable conditions – some heads of cattle. Food production is mainly destined for self-consumption, with any surplus being sold on local markets. Thus, the farmers' livelihoods largely depend on this rain-fed agriculture and livestock, although there is a growing tendency for off-farm diversification.

Many of these farmers' families suffer the consequences of the forced implementation of a development model that is inappropriate to their reality. The belief in the modern agriculture paradigm, which was inspired by the green revolution, led thousands of farmers to adopt 'financial-technological packages' for their properties. In order to implement the new proposals, which were generally based on the logic of access to markets for products that were produced under monoculture regimes, these farmers modified and deforested their properties, facilitated by loans from government-owned banks (Silva 2006).

However, given that the basic premises of these packages were not realised – access to abundant water resources, sufficient and fertilised soil, and dynamic markets – many farmers are now indebted and the natural resources on their farms are devastated. In this context, new proposals are emerging. Some of them are geared towards a modern family-based agriculture such as the production of tomatoes in monoculture and vertical integration for the production of poultry and eggs. Other proposals try to overcome this paradigm and are inspired by the sustainability ideas expressed in the 'Coexistence with the Semi-arid Region' concept and in the organic or agroecological production of food.

Recently, socio-political services such as small pensions for the aging population as well as direct income transfer policies, notably the *Bolsa Família* (Family Allowance), have brought substantial changes to the region by incorporating external resources into the family budget and the local economy. However, the impact of social policies is more complex. As pointed out by Costa (2010): "*the* Bolsa *Família functions as compensatory policy where the state is not capable of giving answers to poverty, unemployment and misery [...] it did not touch privileges [...] the Bolsa Família has important impacts on the reduction of the indicators for hunger and misery in the semi-arid regions. On the other hand [...]* The Bolsa Familia *that feeds the farm worker is the same that paralyses him in his struggle for emancipation and domesticates him politically".*

3.2.2 Climate change projections and expected impacts on agriculture and livelihoods

As several studies have pointed out (IPCC, 2007; Ribot et al., 2005), low and variable rainfall, the recurrence of droughts, high dependency on rain-fed agriculture, and the lack of secure access to natural resources, particularly water, makes the Brazilian semi-arid region highly vulnerable to current and future climate events. Land-use change has already impacted heavily on local agro-ecosystems and approximately 80 per cent of the caatinga biome has been subject to predatory exploration and human interventions (Castro and Cavalcante 2011). This has accelerated processes of land degradation and desertification, and it is expected that these agro-ecosystems will be put under even more pressure as a result of projected climate change impacts (Angelotti et al. 2011).

A number of studies have indicated that the climate of the semi-arid region will become even more challenging for rural populations (Marengo et al. 2009 and 2010). Cyclical droughts in the region have been associated with the occurrence of intense El Niño Southern Oscillation (ENSO) (Alves and Repelli 1992) and are expected to become more frequent. Projected climate scenarios elaborated by downscaling regional climate models indicate a substantial increase of +2.3°C in mean temperature for the region where this study took place in the period from 2041 to 2070, compared to the baseline period (1961–1990) (Alves 2013). Projections of rainfall change and the occurrence of extreme events are even more alarming. They indicate a decrease in annual rainfall by 21.1 per cent comparing the same periods and an impressive increase in consecutive dry days (CDD) by 25.8 days/year (Alves 2013). This suggests that droughts are likely to become even more frequent and severe.

Table 2

Source: field work and Alves (2013)

Climatic pattern in the territory of Cariri, Seridó and Curimataú			
	Observed		**Projected** (comparison 2041–2070 to baseline period of 1961–1990)
	Records	**Perceptions** (by rural communities)	
Temperature	No substantial changes	No substantial changes	2.3°C increase in mean temperature
Rainfall	No substantial changes. The decade from 2000 to 2010 was wetter than the two previous decades.	No substantial changes	21.1% decrease in annual rainfall
Extreme events	Occurrence of cyclical droughts (e.g., 1966, 1981–82, 1998 and 2012–2014). The most recent was also one of the longest and most severe.	Droughts are lasting longer than previously	Increase in consecutive dry days (CDD) by 25.8 days/year. Droughts are likely to become more frequent and more severe.

Given its limited irrigation facilities, these projected climatic changes are expected to impact strongly on agricultural production in the region with a direct effect on the food security of famers and their families. Studies by the Brazilian Agricultural Research Company (Embrapa) indicate that the production of manioc, corn, rice, beans, cotton and sunflower in the region is likely to suffer (Embrapa, 2008). Most of these crops are on the regional menu and account for a large share of the local population's food intake.

Moreover, during long periods of drought, agricultural activity practically ceases for the majority of smallholders. Food has to be acquired beyond the farm, and farmers are often forced to migrate on a temporary basis to find other work. Previously, they tended to migrate to the more economically dynamic centres in southern Brazil (São Paulo, Rio de Janeiro) and the capital cities of the north-east, but according to interviewees, more and more regional centres and medium-sized cities are absorbing this work force. An example of the impact of extreme climate events on local agricultural systems can be seen in the reduction of the cattle herd by one quarter in three severely affected states – Paraíba, Pernambuco and Rio Grande do Norte – during the current drought in the period from 2011 to 2012 alone (IBGE, 2013).

3.2.3 Development paradigms I: understanding the roots of 'Combating the Drought' and agricultural modernisation discourses

Historically, the colonisation of the Brazilian Semi-arid region established an agrarian pattern consisted of large-scale cattle farms and the settlement of labourers in rural areas. Family-based farming emerged in the context of those large farms as a subsistence activity for rural labourers. Already in the nineteenth century, prolonged periods of drought brought problems when they impinged on the political and economic interests of local elites and threatened the social order (Silva 2006), for example when droughts provoked rebellions of the rural population.

In the course of the nineteenth century, the issues of property relations and unequal access to valuable and scarce natural resources were neglected in the public debate, and droughts were portrayed as the main cause of the rural population's misery. In accordance with this line of reasoning, infrastructural changes focused on the capture and storage of rainwater and the construction of roads and railways were proposed by the dominant political groups as the solution to the problem. This particular understanding of the problem and solutions to it has since become associated with the discourse of 'Combating the Drought' (Silva 2006).

Moreover the state, under the influence of the emerging cotton- and cattle-farming elites and inspired by public opinion, started to channel investment for this infrastructural development. Initially, measures were taken ad-hoc. However, by the beginning of the twentieth century, the establishment of a number of state-owned institutions signalled a shift from emergency measures to more systematic interventions.

A specific government fund for the north-east was established to finance the construction of several hydraulic infrastructures, such as water reservoirs and wells. Unfortunately, this peak in investment was short-lived and the hydraulic infrastructure that was built with public funding on privately owned land mainly benefitted the cattle-raising economy and strengthened the political position of the land owners, who controlled access to water reserves (Silva 2006).

From the second half of the 1950s, the focus of development in the north-east and the semi-arid region began to change. On the one hand, it became clear that so-called 'hydraulic solutions' did not automatically bring development and affluence to the region. On the other hand, it was evident that the north-east was less developed than the south and the south-east of Brazil, where rapid industrialisation was under way. A Superintendence for the Development of the North-East (SUDENE) was created in 1959 with the goal of promoting the industrialisation of the region, along with transforming regional agriculture by modernization.

The expectations and enthusiasm generated by SUDENE did not last long. In 1964, a military coup put an end to the special attention dedicated to the development of the north-east and the semi-arid region. Some National Development Plans implemented by the military government did focus on developing industrial and irrigated agriculture, although the effectiveness of these programmes was difficult to assess as they were implemented by institutions and agents that were connected to the farming elites.

In 1983, on the verge of the re-democratisation of the country and influenced by a stronger sense of social justice, a Northeast Project was set up by the government in collaboration with civil society. It led to policies focused on poor rural communities and the strengthening of subsistence agriculture through land ownership, water infrastructures, access to credit and technology, rural technical assistance and support for commercialisation and social activism. However, the promotion of irrigation continued to be a priority in the period after the military government.

In fact, throughout the 1980s and 1990s, irrigated agriculture came to acquire industrial proportions, garnering political attention and support and leading to the establishment of what have been labelled islands of prosperity. These dynamic, export-driven and relatively small areas contrast sharply with much larger parts of the region that are marked by stagnation and a chronic agricultural crisis (Araújo 2004).

In addition to an increase in inequality, this dualistic economic system has brought some serious environmental consequences, in particular water pollution close to irrigated areas and increased desertification, which is aggravated by the salinisation of irrigated areas. A decline in agricultural and cattle-raising productivity and a loss in agrobiodiversity has been noted (MMA 2007).

It is clear that rulers and decision-makers have never given priority to small farmers as subjects of development, citizenship and rights, although they make up the vast majority of the population in the semi-arid region. These farmers have only gradually become aware of their rights to better living conditions in the context of a countermovement. In a new arrangement between rural actors, a new discourse of 'Coexistence with the Semi-arid Region' is emerging as the basis for a way of life for smallholders that is complete and without suffering.

3.2.4 Development paradigms II: the roots and proposals of the 'Coexistence with the Semi-Arid Region'

As with 'Combating the Drought', this alternative perspective on development has its roots in the history of the region. Well into the nineteenth century, the main concern of the administrators of the Semi-arid region during periods of drought was social disorder and outbreaks of violence among farm workers and migrants. In some cases, the repressed farmers

organised protest initiatives against the socio-economic order in the semi-arid region and proposals were made for a social organisation that was more in line with the needs of those farmers.

In these protests and proposals, elements of what would later become the 'Coexistence with the Semi-arid Region' paradigm for just and sustainable development were already present. This discourse was always moulded according to what was available to farmers at a particular time. At the end of the nineteenth century and the beginning of the twentieth, social imagery and political justice were imbued with popular Catholic religiosity; they were full of references to miracles, to 'new times coming', and to protecting saints. One notable historical landmark was the rebellion of the followers of the messianic priest Antonio Conselheiro. The apostleship of the charismatic religious leader Father Cicero was another example.

In the 1950s and 1960s, political discourse increasingly began to influence the social imagery of justice, especially after the experience of the Cuban revolution. In this context, social movements were organised and consolidated in what came to be called the *Peasant Leagues*. Although both the state and the church feared the leagues as radical communist organisations, some progressive sectors of the church identified with the suffering of the rural population and supported the leagues in their political actions. So-called 'fathers on the frontline' and ecclesiastic grassroots communities formed organisations linked to the church to raise awareness and bring basic education to rural communities. The military regime brutally clamped down on the activities of the farmers' leagues and persecuted league leaders. However, literacy courses, support and awareness building activities for the farmers continued under the protective mantle of the church.

Over the course of the 1980s these activities were bolstered and the farmers' struggles, now united under the flag of agrarian reform, fostered the re-democratisation of the country. In this context, the idea emerged that it is possible to live well in the semi-arid region under the following circumstances: just land ownership relations, access to water for consumption and production, valorisation of local contexts and knowledge, partnership with science, a stimulating policy environment, and social justice.

These ideas became fundamental principles that were adopted by new social actors, including farmers' organisations and representatives of civil society, the church and government bodies. In the semi-arid region, credit for translating these principles into concrete proposals and political negotiations must be given to the Articulation of the Brazilian Semi-arid region (ASA),[2] a network of civil society organisations that was established 1993. Currently, it includes more than 700 organisations. The ASA has an intense organisational dynamic that is focused on strengthening the farmers' way of life and introducing technologies that are appropriate to the conditions in the semi-arid region. Based on experiences that show that it is possible to live in the semi-arid region while respecting its limits, the coexistence concept presents itself as a new paradigm for the development of the region.

[2] *Articulation of the Brazilian Semi-arid region (Articulação Semiárido Brasileiro – ASA) is a network of several hundred civil society organisations and promoters of the coexistence model. In 2002, ASA established the legal entity Association Programme One Million Cisterns (Associação Programa Um Milhão de Cisternas – AP1MC), which is implementing a national programme for the construction of cisterns and other water harvesting social technologies on behalf of the Federal Government.*

This concept regards the population of small farmers and their families as well as their physical and social surroundings as the subject of development. Moreover, it conceives development as a process of collective social construction, during which constitutive elements are gradually introduced and internalised. The supporters of this approach claim that a transition to more 'coexistence with the Semi-arid region' can, in principle, produce surpluses, increase local and regional food sovereignty, contribute to the alimentation of urban populations, help to rehabilitate ecosystems in degraded areas, and increase resilience to the effects of climate change (ASA 2011). This is the focus of the next section, where we look at coexistence as an agricultural practice and a methodology for the transition to agroecology, based on evidence collected from farmers and their organisations in the Cariri, Curimataú and Seridó regions in the State of Paraiba.

Comparison of the 'Combating the Drought' and 'Coexistence with the Semi-arid Region' discourses

'Combating the Drought'	'Coexistence with the Semi-arid Region'
Inspired by Green revolution paradigm	Inspired by agro-ecological transition paradigm
Considers nature and local population from the perspective of their limitations	Considers nature and local population from the perspective of their potentials
Promotes agricultural techniques based on intensive use of water	Promotes agricultural techniques based on optimal use of available water
Suggests use of exotic biodiversity, few and specialised vegetable varieties and animal races that are very input-intensive	Suggests use of native biodiversity and/or biodiversity adapted to the environmental characteristics of the region
One-dimensional economic and market-oriented understanding of development	Multi-dimensional (social, ecological, economic, cultural, political) understanding of development
Sustainability analysis focuses primarily on productivity levels	Sustainability analysis integrates productivity levels, resilience, stability and autonomy
Considers the role of science as generating and transferring exogenous innovations	Believes that science and local culture construct innovations collectively

Table 3

Source: field work and Silva (2006)

3.3 Options for adapting to changing environments

The previous section discussed the historical roots of the 'Coexistence with the Semi-arid Region' (CSA) discourse. Imaginaries based on agricultural modernisation still have broad support at regional and national level. However, this mainstream development paradigm is being increasingly replaced by alternative development models that have a systemic or even holistic vision for the semi-arid region. Together with other factors, it has been suggested that strategies based on these alternative discourses have been fundamental in reducing the structural vulnerability of family farmers (ASA 2011). This section explores agroecological family-based agriculture as an alternative discourse that is closely aligned with the principles of the CSA discourse. It shows how this strategy is theoretically conceived in accordance with the perspectives of regional farmers and their organisations. It also discusses this proposition with evidence from a territory in the State of Paraíba.

3.3.1 'Coexistence with the Semi-arid Region' (CSA) and agroecological transition in the Brazilian semi-arid region: principles, vision and strategies

Local organisations' understanding of CSA and the agroecological transition is based on fundamental guiding principles with regard to sustainability. According to these principles, sustainability should be attained in five dimensions. Social sustainability denotes the democratisation of access to strategic resources and a more equal distribution of goods and services. Economic sustainability is secured by the efficient allocation of resources and the search for quality of life that should override economic profitability. Environmental sustainability is obtained on the basis of respect for the limits of ecosystems and an acknowledgment of their potential. As a central element of environmental sustainability, family-based agriculture is seen as the driving force of development in the semi-arid region. Political sustainability is obtained by way of broad participation in decision-making processes. To this end, the emergence of new collective social subjects that defend the ideals of the new paradigm in the various local, regional and national political arenas is stimulated. Cultural sustainability denotes the set of values that favour development strategies based upon dialogue with the population of the semi-arid region.

According to the organisations working on the promotion of this paradigm, it is possible to formulate a strategic vision for the promotion of agroecology. In a first phase, access to land has to be secured by means of ownership titles or formal arrangements. In a second phase, access to sufficient water for human consumption must be guaranteed by constructing family-owned cisterns. In a third phase, investments in infrastructures for the storage of larger volumes of water from rainfall, creeks and rivers are made. This allows farmers to produce their own food and thereby attain food security for their families. In this phase, emphasis is placed on capacity building for water resource management and on organic or agroecological ways of producing food that shun the use of fertilisers, genetically modified seeds and pesticides. The introduction of these technologies is strongly linked to the validation and systemisation of local knowledge (e.g. in committees and seed banks) and the strengthening of native and locally adapted species.

In this way, food security can be improved and quality of life enhanced by introducing technologies and social approaches that are in line with the possibilities and limits of the ecosystems in the semi-arid region. This depends on better cooperation between farmers and their allies. By increasing the productive base of agroecology, the main aim is to recover degraded areas and regenerate ecosystems. By the end of this process, it is expected that the family farmer will have a new social significance as an agent of local development, and be less vulnerable and more resilient as an agroecosystem administrator.

3.3.2 Evidence from Cariri, Siridó and Curimataú in the State of Paraíba

After describing the regional context and the main characteristics of the alternative discourses that assume family farmers as agents of development, this subsection examines the effectiveness of practical initiatives on the ground, paying particular attention to the farmers' perspective. It is not an assessment of the viability of agroecology-based family agriculture – this is already proven by a growing body of evidence coming from projects all over the world (e.g., Altieri and Nicholls 2006) – but rather an investigation of the changes that the introduction of technologies and practices linked to the ideas of 'coexistence with the Semi-arid region' and agroecology is bringing to rural society. It is organised in five main messages:

"Nowadays, we do not suffer from hunger as we did in the past."

Older farmers have vivid memories of the suffering caused by hunger in periods of prolonged drought. They recall how difficult it was for their parents to put food on the table and how far women and girls had to walk to get water. Nowadays, they say, things are different. Even in dry periods, people do not suffer from hunger anymore. Given that a large share of food has to be bought in dry periods, this is quite an improvement. Five factors have contributed to this: income transfer policies introduced during Lula's first presidential term (2003–2007); the wide availability of family-owned fresh-water cisterns; pension payments for the elderly that support extended families; credit programs for family-based agriculture (PRONAF); and the recent introduction of water-storage solutions for production purposes. Thus 'coexistence with the Semi-arid' and the agroecological approach contribute to food security and quality of life, but social policies continue to play a vital role in dry periods.

"Agriculture has to produce a lot to be sufficient."

Mr Chico (68) called attention to a cultural habit: when inherited, land is divided equally between children. Properties thus tend to fragment and families have to survive on the production of plots that diminish in size from one generation to the next. The challenge for agroecological family-based agriculture is therefore to increase productivity in an environment that, for the time being, will continue to be adverse due to reduced soil fertility and limited water availability and will also have to cope with gradually increasing mean temperatures.

"The place of women has changed a lot."

'Coexistence with the Semi-arid' and agroecology as well as infrastructure technologies and social approaches have increased the visibility of women's contributions. The construction of drinking-water cisterns liberates women from the task of carrying water in drought periods. However, larger water-storage facilities for production are linked to the creation of vegetable gardens close to family homes, and it is women who take care of these gardens and bring any surpluses to the market. The power relations within a given family determine whether this also leads to an increase in women's economic independence. Where community mobilisation and family support are concerned, it is female community leaders who inform the community, communicate with municipal and thematic commissions, and seek to promote a communitarian spirit. The number of women who leave the house to work, study, participate in some group, or do community work is steadily growing. These women tell us that the gender debate is increasingly taking place within the churches, community associations, and capacity-building courses promoted by civil society. However, they claim that machismo is strong and many women are still confined to the domestic sphere as wives and servants.

"The families are very much in need of knowledge."

Many families feel abandoned and no longer believe in programmes and projects or even in the mere possibility of improvements to their quality of life. People's level of self-esteem is low and their motivation to participate in activities such as community meetings is often lacking. Many families are not prepared to deal with the large volume of novelties and knowledge that the introduction of coexistence innovations brings to the community. Lately, the situation has gotten even worse – the increased scale of the programmes stretches capacity-building courses and technical assistance to their limits. According to community leaders, more systematic and regular support is urgently needed.

The work of community leaders linked to local farming organisations, such as the Regional Collective (*Coletivo Regional*), is a key factor in the success of coexistence innovations. These leaders, usually women, identify the socially vulnerable families on the margins of communities who feel little inclination to engage in participation. By talking to these families and forging a bond based on trust, these community leaders have managed to integrate such families into the programmes and helped to improve their quality of life. Community leaders are very much respected among the families that have received water-storage solutions for production.

"Climate change and ecosystem degradation are not issues of concern in the communities."

Although the farmers suffer from the effects of climate change and natural resource degradation, these issues are not addressed within the communities. The farmer's comprehension of the climate context is minimal. The reasons for this are not clear. It is possible that this level of abstraction does not generate much interest or that issues linked to land governance are prioritised. Perhaps advisory organisations do not feel prepared to discuss these issues with the community. When questioned, the farmers agree that climate change is relevant to their situation and show interest, but they do not know how to get more information in order to form an opinion and make choices for lines of action.

Cement cisterns are constructed for rain water harvesting. © Matheus Alves Zanella

3.4 Discussion

The emerging paradigm 'Coexistence with the Semi-arid Region' (CSA) is viable and has been proven to contribute to vulnerability reduction. Together with other supporting factors, actions undertaken as part of the coexistence approach have contributed to food security, increased resilience, improved quality of life, and fostered more just and democratic social relations. To date, more than 600 000 drinking-water cisterns have been built on small family farms. This has dramatically increased the availability and quality of drinking water and significantly reduced the incidence of water-borne diseases, thus improving the overall health of the rural population, especially that of infants and children.

The ready availability of fresh water for human consumption has also had a positive impact on the lives of women and teenage girls, whose workload in drought periods has now been considerably reduced. For adult women, this translates into more time for food production and community work, while teenage girls simply have more time to study and for social activities.

The installation of larger cisterns for production purposes boosts farmers' food production capacities and nutritional quality of diets. This results in a more diversified diet and larger quantities of healthier food on the table, even when drought conditions impose restrictions. While previously (i.e. before the introduction of the cisterns and capacity building) their diets consisted mainly of rice, beans, manioc, fruit and the occasional piece of meat or poultry, farmers report that nowadays vegetables and different kinds of lettuce and fruit have come to occupy a constant place in their families' daily diets. Again, the overall health of the community has benefitted most from this change of diet. The fact that farmers now control the factors that determine the availability of fresh water and food means that their vulnerability has been greatly reduced.

Moreover, rather than being introduced top-down or from the outside, 'coexistence with the Semi-arid' and agroecology in the region have been put to the test by the farmers themselves. These approaches have been perfected and then integrated into a development model as an alternative to a more exclusive and environmentally impacting industrial agriculture. This exemplifies more comprehensive adaptation measures that go beyond the implementation of technological solutions and consider changes in political processes that break with socially exclusive development patterns (Obermaier 2011).

Table 4
Source: field work

Main measures promoted by PATAC to apply 'Coexistence with the Semi-arid Region' in practice		
Measures	**On sustainable management of agrobiodiversity**	**On community-led development**
■ Construction of water harvesting systems: cisterns for drinking water, water cisterns and other storage facilities for agricultural production	■ Promotion of storing forage for drought periods ■ Facilitation of community seed banks and exchanges of seed varieties and animal races ■ Community-based research on native and locally adapted seeds ■ Identification and labelling of local genetic base	■ Farm-to-farm knowledge exchanges on locally adapted agricultural techniques ■ "Solidarity revolving funds", i.e., family-to-family, community-managed funding for small investments

However, there are barriers to it becoming the dominant development paradigm in the region. Although there are innumerable successful experiences of the transition to agroecology, the new production model only affects a small proportion of farmers, and it has yet to be seen if it can help to rehabilitate degraded areas and regenerate ecosystems that have been affected by human action and climate effects.

An understanding of the barriers to its expansion, particularly those related to governance and local decision-making processes, can shed some light on how to further promote agroecology and 'coexistence with the Semi-arid'. Firstly, it seems that leaders and supporters in communities, cities and in the territory/state feel overwhelmed and are in need of information, training, advice on planning, and adequate resources. A recent study pointed to how difficult civil society organisations find it to compete for public tenders launched by the Federal Government. The inflexibility of this process impedes innovation and may lead organisations to lose sight of their philosophy and methods when implementing 'coexistence with the Semi-arid' programmes. According to a survey conducted with several organisations in the ASA network (Bleeser 2014), the need to comply with the targets set by public tenders has undermined quality.

This situation is aggravated by the barriers to 'coexistence with the Semi-arid' and agroecology at local and municipal political levels. While a favourable environment is being created at national level – as shown by the launch of the National Policy and National Plan for Agroecology in 2013 – at state level the situation remains undefined.

The governance environment in most municipalities is plainly disinterested or even adverse. At local level, this is determined by political and economical interests that are linked to power groups connected to traditional rural elites, agricultural and cattle-farming entrepreneurs, agribusiness, or the mining industry. For many of these actors, a development inspired by the goal of agricultural modernisation seems to be the only rural development possible, and it doesn't seem to matter if it has already failed in the region or if it has been socially exclusive and damaging to the environment.

On the other hand, a growing number of communities are receptive to 'coexistence with the Semi-arid' and agroecology, thanks to the proven effectiveness of storage infrastructures and productive subsystems. Local farming organisations, such as the Regional Collective, and their supporting organisations from civil society must identify some key actors in the municipalities and the region as a whole and prioritise the task of advancing dialogue with these actors in order to turn them into allies. Given the complexity of the political-administrative situation and the variety of actors involved, what is missing is a strategic vision, training and qualification, and a positive governance environment at all levels.

Communities save native seeds, thereby conserving genetic resources. © Matheus Alves Zanella

Water is a scarce and disputed resource in the Brazilian Semi-arid. © Matheus Alves Zanella

3.5 Conclusion

Effective strategies for reducing livelihood vulnerability, such as the widespread use of small-scale water harvesting technologies, are certainly not just a question of technological deployment, but also part a historical struggle for the empowerment of previously marginalised families. As described in this chapter, alternative development discourses and practices, such as those inspired by 'coexistence with the Semi-arid region' and agroecology, did not suddenly materialise divorced from local social and economic realities. On the contrary: They are rooted in the history of the region as alternatives to the predominant development models that failed to bring sustainable and inclusive rural development to the region.

As the evidence analysed in this chapter suggests, experiences based on 'coexistence with the Semi-arid' and agroecological transitions can address pressing societal challenges such as social justice, food security, and sustainable use of resources. The study revealed important changes in terms of less incidence of chronicle hunger, variations in gender roles, and the relatively low concern attributed to climate change and ecosystem degradation from the perspective of the rural people. Additionally, it discussed major obstacles that hinder 'coexistence with the Semi-arid' and agroecological transition discourses from becoming the dominant frame of development in the region, particularly in the local governance system.

In fact, the accumulation of successful experiences at grassroots level is gradually inspiring the design and implementation of public policies, but these policies are restricted to national level. Regional and local decision-makers are less influenced by the principles and methods that these alternative development models propose. Besides finding local allies, a great challenge remains: how can the 'coexistence with the Semi-arid region' and the agroecological transition be scaled up without watering down their principles, approaches and methods or devaluing local capacities.

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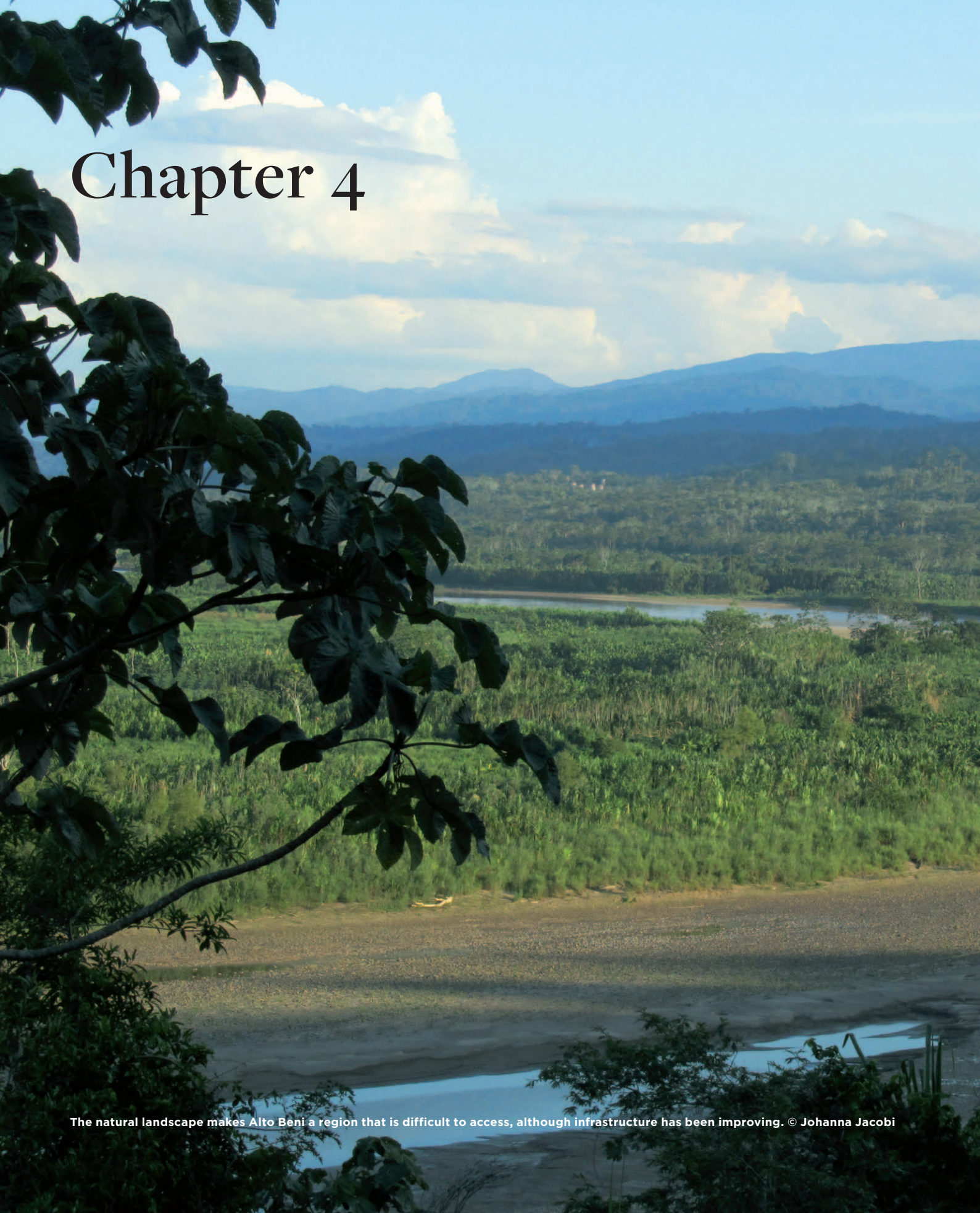
Chapter 4



The natural landscape makes Alto Beni a region that is difficult to access, although infrastructure has been improving. © Johanna Jacobi

Alternatives for the Sustainable Development of Alto Beni, Bolivia

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ABOUT CDE, FACULTY OF AGRONOMY/UMSA LA PAZ AND FUNDACIÓN PIAF-EL CEIBO

The Centre for Development and Environment (CDE) is an interdisciplinary research centre of the University of Bern, Switzerland. CDE's overarching goal is to produce and share knowledge for sustainable development cooperation with partners in the Global North and South. As part of this research, CDE has collaborated with the Faculty of Agronomy of the *Universidad Mayor de San Andrés* (UMSA), situated in La Paz, and with *Fundación PIAF-El Ceibo*.

Fundación PIAF was created by the Central do Cooperatives El Ceibo as a non-profit organization serving the needs of cooperatives and their families. One of its main activities consists of providing technical assistance and fostering the sharing of knowledge among the cocoa producers of Alto Beni. The foundation is also responsible for monitoring compliance with organic agriculture standards, providing micro-credits and managing social support programs, such as health, education and retirement programs.

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4.1 Introduction

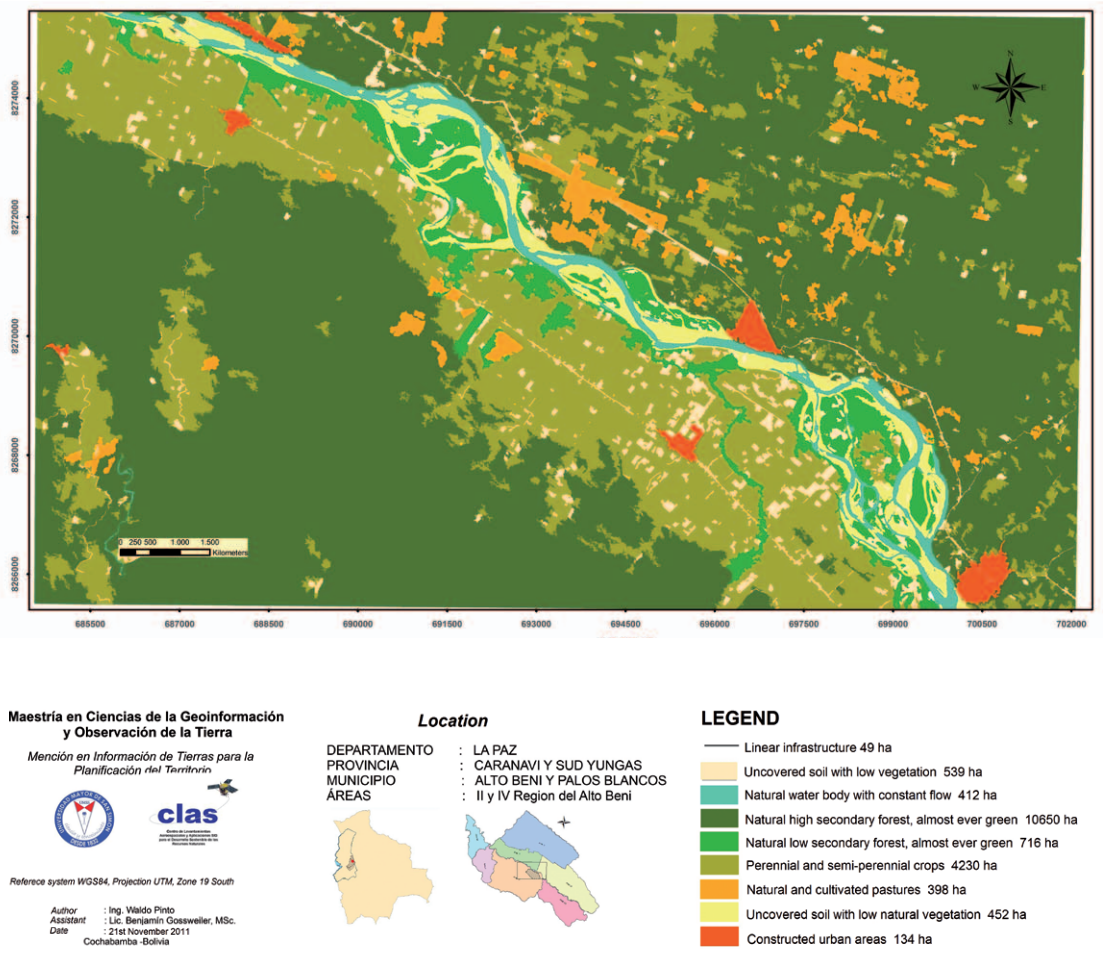
The mountainous rainforests of the Bolivian Yungas are part of the Tropical Andes Biodiversity Hotspot (Myers et al. 2000). The climate is rainy-tropical with a dryer season in winter. The mean temperature is about 26°C and annual precipitation is about 1500 mm (Somarriba and Trujillo 2005). Most parts are not easily accessible and settlements are concentrated along the few roads crossing the Andes to the Amazon.

The region of Alto Beni, part of the Yungas and the site of the research for this case study, is located where the Andes hit the Amazon at an altitude of 450–800 m. The distance by road to the capital La Paz is about 270 km, which takes about 7 hours under normal conditions. Landslides, road blocks, and frequent accidents make the journey long and dangerous.

Alto Beni has long been inhabited only by small groups of local indigenous Amerindians, the *Moseténes*, who lived as hunter-gatherers until Franciscan monks made them settle down in the 18th century and introduced the cocoa tree and other crops to the region (Elbers 2002). Starting in the 1960s, the Bolivian government encouraged *Aymara* and *Quechua* peasants from the *Altiplano* (Andean Plateau) to colonize the region, by providing incentives such as direct payments, land titles, agricultural equipment, and food supplies (Elbers 2002). Today the Alto Benian population is estimated at 23,000 inhabitants, the vast majority of whom are indigenous settlers from the highlands (von Stosch 2010). Most households in the region depend on agricultural production for both subsistence and commercialization, composed of a mix of annual and perennial crops, such as citrus, papaya, cocoa, banana, plantain, rice, and cassava.

The most common land-use system is slash-and-burn-based shifting cultivation with an agricultural frontier that is moving more and more into the remaining primary rainforests, leading to a continuous loss of biodiversity. Most agricultural practices are not well adapted to the ecosystem: they are predominately monocultures and soils are left bare between crops, leading to soil erosion and, increasingly, to land degradation. Forestry practices are also not well adapted: high value timber trees are extracted without replacement, and, according to local farmers, there are often no seed-bearing trees left of certain species. Mahogany, for example, used to be an important component of the local ecosystem but now has almost entirely vanished from the region.

The agriculture and forestry based livelihoods of the Alto Benian population are therefore under increasing threat from internal and external factors that are likely to degrade the natural resources which the people depend on, either over the short term or the long term. Furthermore, deforestation and the conversion of forest to agricultural land contribute considerably to global greenhouse gas emissions (IPCC 2007).



Graph 1: Land use cover in Alto Beni

Source: Pinto (2011)

Taking into account these dynamics, the present case study focused on one production system that offers an appropriate alternative to the agroecosystem prevalent in the region: agroforestry systems. These systems have been promoted and implemented by researchers and development agencies in Alto Beni since the 1980s and can be sustainable in ecological as well as in economic and social terms, if well managed. Organic and fair trade certification of cocoa cultivated under agroforestry has a great potential to improve family incomes and to reduce poverty in the region (Jacobi 2013). The present study also addressed the barriers to the wide-scale adoption of these more sustainable systems in Alto Beni, looking particularly at those barriers related to governance. To this end, more than 30 external and internal actors influencing the use of natural resources in the region were identified and interviewed during in May and June 2013, complementing the already existing literature on different forms of resource use in Alto Beni. The interviews focused on the activities and rationales local actors have developed, their opportunities to change governance patterns regarding resource use, and the role of climate change for their resource use activities. Furthermore, this research profited from results from an interdisciplinary research project in Alto Beni on the role of organic certification for social-ecological resilience building in the context of climate change (Jacobi 2013).

4.2 Environmental, socio-economic and institutional changes

4.2.1 Climate change projections

Most livelihoods in Alto Beni are based on farming, both for subsistence and for commercialization. Monoculture cropping and degraded soils, newly arriving plant diseases, low prices for agricultural products, and competition with other types of resource use put farming livelihoods at risk. It is expected that in coming years the local agroecosystem will be under even more pressure due to predicted climate change impacts (World Bank 2009, Jacobi et al. 2013a).

Given the relatively recent occupation of the area, climate data are only existent from the 1960s onwards and therefore too recent for drawing conclusions about long-term trends. However, the existing data show that extreme temperatures in summer have been increasing from extremes of 37–38°C in the 1960s and 1970s to extremes regularly exceeding 40°C in the 2000s (Jacobi et al. 2013b). The closest meteorological station with more long-standing monthly data is located in Rurrenabaque, on average 200 km north of the region, which shows no statistically significant changes in mean temperature trend for the period of 1948–1990. For mean monthly precipitation, however, the recorded observations show a significant, albeit small increase of 4.71 mm/year per decade (Andersen and Verner, 2009).

The recorded observations are in line with the perceptions of local populations from Alto Beni. Several interviewed groups consistently declared that heat is increasing, and the rainfall period is becoming shorter, more unpredictable, and more intense. Along with land-use changes, this has been identified as a source of increasing soil erosion and disasters such as landslides and flash flooding. Interviewees also indicated that productive cycles, particularly for fruit production, have been affected by these changes. Moreover, they stated that their labour force was affected by increasing temperatures, for example, that it was no longer possible to work on the plots around noon, which makes them lose several potential working hours every day (Jacobi et al., 2013b).

> "Dry spells are becoming more frequent. Sometimes, it looks like the climate is becoming crazy, and we farmers are guided by the climate. For instance, flor de mayo should bloom in May, but today it blooms in February."

Box 1: Statement by Yesenia Durán, banana producer

Projected climate scenarios for the region suggest that local populations will be increasingly faced with changes in current climate patterns. Climate change projections[2] derived through downscaling of regional climate models indicate a substantial increase of +3.5°C in mean temperature for Alto Beni in the period from 2041 to 2070, compared to the baseline period (1961–1990) (Alves, 2013). Projections also indicate an annual rainfall decrease of 13.5% for the same periods, although rainfall is expected to proportionally decrease during rainy season (December to February) and increase during dry season (June to

August). Some indicators also suggest more occurrences of dry spells (consecutive dry days – CDD – increases by 2.1 days/year) and flooding (annual maximum consecutive 5-day precipitation total that could lead to flooding – R5XDay – increases by 4.0 mm/year) (Alves, 2013).

In summary, projected scenarios suggest an increase of events that local populations already say they have observed, such as more unpredictable rainfall periods with shorter and more intense rains.

Climatic pattern in the Territory of Cariri, Seridó and Curimataú

	Observed		Projected (comparison 2041–2070 to baseline period of 1961–1990)
	Records	**Perceptions** (by rural communities)	
Temperature	No substantial changes in mean temperature (1948–1990)	Heat is increasing, the evenings, in particular, are becoming warmer.	3.5 °C increase in mean temperature
Rainfall	Slight increase of 4.71mm/decade in mean annual precipitation (1948–1990)	Rainfall period is becoming shorter, more unpredictable and more intense	13.5% decrease in annual rainfall, but proportionally decrease in rainy season and increase in dry season
Extreme events	Extreme temperatures in summer have been increasing from extremes of 37–38°C in the 1960s and 1970s to regularly exceeding 40°C in the 2000s.	Along with land-use changes, more intense rains are indicated as causes of disasters such as landslides and flash flooding	More occurrence of dry spells (increase of consecutive dry days – CDD – by 2.5 days/year) and flooding events (annual maximum consecutive 5-day precipitation total that could lead to flooding – R5XDay – is increasing by 4.0 mm/year)

Table 1

Source: Alves (2013), Andersen and Verner (2009) and field work

All of these impacts have great influence on the agricultural production in the region, since the farming families' livelihoods are mostly based on fruit production and are thus very vulnerable to climate change impacts such as changes in temperature and humidity. Cocoa, one of the main cash crops of Alto Beni, is most sensitive to climate variability, especially prolonged dry seasons. According to Anim-Kwapong and Frimpong (2010), water stress easily results in considerably lower cocoa yields and an increase in mirid damage. Cocoa is also susceptible to changes in the hours of sunlight, temperature, and soil conditions; additionally, changes in the climate are expected to alter the global distribution, stages, and development of pests and pathogens (Anim-Kwapong and Frimpong 2010).

The flowering and maturation of other types of fruit is also extremely susceptible to changes in the local climate: Mango, for example, needs a rather dry weather before and during blossoming for abundant fruit development and does not tolerate excessive rainfall and low temperatures during the flowering and fruit ripening period, which result in abortion of the fruit (Staphit et al. 2012). Papaya is especially susceptible to wind and to long dry periods. The increase in extreme weather events, heavy rainfall, and droughts is predicted to have a negative effect on fruit production in Alto Beni, including cocoa, citrus, papaya, banana, and mango. In a region where livelihoods are so dependent on crops, the vulnerability of residents is expected to increase along with the intensity and frequency of natural threats.

4.2.2 Land-use changes

Alto Beni was originally inhabited by groups of hunter-gatherers, but planned agrarian colonization since the1960s has brought about substantial changes in land use. Alto Beni has an area of 270,000 ha; this is not an administrative unit, but refers to the upper valley of the Rio Beni, which comprises the municipalities of Palos Blancos and Alto Beni (former part of Caranavi). During the process of planned colonization in the 1960s, about 1500 *Aymara* and *Quechua* families from the *Altiplano* (Andean Plateau) moved to Alto Beni. About half of them later left the region due to the problems they faced regarding diseases, difficulties in cultivation, and the huge differences of cultural and daily life compared to the *Altiplano*, among other reasons.

In addition, more than 7000 families from the *Altiplano* settled spontaneously in the region by their own initiative. Almost half of the population of Alto Beni are now *Aymara*, 20% are *Quechua*, 22% are non-indigenous, and about 10% belong to the local indigenous group, the *Moseténes* (von Stosch 2010).

The *Moseténes* were granted a common land title of 100,000 ha in 2001, the *Tierra Comunitaria de Orígen* (TCO)[3] Mosetén, with the main objectives of preventing their displacement and allowing them to live according to their traditions and principles. However, intrusion by colonizers and other actors into the TCO causes frequent conflicts (von Stosch, 2010). The *Moseténes* had founded an organization in 1994 to claim their ancestors' territory and to represent their interests (OPIM), as well as another organization to defend the interests of Mosetén women (OMIM). After their principal achievement, the official recognition of their land as TCO, they now represent the *Moseténes* and manage how the TCO is used.

Inside the TCO, land and related natural resources are managed in two systems: i) communal, where access and use is decided collectively or through permission requested from the community; and ii) private; although private plots are not formally registered, informal agreements between community members set up boundaries in which use is decided by one family only. Their livelihoods today are dominated by timber extraction and small scale agriculture, mostly focusing on rice, banana, plantain, citrus, and other fruits. Hunting and fishing remain also important activities. Focus is placed on subsistence, but cash crops like cocoa are gaining importance. Additional incomes or exchange of goods is obtained by building traditional houses and handicrafts.

The livelihoods of the colonizers (mostly represented by the organization *Federación Agro Ecológica de Comunidades de Alto Beni* – FAECAB) are less diverse and more focused on cash crops such as cocoa, papaya, banana, and citrus. Here, private land management is the norm and the typical size of land units – 12 ha – is derived from the colonization process. Usually, only about 7 ha are under cultivation, as not all parts of the land are adequate for cultivation and labour force is limited. Most families have additional off-farm income sources, e.g., from transport or small grocery stores, thereby diffusing the impact of income loss due to crop failure. The poor infrastructure, frequent road blocks, and poorly developed market chains inhibit the commercialization of the wide range of agricultural products from Alto Beni in the capital La Paz (which is the nearest large city), although there is a high potential especially for fruit trade (German Development Service 2010).

[3] *In 2009 legislation was reformed and all TCOs received the designation* Territorios Indigenas Originario Campesinos *(TIOC).*

4.3 Options for adapting to the changing environments

4.3.1 Agroforestry systems as an adaptation option

As an alternative to monocultures in shifting cultivation, agroforestry systems have been recommended and implemented by scientists, extension services, development organizations and farmers' organizations worldwide (Stepler and Nair 1987, Nair 1992). Project reports, research studies, and farmers' interviews show that agroforestry can be a viable and sustainable alternative to the non-sustainable land-use systems that are currently predominant (Jacobi et al. 2013a). Diversified agroforestry systems have a great potential to reduce fundamental vulnerability sources such as yield loss, biodiversity loss, food price hikes, soil degradation, and climate impacts. Agroforestry seems even more appropriate as an adaptation option for Alto Beni populations, given the high dependence of their livelihoods on the natural resources.

Agroforestry systems can increase incomes through a diversified production of high quality products. In the case of cocoa agroforestry, this could mean that families produce a cash crop, shaded with fruit and banana trees – which generates an income throughout the year whereas cocoa only provides an income during 2–3 months – and high-value timber trees – which accumulate value over time, functioning like a savings account for the farming family (Tscharntke et al. 2011, Somarriba and Beer 2011).

Diversified production is important for the in-situ conservation of agricultural biodiversity, and it enhances food sovereignty and the diversification of the farming families' diet. Soil fertility can be increased through a high input of organic material from pruning, and the soil is not left bare as it is often the case in monocultures. Shade trees protect the other plants from extreme weather events. Water stress was shown to be less in agroforestry systems and pests and diseases are reduced due to abundant antagonists (Altieri and Nicholls 2006). Furthermore, agroforestry systems have a high carbon sequestration potential, which is important in the context of climate change mitigation (Nair et al. 2009).

Table 2
Source: Jacobi (2013)

Comparison of agroforestry systems and monocultures in Alto Beni

Features	Agroforestry systems	Monocultures
Tree and crop diversity	Cocoa Coffee Banana Papaya Citrus trees Pineapple Timber trees Fruit trees Medicinal plants ... (a total of 142 tree and crop species found on 38 agroforestry farms)	Cocoa *or* Banana *or* Papaya *or* Citrus trees *or* Rice *or* Manioc
Cocoa yields	466.6 tons per year per hectare	350 tons per year per hectare
Certification	Mostly with organic certification	Mostly without certification
Farmers' organisations	Most farmers are members of a cooperative and/or other farmers' organization.	Most farmers are not affiliated to farmers' organizations.
Advantages according to farmers	Better soil fertility and restores depleted soils, higher water availability, farmers can work in the shade, shade is better for cocoa trees, diversity of products, additional income from timber and fruits, diversified diet, higher resilience to climate change, less susceptible to certain cocoa diseases	Higher yields in the short term (if external inputs are available), less labor input, easier to manage, less susceptible to certain cocoa diseases
Disadvantages according to farmers	More labor input, knowledge-intensive, restricted availability of plants and seeds, markets only developed for cocoa, citrus, banana, and timber	Soil erosion and degradation, susceptible to droughts and extreme weather events, dependency on cocoa price, risk of yield loss
Main constraints	Labour intensity, limited market access for diversified products	Susceptible to pests and diseases, soil depletion, climate impacts

4.3.2 Understanding livelihood decisions

Although the previously mentioned advantages of agroforestry systems in reducing vulnerability sources were already identified in studies in the region (Jacobi 2013a), less sustainable production systems such as cocoa monocultures are still predominant in Alto Beni's landscape. Livelihood decisions are complex and subject to a myriad of factors. Apart from small-scale agriculture – the predominant activity for the majority of the population – livelihood diversification towards the service sectors seems to be a recurrent strategy for many families, serving for both risk reduction and generation of complementary income. When choosing which type of agricultural production to implement, farmers indicated three main criteria: profitability, soil potential, and secure market access. Parental influence and natural tendency of some farmers to innovate were also suggested as factors influencing the decision.

These results suggest that farmers' own environmental concerns seem to have a minor role in their production decisions, at least compared to economic factors. The majority of our interviewees (especially farmers) described themselves as very aware of environmental issues, although many had production systems – such as papaya and citrus cultivation in monocultures – which are more likely to cause soil degradation when conducted without soil protection measures.

Other actors such as informal forest loggers and *Moseténes* (who were allowed to extract timber from the TCO under the condition that they pay a sales tax to the Mosetén community) also indicated awareness of the consequences of their activities on natural resources, but emphasized the economic pressure that

forced them to extract timber. It was mentioned that logging is a relatively easy way of making money, and that others would extract the timber if they did not – a dilemma commonly found in many forest-rich regions. Most of the farmers interviewed stated the necessity of planting trees, not only to halt soil degradation, but also to help to preserve biodiversity and adapt to climate change. However, they stated that more capacity building on sustainable agriculture was needed to enable more sustainable resource use, as well as "integrative support", referring to better support not only for shifting cultivation systems, but also for market chain development, including and enhancing processing and transport.

4.3.3 The role of supportive organizations in agroforestry adoption

As agroforestry systems are knowledge intensive, local organizations that enhance knowledge exchange and organize extension services are crucial to support their implementation. In the case of Alto Beni, farmers' cooperatives such as *El Ceibo* and *Banabeni* have shown that cooperatives enable a social network as well as a knowledge network, which supports adoption and management of agroforestry systems. In fact, the main factor sustaining long term success of agroforestry adoption seems to be the farmers' cooperatives.

El Ceibo, which functions as an umbrella organization for organic cocoa producers in Alto Beni, was a local initiative founded in 1977 and later received external support from development organizations. In 2013, they had approximately 1300 member families in 49 cooperatives. Members receive a premium price for their cocoa (through organic and fair trade certification), and the organization has a bank with low interest loans, a store with equipment for cocoa production, a regular radio program and courses on sustainable cocoa cultivation, as well as an agricultural consultant for each of the seven areas of Alto Beni. Regular assemblies take decisions in a democratic way: Assemblies are organized regularly and all cooperative representatives have right to speak and vote. Bebbington (1996) describes spill-over effects of the umbrella organization of cocoa cooperatives on the entire region through higher cocoa prices, a transport system, and better market integration of Alto Beni with the surrounding region, particularly La Paz. The role of their extension services is especially important as they support farmers in managing agroforestry systems by pruning high trees with equipment that farmers often do not have at their disposal, and they give advice in case of severe infestations with pests or plant diseases. This could be observed during our research in the case of the newly arrived fungal disease black pod rot (*Moniliophthora roreri*), which can cause yield losses of up to 100%. *El Ceibo* organized courses and events on organic control of the disease in all areas and supported the farmers in the implementation control measures. Although the disease is still a serious problem in Alto Beni, the assistance offered by *El Ceibo* to their cooperatives and individual cocoa farmers may have contributed to a reduction of their vulnerability. Another important point regarding the level of implementing agroforestry systems was the commitment by the cocoa farmers and other stakeholders involved, e.g., *El Ceibo* staff and agricultural consultants. Most *El Ceibo* staff are also cocoa farmers and rotate every four years so that they do not lose contact with the farmers' reality.

In summary, internal as well as external organizations were extremely important in helping farmers' groups, such as organic cocoa farmers, to organize themselves. Farmers organized in cooperatives were more able to represent their interests in local decision-making. They were also better placed to identify opportunities for receiving external support, leading to more sustainable resource use practices. This can be seen particularly in programs implemented by local governments, such as water catchment area protection, reforestation, and agroforestry. Awareness of agroforestry as an environmentally friendly and economically viable alternative to common land use systems is clearly created with the help of many different internal and external organizations. We regard this as a key factor to supporting sustainable resource use, as different aspects of livelihood strategies require different fields of expertise and different forms of support. Therefore synergies between different organizations are needed in order to, for example, change agricultural systems and adopt methods that use the natural resource base more sustainably. Unfortunately, however, our interviews indicate that various organizations often develop similar projects without coordination or information exchange. For instance, interviewees indicated that reforestation projects

were conducted by both local municipalities as well as by farmers' organizations without any coordination between the two.

Additionally, lack of the "integrative support" mentioned by interviewees may be one of the most important reasons why potentially sustainable production systems are still not widely adopted and why less sustainable production systems, such as papaya or citrus monocultures, are dominant in the landscape. As an example, interviewees noted the difficulty of selling agroforestry products (except the main cash crop and timber) because it is harder to commercialize small quantities of a variety of fruits. Close cooperation between different organizations could not only support sustainable production in agroforestry systems, but also the processing of agroforestry products (e.g., the production of fruit pulp, juices, dehydrated fruit in solar dryers...), their certification, transportation, and access to markets.

However, the lack of organizational support and cooperation between organizations was not the only problem mentioned in our interviews. Besides a lack of knowledge on how to implement and to manage agroforestry systems (Jacobi et al. 2013a), interviewees mentioned other reasons impeding a wide adoption of agroforestry systems. Since *El Ceibo* is as a well-developed organization with common possessions such as a chocolate factory, it requires a fairly high entry fee, so that the initial investment to profit from their networks and support was rather high. Further, financial incentives for agroforestry were low and the benefits mostly long-term (e.g., high-value timber trees), which makes it difficult to respond to the people's short-term needs.

Agricultural products from Alto Beni are shown in a local fair. © Maria Isabel Pillco Mariscal

4.4 Discussion

The experience of Alto Beni cooperatives in promoting the adoption of more sustainable agricultural production systems such as agroforestry demonstrates that even when technological solutions exist for addressing fundamental vulnerability sources, they face fundamental challenges in becoming mainstream.

In the context of Alto Beni, agroforestry is not an experiment any longer.[4] It has already a history and a number of farmers have applied its principles, many organized in the cooperatives. And as indicated before, due to the additional income sources, improved soil fertility, and other benefits, it has great potential to reduce vulnerability to exogenous changes, such as those brought by the shorter and more unpredictable rainy season predicted in climate change projections. Therefore, when addressing vulnerability sources in the context of Alto Beni, the question is no longer whether agroforestry can serve as an option for adaptation, but how to create incentives and reduce the barriers that inhibit its widespread adoption.

This study has identified some factors that impede the mainstream adoption of agroforestry and other more sustainable agricultural production systems. Among those, the lack of concerted action between the different supportive organizations is important. Dealing with different organizations and projects results in higher transaction costs for farmers, since they have to spend time and energy interacting with multiple different agents when receiving support for or implementing a project. It also inhibits the creation of synergies between different public interventions.

To some extent, this is clearly an issue to be addressed at the local governance level. Our research indicated that asymmetric power distribution between the different actors and their organizations is not as a major hindrance to better coordination – at least compared to other contexts where power disputes are more evident. This indicates that solving this lack of coordination is less costly than in rural areas where higher competition between groups is found. It seems to be a matter of willingness to collaborate; this could be improved by helping the different organizations see the benefit of it.

This is related to another point identified in the study, mentioned by interviewees as the need for "integrative support", that is, support which does not focus on ad hoc interventions through small projects, but which consolidates support in a comprehensive strategy that includes the development of the whole value chain. In the case of agriculture, this not only refers to sustainable cultivation, but also to processing, transport, and commercialization of products, among others. In Alto Beni, *El Ceibo* managed to cover many different aspects with the cash crop cocoa, with a strategy based on two essential pillars. First, a foundation (*Fundación PIAF*), controlled by *El Ceibo*, which for many years has been responsible for providing technical assistance, organizing knowledge sharing activities, and monitoring compliance with organic agriculture standards. Second, an agroindustry dedicated for processing the raw material, therefore increasing value added and consequently income generation.

[4] *In fact, one could argue that it has never been experimental, given the basis of this principle in techniques derived from traditional and indigenous agricultural systems (Milz 2010).*

However, there are disadvantages to concentrating these essential services in a single organization, for instance the high entry fee *El Ceibo* charges for new members. The concentration of power can also lead to less transparency, which was also indicated by some interviewees. A potential solution could be to decentralize decision-making in large organizations and to build new organizations following the example of successful organizations, e.g., a central of cooperatives for fruit from agroforestry systems. The cooperation and exchange between different organizations touching different livelihood aspects of local populations seems of utmost importance to encourage more sustainable resource use.

The study also identified the lack of financial incentives for agroforestry adoption. In other words, less sustainable agricultural activities, such as papaya or citrus cultivation in monocultures, or timber extraction from forests continue to be more profitable, at least in the short term. Here is one of the main challenges for promoting more sustainable agricultural systems. Financial pay-offs for these alternative systems usually take more time to consolidate and can be less secure than already established forms of resource use – as is the case with timber provision in agroforestry. Premium prices such as those guaranteed by organic or fair trade certification are ways of creating an additional financial incentives for farmers. But, as experience in Alto Beni shows, they might not be sufficient for inducing a more widespread shift from monocultures to agroforestry. Addressing the challenge of creating more financial incentives – such as payments for ecosystem services suggested by some farmers – or establishing disincentives for less sustainable farming methods seems to be rather difficult given the policy of the government, which refuse payments from carbon credits without offering either incentives for sustainable farming practices themselves, or supporting organizations that control illegal forest logging and timber extraction.

One option, namely payments for ecosystem services (PES), has been rather problematic in Bolivia. At the discourse level, PES have been associated with processes of *commodification* of nature (Kosoy and Corbera, 2010) and it has met resistance from many groups arguing for more comprehensive and holistic nature values, such as "non-commercialization of nature". Although the criticism is less pronounced at the local level than in the regional or national context, it indicates few chances of development given the current political context. Another alternative for incentivizing sustainable resource use systems or promoting awareness among consumers could be environmental subsidies. In the case of agroforestry, they could finance the initial implementation phase, which is more costly, until the system is established and returns become more evenly distributed.

Our findings lead us to the conclusion that overcoming some of the barriers for promoting widespread adoption of more sustainable systems such as agroforestry could be tackled at the local governance level with relatively less complexity than other more fundamental challenges. More research is needed to address the structural reasons that success cases such as *El Ceibo* from being adopted on a large scale. A better understanding of the institutional settings and the organizations and the political economy of incentives and disincentives could shed light on how to develop the integrative support that farmers declared necessary for fundamentally changing the Alto Beni landscape, local people's vulnerabilities, and therefore its future.

4.5 Conclusion

The development of alternative and sustainable development pathways is one of the greatest challenges many rural populations are facing as climate variability increases and social vulnerabilities persist. Alto Beni is an example of how the livelihoods of a whole region can be dependent on how natural resources are governed. In this context, a strategy for promoting pro-poor resource governance would require addressing the current unsustainable agricultural practices and offering methods of using the natural resource bases in which rights and livelihoods are secure and sustainable development is promoted for Alto Beni populations.

This chapter discussed one successful option for adapting to this changing environment, namely agroforestry, which however, continues to be used to a limited degree in comparison with less sustainable systems. The experience of agroforestry in Alto Beni demonstrates that solutions adapted to and co-developed by smallholder farmers already exist and they can surely improve the livelihoods of poor rural people and make them more resilient. It also shows the significant barriers found at the governance level for supporting a higher adoption rate of more sustainable agricultural systems.

Finally, it demonstrated how the existence of strong self-organized bodies of small-scale farmers can be crucial to spreading sustainable resource use and, even more importantly, empowering local populations to take charge of their own development. Indeed, it is the existence of these organizations which enables the social and knowledge network necessary for diffusion of knowledge intensive systems, such as the case of agroforestry. Our case study shows that external support for setting up these organizations is certainly needed, but in a way that the development control remained in the hands of the local population.

Papayas and other fruit are bought by middlemen. © Maria Isabel Pillco Mariscal

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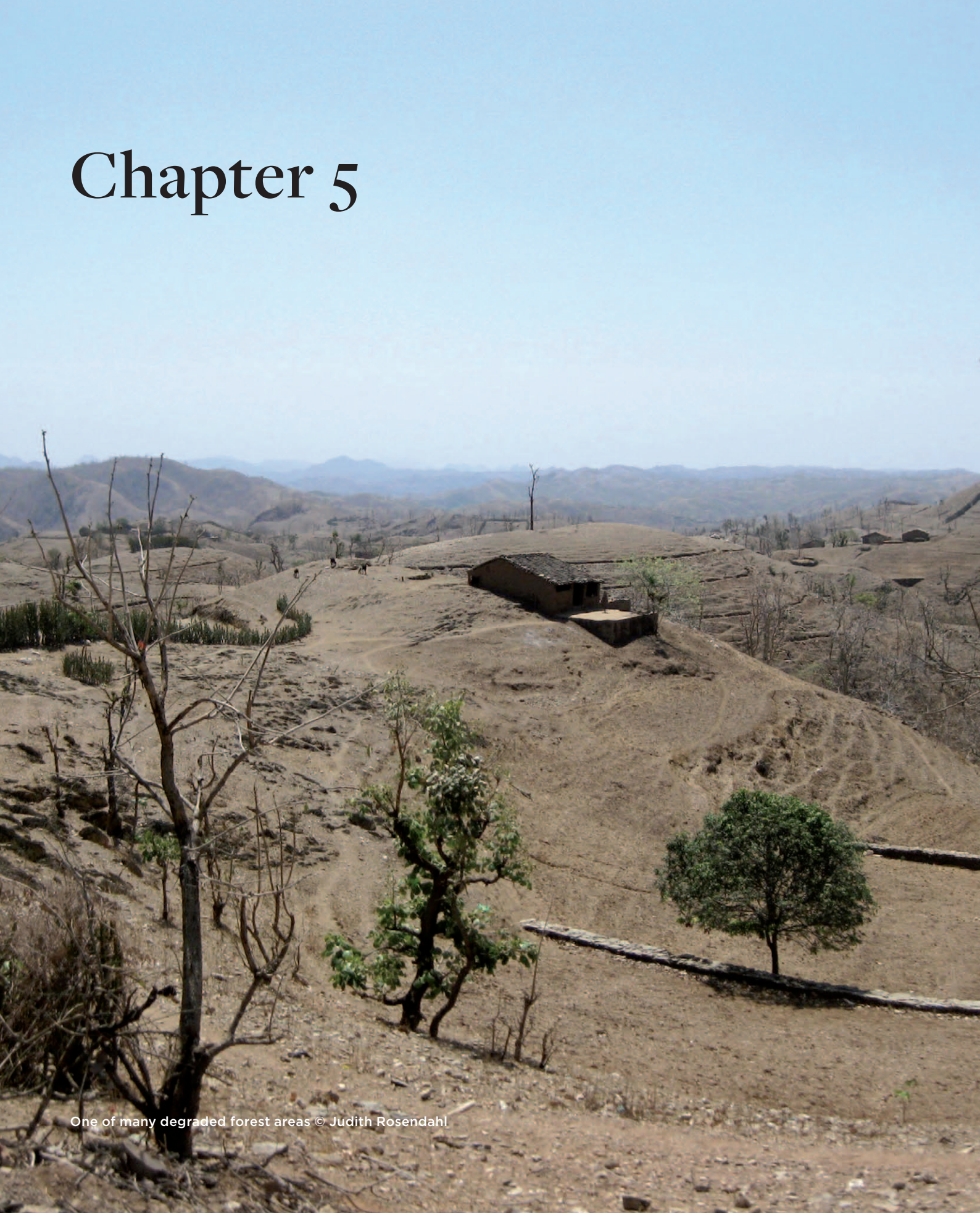
Chapter 5



One of many degraded forest areas © Judith Rosendahl

Community-based Management of Common Land in Southern Rajasthan, India

Authors: Rimjhim Pandey [a, 1, 2], Shailendra Tiwari [a], Judith Rosendahl [b]

ABOUT SEVA MANDIR

Founded in 1968, Seva Mandir is an Indian non-profit organisation that has been working for 40 years with the rural, predominantly tribal population in the Udaipur district of Southern Rajasthan. Seva Mandir's work centres on efforts to strengthen cooperation and a sense of solidarity among communities with the goal of improving social equity and increasing resilience to climate change. The organisation carries out activities in 626 villages and 56 urban settlements.

Seva Mandir supports communities in the (re-)establishment of common lands through often prolonged negotiations that aim to halt privatisation, develop and protect degraded lands, and put equitable benefit-sharing mechanisms in place.

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5.1 Introduction

In recent years, India has often been cited as a showcase of an emerging economy. The country's economic indicators are indeed impressive: it is one of the world's fastest growing economies and, in terms of purchasing power (PPP), the third largest economy in the world (IMF, 2012). However, these figures should be seen in relation to the living conditions of most of the population. One third of Indians continue to live below the poverty line and 53.7 per cent are considered poor according to the Multidimensional Poverty Index (MPI 2011). Large numbers of these people live in rural areas, and poverty is worst among members of scheduled castes and tribes (IFAD). Lack of access to productive assets is a major cause of poverty among India's rural population.

The State of Rajasthan in the north-west is one of the poorest areas of the country. Three quarters of its 68 million inhabitants live in rural areas and depend largely on natural resources for their livelihoods. According to the MPI, 62.8 per cent of the state's population is poor. There is a high percentage of scheduled castes and tribes in this region (19.2 and 13 per cent respectively), and they are the poorest of the poor.[3]

Poverty and scheduled castes and tribes in India and Rajasthan

	National average	Rajasthan
Incidence of poverty (MPI, based on data from 2005)	55.4%	64.2%
Scheduled castes/scheduled tribes	16.6%/8.6% (2001)	19.2%/13%

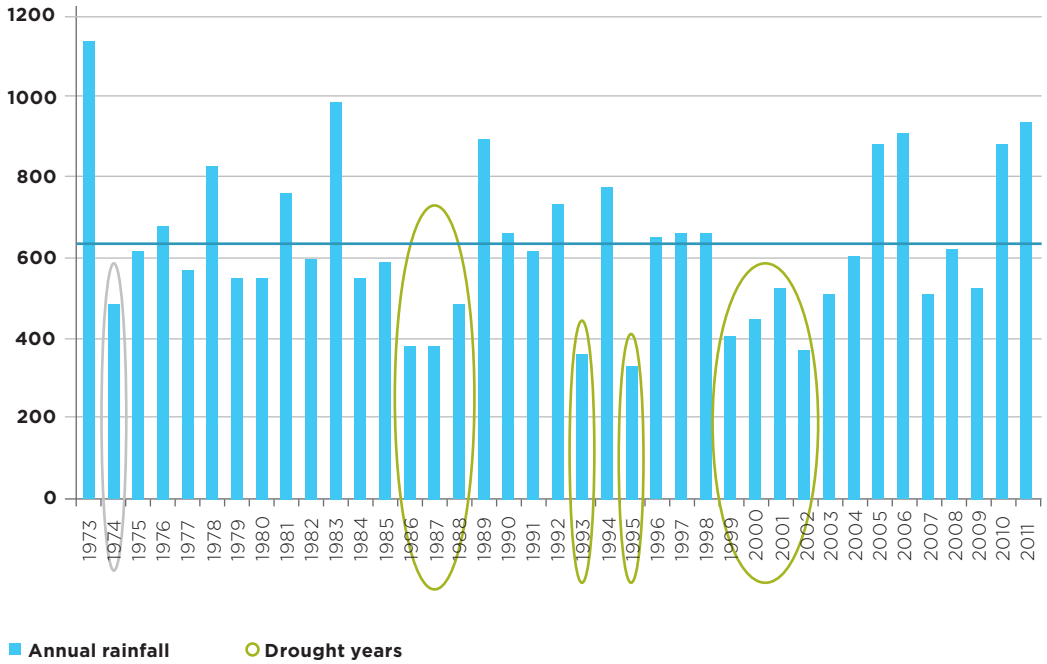
Table 1

Source: Government of India and Seva Mandir

[3] *In 2005, these groups accounted for 80 per cent of India's rural poor, although they represent a much smaller proportion of the total rural population.*

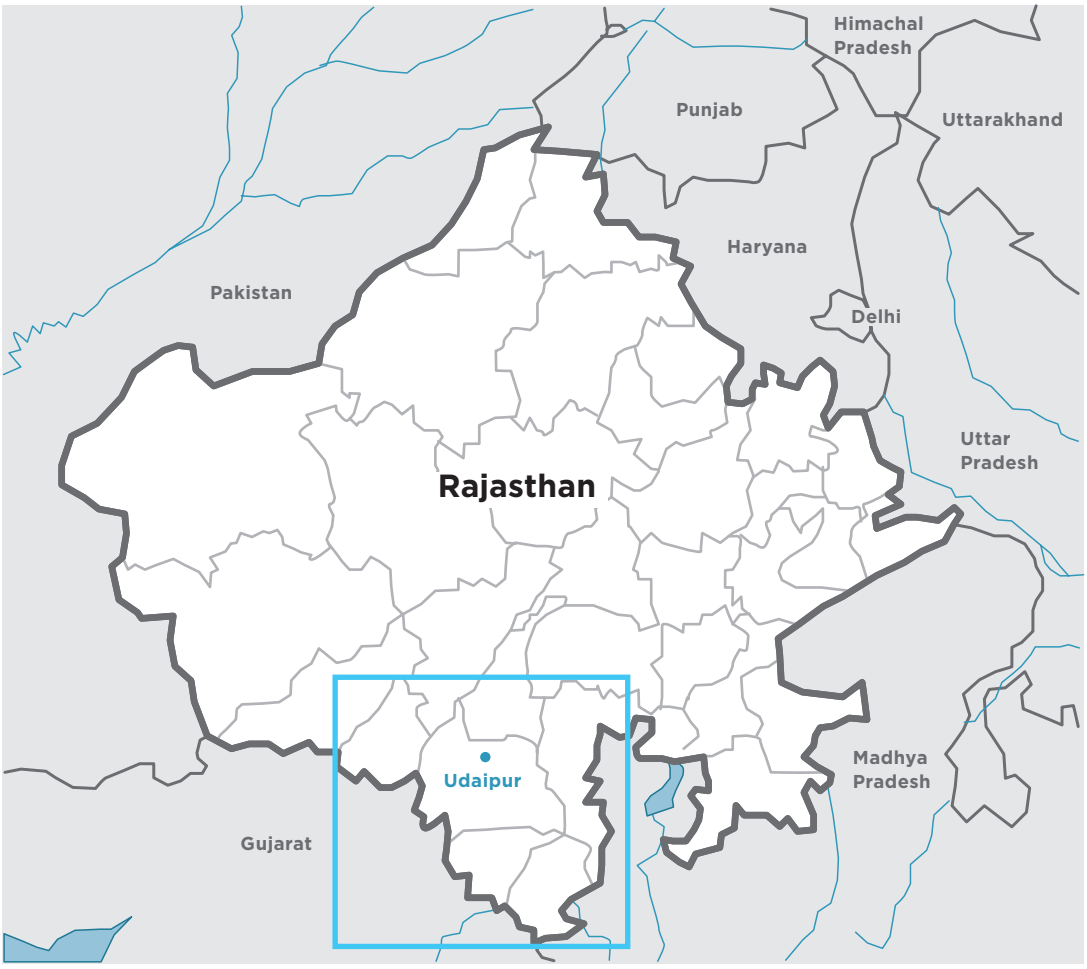
The Thar Desert covers a large proportion of Rajasthan, while the remaining southern and eastern parts of the state are characterised by a semi-arid climate. The economy is based primarily on tillage farming and animal husbandry. Research for this case study took place in Southern Rajasthan in the Aravali Mountains, a mountain range that extends approximately 800 km to the north-east with peaks as high as 1 722 m.

Given the semi-arid climate and highly erratic precipitation, the region is prone to water scarcity and faces a drought cycle every three to four years. The soils are sandy with poor water retention and nutrient levels. They are also prone to water erosion. Land degradation is proceeding at an alarming rate (Government of Rajasthan, 2013). These conditions pose a serious threat to livelihoods based on natural resources.



Graph 1: Annual rainfall Udaipur (1973–2011)

Source: Jajoria et al. (2014)



Graph 2: Location of Southern Rajasthan

Most people live on less than INR 20 (USD 0.35) per day and over 90 per cent of the population relies on subsistence agriculture. Animal husbandry is another major economic activity. However, the productivity of livestock is low due to a lack of adequate pastureland and fodder. The vast majority of the rural population, especially the poorest people, depends on Common Property Resources (CPRs) for their livelihoods. The study area is characterised by a very high share of common land (73 per cent). This provides several direct and indirect benefits to local communities, including fodder, grazing space for livestock, and sources of wood and Non-Timber Forest Products (NTFPs). Common property resources are estimated to contribute up to 29 per cent of the income of poorer Indian households (Meinzen-Dick et al. 2006). Data from Seva Mandir states that that 49 per cent of the total fodder requirement for this area in 2006/07 was covered by crops grown on common land (Poojary 2013).

However, this land is being severely degraded and massively encroached[4] upon. This raises questions regarding the access to and sustainable use of natural resources. The present case study addresses these questions by investigating the reasons for as well as the extent and effects of privatisation and degradation in the context of climate change. It also examines the parameters and effects of community-based governance of common land. The study adopts a pro-poor perspective on natural resource governance, i.e. it focusses on the poor and analyses instances of resource governance that have an impact on poverty reduction. By 'pro-poor natural resource governance', we understand governance systems that either directly involve poor people in decision-making processes or are designed by the poor for the poor. The study investigated eight villages in Southern Rajasthan, which were selected on the basis of their history of managing CPRs: four villages where the (re-)establishment of common land has been successful and sustained, three villages where the attempt failed in the long run, and one village that was not subject to such an intervention. The study is based on quantitative data on an aggregated and a household level and qualitative data in the form of interviews, Focus Group Discussions (FGD), and Participatory Rural Appraisals (PRA) for the purpose of social mapping.

[4] Encroaching in this context denotes the (mainly illegal) occupation of common land by individuals.

5.2 Environmental, socio-economic and institutional changes

5.2.1 Legal and customary rights governing land in Rajasthan: a historical overview

Before colonisation, land governance in the region was characterised by the presence of caste-based village councils (*Jati Panchayats*) composed of representatives of the respective castes. In mixed caste villages, the upper castes usually had a major influence on both formal and informal institutions. They also dictated the governance of the commons. Usually, members of the upper castes oppressed lower caste groups. In villages with a homogenous tribal population, the upper-class tribe members dominated Common Property Resources (CPRs). The councils were biased in terms of gender and power and mainly served the interests of the most powerful members of the community. In colonial times, the traditional institutions were replaced by a village head, who was appointed by the colonial rulers to collect taxes and help to exercise power and exploit resources (Pandey, Shah, and Nepak 2009). With the end of colonial rule, these institutions collapsed or were taken over by powerful individuals. In the absence of governing institutions, common property resources were in many cases partly or fully occupied by individuals.

After independence, historical land-use patterns were codified. Land was surveyed, classified and divided amongst various government departments and tenants based on land quality and productivity in various acts (Rajasthan Forest Act, Rajasthan Tenure Act, Rajasthan Panchayat Act, etc.). Densely forested uplands were designated forest lands, lowlands were categorised as agricultural land, and the intermediate pastoral wastelands[5] were described as commons. In the process of land codification, higher caste families with larger and better land holdings were concentrated in the lowlands and tended to rear large ruminants primarily for their milk and draught power. Populations forced to move to hillier and less productive tracts in the tribal areas were more inclined to rear small ruminants. They used biomass from upland forests, which were gradually converted into silvipastoral systems (Seva Mandir 2010).

Of the present four land categories – i) private agricultural land, ii) revenue waste land, iii) village forest land, and iv) village pastureland – the latter three are widely used as common lands in rural areas. Despite the fact that they are all under the control of different government departments, the usufruct rights lie with the local community. Thus we see a process whereby CPRs that were at one time common property have been turned into state property and subsequently transformed into state property (with or without usufruct rights for the community), individual property, or open-access resources.

[6] *Common lands are generally labelled 'wastelands', the term given to them by the colonial government because they did not contribute to government revenue through crop cultivation.*

Land categories according to Indian legislation			
Private agricultural land	**Revenue waste land**	**Village pastures**	**Village forest land**
Land fit for agriculture privately owned	Land not fit for agriculture, controlled by Revenue department, usufruct rights with the community and widely used as commons	Usufruct rights with the community and widely used as commons	All non-private and non-village lands on which forests stand or stood, widely used as commons

Table 2
Source: Seva Mandir

Forest land and agricultural land

Both federal and state governments are competent to legislate for forests in India. After independence, several consecutive national forest policies were put in place. The general tendency of the first two policies (1952, 1976) was to transfer forest management completely to the state and prohibit the use of forests by communities. In 1988, there was a shift in policy with the introduction of a law stating that forests were not to be commercially exploited to meet the demands of industry, but were to be maintained for environmental reasons and to satisfy people's basic needs and strengthen the tribal population's links to the forest. To put these new policy objectives into practice, the Federal Ministry of the Environment and Forests issued guidelines for involving village communities and voluntary agencies in the rehabilitation of degraded forest lands under the Joint Forest Management (JFM) Programme. Under this programme, the communities had a role to play in the protection and management of forest areas and were entitled to harvest produce from forest areas. Civil society organisations were supposed to organise communities and engage in various activities. Nevertheless, the JFM's success remained limited to certain pockets of the country. The main reasons for this lie in the Forest Department's lack of willingness to cooperate with the communities and civil society and in the fact that the communities themselves were ill-prepared for the task of protecting the forests.

Given their alienation from the forests by law, tribal communities and activists campaigned for more than three decades for the recognition of the bona fide and usufruct rights of those communities. In 2006, the parliament passed the Forest Rights Act (FRA) in a landmark decision. This act aimed to correct the historical injustice done to tribal and other forest communities and restore the traditional forest management rights of both individuals and groups. It marked a major policy shift from traditional, centralised forest management towards decentralised reform. Individuals who occupied forest land on a fixed date were to be conferred with rights over it following a claims procedure.

At state level, Rajasthan enacted the Rajasthan Forest Act in 1953, which was in line with the Indian Forest Act of 1927. Under this act, there are three classes of forests, namely reserve forest, protected forest and village forest (or 'unclassified' forest). While restrictions on access to forest areas apply in the case of the reserve and protected forest areas, access to unclassified forest land is relatively easy and usufruct rights are granted. The act provides for elaborate procedures for determining the above categories and settling the question of land rights via the Forest Settlement Officer (FSO). The Rajasthan Forest Act anticipates two types of claims in the case of forests due to be categorised as 'reserve' or 'protected': instances where a forest dweller claims ownership of the land and instances where a forest dweller claims easement rights such as right of way or use of forest resources (water, pastureland, produce). Claims may be made for rights or concessions.

Furthermore, under the Rajasthan Land Revenue Act of 1956, certain lands in a village are to be set apart as pasture (*Charagah*) on the basis of the number of cattle that exist at a certain point in time. These lands are placed under the protection of the *Panchayats*, local self-governing bodies with responsibility for two to four villages.

In accordance with the Rajasthan Tenancy Act of 1955, all agricultural lands are owned by the state, and the farmers who work that land are tenants with the permission of the state. Under the Rajasthan Land Revenue Act, people who encroach on that land can be imprisoned for up to three months and face a financial penalty of fifty times the annual rent of the encroached land (ELDF 2011). However, this punishment is hardly ever imposed by the government administrator (*Patwari*), and revenue land is often extensively occupied across all categories of common land.

5.2.2 Common land: privatisation, degradation, and the (re-)establishment of community land

In Southern Rajasthan, 73 per cent of the land falls into one of the common land categories and only 27 per cent is privately owned. The average size of land holdings in the villages studied ranges from 0.6 to 1.4 hectares. These small plots are inadequate to provide for the needs of a household. The frequency with which households use the commons to extract resources – fodder, wood and NTFPs – is a measure of their dependence on the commons. Almost half (49 per cent) of households use the commons daily, and another 18 per cent use them weekly. This shows how important common lands are for a majority (67 per cent) of the population.

In spite of the high proportion of common land in the region, the availability of natural resources from that land is increasingly limited due mainly to two interrelated processes: i) rising human and livestock populations resulting in over-use and degradation and ii) a de facto privatisation of common land as a result of encroachments. Rajasthan experienced a population increase of 21.4 per cent in the decade from 2001 to 2011, and the number of people in the state continues to grow. This demographic growth has led to further fragmentation of land holdings by descent. It has thus become necessary to bring more and more land under cultivation for food crops, which in turn has led to a decrease in privately owned pastureland. As a consequence, most of the commons in the region have either been occupied by individuals whose ownership is contested, or illegally encroached upon mainly for the purpose of agriculture (81 per cent) and animal husbandry (74 per cent). Today, nearly 70 per cent of common land has been encroached upon. This is especially problematic for the poorest, as these encroachments have reduced the resource base for livestock sustenance and denied marginalised farmers access. Thus, the poorest lack access and are deprived of important livelihood assets.

Moreover, as an indication of the environmental impact of the encroachment process, the communities testify to a severe decline in tree cover and severe degradation of available land over the last three to four decades. This is mostly due to excessive exploitation by contractors who hire people to cut down trees in these villages for timber. The need for money combined with a desire for more land that can be brought under cultivation prompted people to cut down dense forest. In 2008, forest cover in Rajasthan was reduced to 4.7 per cent of the total area, while tree cover was reduced to just 2.4 per cent (Forest Survey of India, 2011).

Furthermore, land possession is a status symbol in the region and correlates with one's position in society. Almost one third (29 per cent) of the occupied land has been left barren. It is the most powerful and influential people in the community who do the most encroaching. Their position in society – some hold official positions on village councils and have links to local politicians – allows them to do so. In some instances, they also bribe officials. The occupation of more land in turn adds to their power and influence. The weaker families also encroach upon common lands, but they tend to occupy considerably smaller plots. To do so, they bribe lower level land officials – initiating a patron-client relationship where the weak do not speak up against the powerful. This reduces or completely prevents any questioning of how the government operates. There is thus a consensus within the community that slowly leads to the occupation of all common property for private use. This de facto

privatisation process is to the detriment of the poor and marginalised, as they are left with only a small quantity of less productive agricultural land and less options for livestock grazing. As regards the types of land encroached, revenue wastelands have been most affected by encroachments in the study area (81 per cent of revenue wasteland was encroached upon, compared to 53 per cent of common pastureland and 13 per cent of forest land).

Importance of common land for local livelihoods in Southern Rajasthan

Average size of land holdings	Common land in the region	Daily use of commons	Weekly use of commons	Common land encroached upon	Encroached land left barren
0.6–1.4 ha	73%	49%	18%	70%	29%

Table 3
Source: Seva Mandir

5.2.3 Effects of community-based land governance on land use, livelihoods, ecology, and power relations

Seva Mandir supports the process of (re-)establishing CPRs. If the village community decides to do so, they first hold negotiations on removing the occupants from the sites. Then, CPRs are demarcated and protected by stone boundary walls, which protect vegetation and keep ruminants out. Parallel to this, people engage in activities to conserve soil and moisture, which enhance productivity and increase groundwater, and plant species of grass and plants that are suitable for the region. After a year or two, the site starts yielding fodder and other products, which are distributed to the community in accordance with an agreed cut and carry system. The sites have the status of either pastureland or Joint Forest Management (JFM) sites.

Main supporting measures by Seva Mandir for (re-)establishment of common lands

Facilitation of community negotiations to convince encroachers to leave occupied common land
Assisting communities with legal processes, e.g. registering land as Joint Forest Management (JFM) site
Demarcation of common land and building stone boundary walls
Soil and water conservation measures, planting of suitable grass and plants species
Facilitation of community negotiations to agree on benefit-sharing mechanisms

Table 4
Source: Seva Mandir

Data collected from villages that permanently manage (re-)established CPRs shows that the development of common land brings both short-term and long-term benefits to the community. The vast majority of households stated that there are major economic, social, political and institutional gains. As stated above, the average size of land holdings is too small to cover household consumption, and the commons play a vital role by supplementing their sources of fodder, fuel wood and NTFPs. Fodder, in particular, is often in short supply in the dry summer months from April to July, when people are forced to buy fodder for their livestock from the markets. On average, households require 29 200 kg of fodder per year. Before the communities (re-)established common land, these parcels had very low yields (less than 50–100 kg) due to encroachments and open grazing. As a result, the communities faced severe fodder deficits, especially in summer. As most of the land was occupied by the most powerful people in the commu-

nity, poor households were barely able to meet the fodder needs of their livestock. After CPRs were (re-) established and rules for the use of common resources were introduced, the productivity of the sites improved greatly. Average fodder production per hectare on these sites has increased fivefold. People can now avail of the benefits of sharing with all segments of society. In the ten to fifteen years since the sites have been (re-)established, the communities have reported no fodder deficits in their region despite the severe climatic conditions and lower precipitation. On average, households harvest between 400 and 500 kg of fodder from the CPRs per year. They have sometimes even been able to sell surplus fodder on local markets. In this way, households also save money that used to be spent on purchasing fodder during the summer months. Moreover, women's workloads are reduced as they do not need to travel long distances to get grass for their animals, firewood, and other forest produce required to meet household needs. Generally, households closer to the CPRs, which usually lie at the periphery of villages, seem to benefit more than others.

Benefits of common lands

Average benefits from common lands per household per year from CPR site	
Fodder	560 kg
Fuel wood	147 kg
Non-Timber Forest Products (NTFP)	50 kg

Table 5
Source: Seva Mandir

5.2.4 Climate change projections and people's perception of climate change

Climate models for India (INCCA 2010)[6] project a temperature increase of 1.7–2°C by 2030. They suggest that minimum temperatures are increasing, especially in western parts of India. Rainfall is projected to increase in Central India and the Himalayan Region, with extreme rainfall likely to occur in the Western Ghats and adjoining regions. For the western part of Rajasthan, Kumar et al. (2013) project a 20 to 40 per cent increase in rainfall in the period from 2070 to 2100. Yet for large parts of Rajasthan, no significant changes in precipitation are forecast. For all northern parts of India, including Rajasthan, the authors project temperature increases of 1.5–2°C by 2030 and 2–5.5°C by 2100.

Even in the unlikely event that precipitation increases, higher temperatures may lead to reduced soil moisture and more water stress. Plant growth and agricultural yields are likely to be negatively affected (Kumar and Parik 2001). This would compound problems in an area where water for irrigation and drinking purposes is scarce, has to be extracted from groundwater, and is already reported to be over-exploited (GOI 2006, cited in Moors 2013). Given their reliance on agriculture and animal husbandry, the livelihoods of farming families are thus vulnerable to even greater water scarcity and decreased vegetative and agricultural production. O'Brien et al. (2004) confirm that Rajasthan has a low adaptive capacity to climate change and a very high climate sensitivity for agriculture at the same time. They conclude that Rajasthan is one of the regions in India that are most vulnerable to climate change.

[6] *The projected climate in 2030 for India and its sub-regions has been generated as an average of values from 2021 to 2050 and with respect to the observed climate in the period from 1961 to 1990 using the regional climate model PRECIS, which is a version of the regional climate model HadRM3. The projection uses a greenhouse gas scenario that is driven by the A1B socio-economic scenario developed by the IPCC, which assumes significant innovations in energy technologies (including renewables) that improve energy efficiency and reduce the cost of the energy supply.*

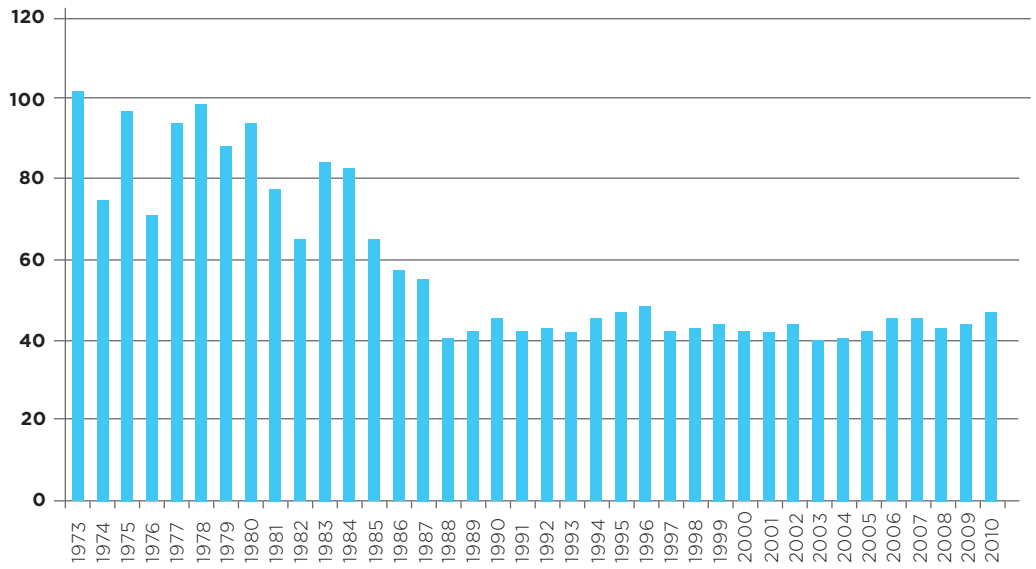
In the perceptions of the local communities, the onset, duration and distribution of the monsoon, which has always been changeable, have, however, become highly unpredictable and erratic. Previously, villages used to adjust their agricultural operations to the distribution of the monsoon, something that has now become extremely difficult for them to do. Often, there is no rainfall when it is needed and too much rainfall when it is not required. According to most of the interviewed villagers, the monsoons now tend to come one month later than usual. Total precipitation is far less than it was forty years ago. Moreover, winters and summers have become very intense. Summers, in particular, have become more unbearable than usual for the people. Due to changes in the climate, flowering times have also changed. For example, mango trees that previously used to flower in March now flower in February. According to the interviewees, trees like bamboo and mango also age earlier than usual and die prematurely. The production of fruits, gum and resins from forest areas has fallen in recent years.

Climatic pattern in Southern Rajasthan

	Observed		Projected
	Records	**Perceptions (by rural populations)**	
Temperature	No data available for the site	More extremes, summer has become particularly unbearable	Increase of 1.5–2°C by 2030, 2–5.5°C by 2100
Rainfall	Duration of monsoon decreased by almost 150% (1973–2011)	Too much when not needed and none when needed	Increase of 20–40% between 2070–2100 in western Rajasthan; no significant changes in other parts

Table 6

Source: Rathore et al. (2013), Vidyunmala and field work



Number of days with precipitation

Graph 3: Duration of Monsoon Season in Southern Rajasthan

Source: Rathore et al. (2013)

5.3 Adaptation to changing environments

This section describes the livelihood options in the rural, predominantly tribal parts of Southern Rajasthan, and their significance in the context of the ongoing degradation of natural resources, increasing population pressure, and the current and projected impacts of climate change. More specifically, it assesses adaptation options for natural resource-based livelihoods and the effects of community-based land governance.

The possibility of engaging in alternative economic activities is an indicator of the farmers' ability to turn to other economic activities in reaction to reduced incomes from agriculture due to adverse climatic conditions such as droughts (O'Brien et al. 2004) or degradation. In recent years, the region has seen a diversification of livelihoods in the form of wage labour. For 84 per cent of the households in the study area, wage labour contributes to their household income. Labour migration – mainly long-term migration (six to twelve months per year) – is a reality for 37 per cent of households. In some regions, daily labour migration has become a common livelihood option. In most cases, young people leave their villages every day to work in hotels, mines, etc. However, wage labour is rarely an option in the most rural areas, where farming is still the primary occupation of the surveyed households. This is particularly true of poor tribal people, who not only tend to live in rural areas, but are also limited to unskilled wage labour. To improve their livelihoods, land use would need to be optimised. People who continue to depend on natural resources for their livelihoods engage in one of the following adaptation strategies: many people try to maximise their share of privately owned land by encroaching on common lands as much as their position in the community allows. This practice is widespread in the region. The other strategy is to (re)establish and sustainably manage common land with the entire community. However, this option is practised to a much lesser extent and limited to villages that receive external support for such interventions.

In investigating the motives for adopting either option, this study found that households opposed to the (re)establishment of CPRs believe that they have individual rights to the land parcel and do not take part in community meetings for that reason. Households who support CPR initiatives have closer links to the community and/or are dependent on the commons (poor, landless households where the head of the household is often a widow).

This also points to the factors that determine the success or failure of CPR development in the long run. The collected data indicates that sustainable community-based governance depends on the benefits CPRs bring, the strength of community bonds, effective leadership, and the continuous support of an external agency. In villages where interventions ultimately failed, political and social parameters were mainly to blame. These communities were socially and politically fragmented and did not commit unanimously to the establishment of CPRs. Internal resistance from powerful segments of society proved to be a major hindrance. These people continued to occupy land for their personal benefit with no protests from the rest of the community, which was afraid of taking a stand against them. Bribing was also commonplace in these villages.

The effects of community-based land governance on land use, livelihoods, ecology, and power relations identified in section 2.3 indicate that the establishment of effective rules for common management and the rehabilitation of degraded sites have increased peoples' resilience to drought and the existing and projected impacts of climate change. In all successful cases, efforts to protect, manage and properly govern CPR have yielded several benefits. The most immediate benefits are the increased availability of fodder, but also of fuel wood and NTFPs. These goods have increased people's ability to cope with harsh climatic conditions including long periods of drought. Ninety per cent of the surveyed sample households in areas where CPR has been a success believed that the sites have contributed much to meeting the deficits in their regions. Moreover, an increase in both floral and faunal growth has been recorded on the established sites. Thanks to sustainable resource use, the once highly degraded sites have been revitalised and have constantly yielded resources over a period of ten to fifteen years. The communities described an increase not only in vegetation but also in the population of wildlife such as panthers, foxes, deer, blue bulls, peacocks, rabbits, etc. Thus, due to sufficient vegetation cover, soil and moisture conservation activities, and protection from resource overuse, developed CPRs have been more resilient to droughts and irregular rainfall.

Furthermore, in the villages where CPR initiatives succeeded, the power dynamics in the community changed drastically and the richest and most influential people became part of the process. Previously, people who held higher positions in society – for example the *Rajputs*, *Brahmins*, and the rich businessmen – used to rule over the lower segments such as the scheduled castes and scheduled tribes (*Meghwal, Gameti, Meena, etc.*). Their domination was based not only on their caste superiority, but also on their large shares of land, which made them financially secure and reinforced their status. When, with the help of external agencies, communities jointly decided to evict encroachers in order to (re-)establish common lands, the powerful were the ones who lost the most land. Nevertheless, in these cases the rich did not oppose the process, but by going along with the process, they gained more respect in society and often took on the role of village leaders who motivated people to proceed with the establishment of CPRs. Since they themselves were involved in these interventions, they had a vested interest in making them work. Through long-term and regular external facilitation, the lower segments of society have gained equal status in the community without creating any rift with the upper segments. Effective benefit-sharing mechanisms that developed at community level have helped to ensure an equal distribution of benefits among all the households.

However, changing the power structure is a complex and delicate process, which is not always successful. It demands acceptance and commitment on the part of the powerful, external facilitation and perseverance.

5.4 Discussion of future adaptation strategies

Based on biophysical, social, and technological indicators, O'Brien et al. (2004) state that Rajasthan has a low adaptive capacity to climate change, and at the same time a very high climate sensitivity for agriculture. They conclude that Rajasthan is one of the districts in India with the highest climate change vulnerability. It has been acknowledged that in addition to climate change, multiple stressors including political, economic, and social conditions affect livelihood and food security. The present study examined the rural, predominantly tribal area of Southern Rajasthan, where the majority of people are poor and depend on natural resources for their livelihoods. They are economically, socially and politically disadvantaged, i.e. they are materially poor and also lack income options, education facilities, infrastructure, a political voice, etc. As the weakest segment of society, they have no access to political decision-makers, so that government authorities do not usually take their needs into consideration. The study clearly demonstrates that (re-)establishing common lands in Southern Rajasthan and facilitating communal management of them is a viable strategy for improving the livelihoods of rural populations and thereby also increasing their resilience to climate change. The study has shown that external facilitation of this process is a way to establish sustainable resource use and an equitable benefit-sharing mechanism from which the poorer segments of the community benefit most. The development of community-managed common land resources by means of external facilitation is also an effective measure to safeguard natural resources. This is *a fortiori* true with regard to climate change. In the successful cases of CPR, the developed resources have proved beneficial and offered solutions for dealing with climatic trends. The community-based governance of Common Pool Resources in the region can thus be considered a successful example of a pro-poor development strategy that enhances the environment and also makes people more resilient to climate change. The successful development of common lands can be a precursor of overall natural resource development in fragile ecosystems. Since people are able to harvest grass and collect fuel wood from the commons, in selected villages, community members have embarked on tree-based farming. This involves growing drought-tolerant fruit tree species and using the space between the tress to cultivate short-duration crops like pulses and vegetables. This has further enhanced the people's capacity to withstand climatic variations.

However, the study also shows that community-based resource governance of common land is not primarily about (re-)declaring and demarcating common lands. Rather, it is the long-term, challenging and cumbersome processes of agreeing on and implementing regulations for resource use and investing in the rehabilitation of degraded lands that are at the heart of this resource governance. From a social point of view, the process is first and foremost about challenging power structures, and it depends on a variety of preconditions.

Furthermore, there are barriers to success on a larger scale. A key prerequisite for this is the consent of different stakeholders with different interests: the *Panchayat*, the community, different government departments, political decision-makers, and NGOs in favour of and against it. In its comparison of successful and unsuccessful cases and those villages that did not engage in the development of commons at all, the study shows that communities need facilitation and longer-term support from an external agency that can provide intense guidance at grassroots level during the initial phase and as required in the long run. Sus-

tained support is especially needed to overcome the social inequalities and power imbalances that consolidated the status of the powerful in the past and allowed them to increase their land holdings to the detriment of the commons, thus minimising the access of the poor. To date, state institutions, including the village-level *panchayats* have generally not been supportive of such interventions and are weakened by corruption and dysfunction. The existing policies that have been designed for the community are currently not being implemented properly at grassroots level. This situation could be improved with the combined help of policy-makers and facilitators on the ground. In this regard, long-term support of external facilitating agencies seems to be required.

Villagers gathering to discuss the rebuilding of a stone wall to protect common land.
© Judith Rosendahl

5.5 Conclusion

The case of community-based management of common lands in Southern Rajasthan shows how the de facto privatisation of common lands is to the detriment of the poor and marginalised segments of the society. This chapter provided a historic overview of the legal and customary rights governing land in Rajasthan, elucidating the current allocation of the agricultural low lands to higher caste families, with the tribal population being pushed to less productive and hillier tracts. It also described the process of classifying land as private agricultural land, revenue waste land, village forest land, and village pasture land. The latter three categories are widely used as common lands in rural areas, and the usufruct rights to them lie with the communities. Most of the land in these areas (73 per cent) is common land that plays a critical role in people's livelihoods, especially those of the poor. However, the poor segments of society are succumbing to resource scarcity, as most of the available common lands are being occupied and de facto privatised by the wealthier people in society. Due to this privatisation and other factors such as demographic pressure and a lack of income options other than agriculture and animal husbandry, land in general and the remaining commons in particular are being overused and degraded. De facto privatisation is perpetuated by several factors. Firstly, there is widespread societal acceptance of these encroachments. Secondly, the responsible government departments, whose task it is to prevent encroachments so that the benefits of the commons are shared among the whole community, are negligent and/or corrupt. Thirdly, shortcomings in policy formulation and implementation mean that illegal privatisation and boundary disputes are not addressed. This has adverse impacts on the livelihoods of the rural poor, particularly people with small land holdings. The problem of privatisation has also fragmented village communities as privatisation leads to an unequal distribution of the (former) commons. The patron-client relationship that develops between encroaching households and bribed government functionaries undermines the accountability of both parties, leading in turn to weak governance of the commons.

Contrary to the conventional belief that the privatisation of the commons is inevitable, the study shows that the unequal and illegal privatisation of the commons can be reversed to the benefit of all, especially the poor. Through a process of persuasion, negotiation and conflict resolution, the commons can be revived and restored. For this to happen, it is important to create and nurture appropriate village institutions and leadership. External facilitation by civil society organisations was found to be a critical element in the process of institution-building and sustaining dialogue about the commons.

In all the cases where people were able to sustainably reorder the property regime in favour of communal ownership of the commons, there have been enormous benefits, not just in terms of better harvests of products like fodder and minor forest products, but also in terms of better social cohesion and solidarity.

This study has shown that the protection of community land from privatisation processes in Southern Rajasthan increased the capacity of poor and vulnerable groups to cope with external stressors such as climate change. When the conditions for community management of resources are secured, they can help to reduce vulnerability.

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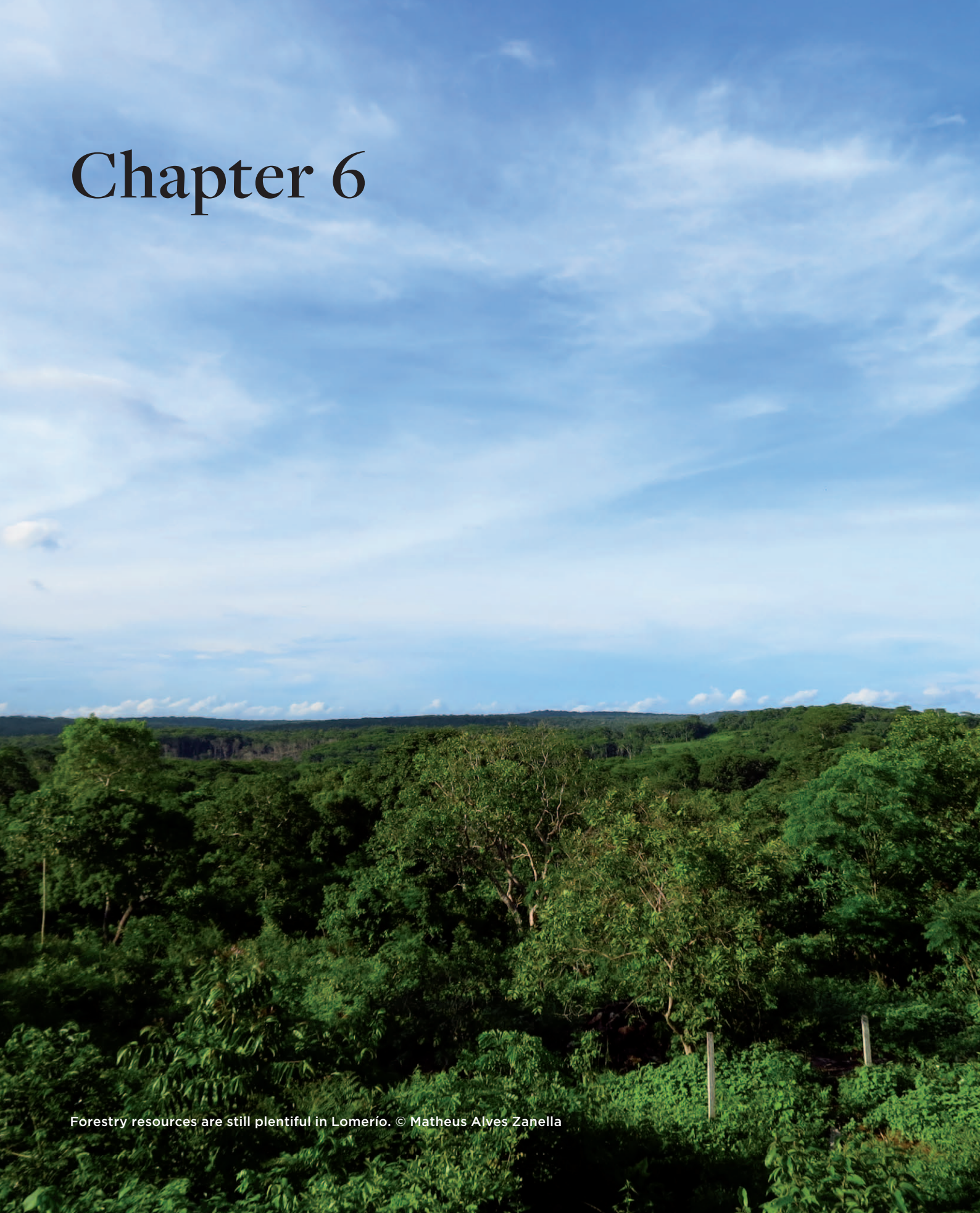
Chapter 6



Forestry resources are still plentiful in Lomerío. © Matheus Alves Zanella

Resource Governance in Lomerío, Bolivia: Indigenous Territory Management in the Context of an Expanding Primary Sector

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ABOUT FUNDACIÓN TIERRA

Fundación Tierra is a Bolivian nongovernmental organization (NGO) dedicated to discussing ideas and developing proposals for rural sustainable development that favor indigenous and peasant groups. With more than 20 years of experience, *Fundación Tierra* works through action research, aiming to influence policy-making in Bolivia on behalf of marginalized and excluded rural populations.

It supports indigenous, natives, and peasant groups by building capacities in management, negotiation, participation, and policy incidence. *Fundación Tierra* research areas include agrarian issues, food security, indigenous rights, and democracy and local governance. It applies action research methodologies that support strong involvement of communities at the local level.

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6.1 Introduction

"May the hichi tuúrsch (Nirri Tuúrr), owner of the water, be more powerful than dollars.
May the hichi iúrsch (Nirri Muurrto), owner of the forest, be more powerful than machines."

The indigenous territory of Lomerío, located in the province of Ñuflo de Chavez, encompassing areas inside the San Antonio de Lomerío and San Miguel municipalities, illustrates a history of struggles and social organization for the formal recognition of community rights in eastern Bolivia (*El Oriente*). The current population of the territory is approximately 9,000 inhabitants and it is situated 380 km northeast of Santa Cruz in the region of *Chiquitanía* – an area historically occupied by a number of different indigenous groups.

First, this chapter provides a historical account of the creation of the Indigenous Territory of Lomerío (*TCO de Lomerío*), exploring how indigenous populations were integrated within exogenous cultural and social institutions and organizations that marked the history of the region. Thus, it briefly describes how the *Chiquitanos* were impacted by: i) Jesuit missions in the seventeenth century; ii) the expulsion of Jesuits by order of the Spanish Crown in 1767; iii) the foundation of the Republic of Bolivia in 1825; iv) the occupation of the region by *mestizos* and *criollos* from Santa Cruz, i.e., non-indigenous populations with European and mixed origins; v) the migration of *Chiquitanos* towards more isolated and inaccessible areas; and finally vi) the process of social and political mobilization, which supported the struggle of indigenous groups for claiming community land rights and territories. In the case of Lomerío, this last process consisted of the formation of representative organizations and political activism which culminated in creating the TCO. Formal claims were presented to the Bolivian state in 1996, after a legal reform adopted by the National Institute of Agrarian Reform (INRA), and the official recognition of communal rights was finally granted in 2006.

Next, the chapter discusses the impacts of this process of recognizing the indigenous territory and how it supports the social organization of the Chiquitano populations of Lomerío. It explores how secured tenure helped improve the security of livelihoods by increasing local people's preparedness to adjust their livelihoods to external changes, for instance, those expected to be caused by future climate changes. However, it also addresses some of the limitations of recognizing community rights when broader support for more comprehensive economic transformations is limited. Thus, the chapter also discusses how, given the economic orientation of the region and the presence of economic pressures, titling alone has not been sufficient to stop the pressure of unsustainable resource exploitation.

In order to discuss these issues, we collected and analysed evidence using diverse methods such as participatory observation, interviews with experts and locals, and participatory mapping techniques conducted throughout the months of February and May 2013. Moreover, given that Lomerío is regarded as exemplifying processed that also occur elsewhere in the region of *El Oriente* in Bolivia, the territory has already been subject to a considerable number of long-term studies, many of those organized by the authors of this chapter in collaboration with local organizations (e.g., CIDOB, 2004a, 2004b; CICOL, 2010; Salgado, 2010, 2011; Vadillo, 2011). Therefore, a great deal of evidence also originates from this secondary documentation.

The chapter is structured as follows. After the introduction, section 2 briefly describes some environmental, socioeconomic, and climatic changes important to understanding the process of creating the TCO of Lomerío. It provides the above-mentioned historical account of the region and the Chiquitano populations, but it also explains how institutional changes were not followed by profound economic transformations. Finally, it presents some climate change projections for the region, complemented by statements by local people on what changes they have already perceived and ways they have adapted their livelihoods.

Section 3 presents some of these strategies, discussing how the struggle for community land rights is embedded in a broader effort to conserve resources that Chiquitano populations regarded as theirs in the face of external pressures. Section 4 discusses how these strategies and the consequent recognition of the territory were an important step in reducing the vulnerability of those groups; it concludes that titling was not enough for inhibiting the expansion of extractive industries with unsustainable methods. Section 5 concludes the chapter with some important messages applicable to broader contexts.

Communities of Lomerio manage forestry resources sustainably. © Matheus Alves Zanella

6.2 Environmental, socioeconomic and institutional changes

6.2.1 Historical occupation of the region and the creation of Lomerío territory

By founding many missions in the lowlands of what would later constitute the Bolivian state, Jesuits created a socio-political system labelled cabildo, which to a limited extent recognized local indigenous leaders (*caciques*) as holders of a certain amount of authority. Today, the *caciques* are still regarded as the local authority by the indigenous population of the region. Moreover, Jesuit missions transformed not only the political system, but also the economic one. Agriculture, which until Jesuit presence was relatively limited in comparison to fishing, hunting and gathering, became the dominant economic activity. When the Spanish crown decided to banish the Jesuits from America in 1767, they left behind a cultural and social structure consisting of small communities organized around small urban settlements in the vicinity of missionary centres.

With the formation of the Bolivian state in 1825, the situation of the indigenous people of *Chiquitanía* saw limited changes. The state imposed new rules mandating that populations had to work for three days per week for the Bolivian state and pay taxes in money or goods. But the cultural and social basis remained relatively untouched (Freyer, 2000; Hoffman, 1979).

Throughout the nineteenth century, the influence of the missions was reduced with departure of the Jesuits and the secularization of the indigenous populations. This facilitated the occupation of the region by non-indigenous populations of European and mixed origins, *mestizos* and *criollos*, originating mostly from the urban Santa Cruz. This occupation initially took place in areas surrounding the city, but later it increasingly entered "missionary lands", forcing the *Chiquitanos* to search for refuge in more isolated and inaccessible lands. In these new areas, the indigenous populations formed new communities organized under the same social system introduced by the Jesuits (Balsa, 2001).

The case of Lomerío illustrates this process. Some families from these indigenous communities, mainly from the localities of San Javier, Concepción, and San Ignacio, flew from farms established by the non-indigenous occupants to the area where today Lomerío is located during the second half of the nineteenth century. Later, *mestizos* and *criollos* also settled in the zone, reproducing a social arrangement where indigenous people became the labourers on farms owned by non-indigenous people from Santa Cruz.

Almost in parallel, another economic transformation started taking place in the region. Attracted by the discovery of rubber, many indigenous people moved towards the north of Bolivia in search of this product. Several of these people took thousands of *Chiquitanos*, in many cases by force, from the farms in the *Chiquitanía*, to be sold as labour force. These were inserted in the rubber economy in semi-slavery conditions, since the most common means of recruiting was the "enganche", i.e., a system where the potential revenue from rubber was almost never higher than the costs of food, clothing, shelter, and tools, so that rubber labourers were forced into dependency on the owner of the extraction area (Krekeler, 1993).

The agrarian reform of 1953 conducted by the Bolivian state also brought little immediate benefit to the *Chiquitanos*. In this legislation, the indigenous populations from the former Jesuit missions were categorized as peasants. This implied that they only could access land titles under collective arrangements or private property with a maximum of 50 hectares per family in both cases (Bottazzi and Rist, 2012). Disadvantaged in comparison with non-indigenous populations of the region, who could apply for land titles without size limitations, this process resulted in legitimizing the occupation of the territory by large cattle farms owned by *mestizos*.

During the 1960s, agrarian unions started to get organized in Lomerío. This has facilitated a process in which *Chiquitanos* began to socially organize under more formalized forms, for instance, by registering the communities, in order to apply for communal lands or even private peasant titles. The territory of Lomerío, therefore, started to take shape during the 1970s, when families started to make reference to the region as that occupied by settlements and communities of *Chiquitano* origin (ETL and GTI-CIDOB, 2008).

This process of socially organizing the territory became even more important during the 1980s and 1990s, facilitated by internal and external developments. During this period, the *Chiquitanos* engaged in an important struggle to defend the territory against logging companies that were illegally extracting wood. They managed to expel these companies in 1992. At the same time, at the regional and national level, the indigenous movement became increasingly influential in the political landscape, mostly due to pressures from rallies and protests organized across the country.

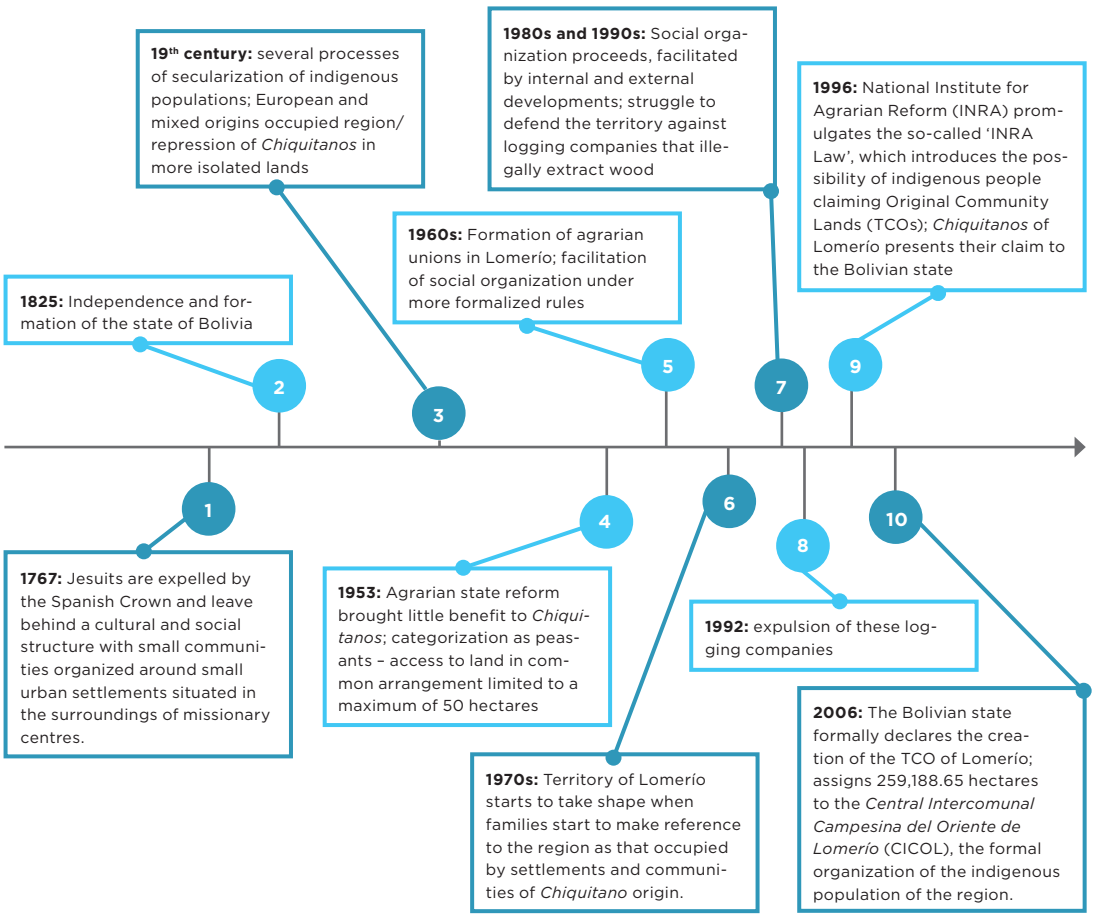
In 1996, after a 120 km indigenous march from Santa Cruz to Samaipata, the National Institute for Agrarian Reform (INRA) promulgated the popularly called "INRA Law", which introduced the possibility for indigenous people to claim Original Community Lands (TCOs). In the same year, the *Chiquitanos* of Lomerío presented their claim to the Bolivian state, initiating a process of land demarcation. The period from 1996 – when the claim was presented – until 2006 – when the Bolivian state formally declared the creation of the TCO of Lomerío – was marked by mobilizations, pressures, and social struggle. After several rounds of negotiations, the Bolivian State finally assigned 259,188.65 hectares as communal property belonging to the Central Intercomunal Campesina del Oriente de Lomerío (CICOL), the formal organization of the indigenous population of the

Lomerío: from land claim to land title (1996 – 2006)

	Main steps	Results
1996	Law INRA 1715	■ Institutes the juridical entity "Original Community Lands" (TCOs)* ■ Accepts 16 claims for creating TCOs*
1996	Initial claim	■ Indigenous population of Lomerío presents a territorial claim that amounts to approximately 300,000 ha. ■ The claim is accepted in the text of Law INRA 1715 and the *saneamiento* process is initiated.
1997 – 2005	*Saneamiento*	■ 54 non-indigenous occupants are identified. They claim amounts of up to 144,648 ha of land that was also claimed by the indigenous occupants as communal land ■ After measurements and titling verification, INRA recognizes 33 private titles belonging to non-indigenous occupants, amounting to 33,682 ha.
2006	Communal land titling	■ IRNA creates the TCO of Lomerío, a territory of 259,188 ha belonging to the 29 communities of Lomerío and administered by CICOL.

Table 1
Source: Vadillo (2011)

*According to Bolivian legislation (Law INRA 1715), the creation of a TCO does not necessarily imply that communal land has to be contiguous. Thus, after receiving the communal land claim, the Bolivian State determines that all non-indigenous occupants should be identified and their land titles checked with official sources in order to identify and secure the legitimate private titles of non-indigenous occupants and demarcate indigenous communal land. This process is referred as *saneamiento* (sanitation).



Graph 1: Historical timeline of the Lomerío region

Source: authors, based on Salgado (2010)

6.2.2 Institutional changes, but limited economic transformations

Besides the already mentioned INRA Law, several institutional changes enable the creation of the TCO of Lomerío. Many of these changes were brought by legislation reform that was approved during the recent history of Bolivia, such as the recognition of plurinationalism as the foundation of the Bolivian state, territorial rights, and the right of self-determination of indigenous populations in the Bolivian Constitution.

In fact, Bolivia has a progressive legislation which recognizes and guarantees rights for indigenous populations. It has ratified and incorporated as national legislation both the Indigenous and Tribal Peoples Convention (commonly referred to as the ILO Convention 169)[2] and the United Nations Declaration on the Rights of Indigenous Peoples.[3] The ideas and philosophy behind these international instruments were very influential in the Political Constitution of the Plurinational State of Bolivia, adopted in 2009. Thus, this constitution can be considered one of most advanced legal frameworks in terms of guaranteeing rights for indigenous populations in all of South and Central America (Vadillo and Miranda, 2012).

[2] *Incorporated into the national legislation as Law Nº 1257, from 11th July 1991.*

[3] *Incorporated into the national legislation as Law Nº 3760, from 7th November 2007.*

In the past 16 years, the Bolivian state has been active in recognizing Original Community Lands (TCOs), the legal term used in the INRA Law which is equivalent to the concept of indigenous territory as mentioned in the ILO Convention 169. As the result of several decades of struggles, mobilization, and marches, the indigenous peoples of Bolivia have achieved the recognition and titling of more than 190 TCO claims, representing a surface of more than 21 million hectares, approximately 20 percent of the national territory (Fundación Tierra, 2011).

The main rationale claimed by indigenous groups to present these demands has been their cultural differences from the national population. To control their territory is, according to this view, key to conserving their social, physical, and cultural reproduction. Moreover, in addition to spaces for cultural and social reproduction, they also call for strategies to secure and control natural resources belonging to the territory in the face of increasing threats posed by modernity, development and market forces which impose new visions, production systems and norms upon traditionally and culturally diverse societies.

Indigenous land recognition in Bolivia

Bolivia has a progressive legislation, which recognizes and guarantees rights for indigenous populations generally.
It has ratified the Indigenous and Tribal Peoples Convention (ILO Convention 169) and the United Nations Declaration on the Rights of Indigenous Peoples.
The new constitution (2009) recognizes Bolivia as a plurinational state.
Since 1996, more than 190 TCO claims have been accepted. These represent an area of more than 21 million hectares or approximately 20 percent of the national territory.

Table 2
Source: Fundación Tierra

Nevertheless, there are difficulties in securing the rights declared by the legislation; they may come into conflict with other pieces of legislation, such as laws for constitutional development, where rights can be reduced or limited (Bolpress, 2012). But the biggest factor that limits rights is certainly the economic orientation of the Bolivian. Although the new constitution is an improvement in that it recognizes many indigenous rights; the development model of the state continues to be overly dependent on extractive resources and on the primary economy (mining, oil and gas, and agriculture).

These economic activities put pressure on indigenous territories and protected areas in many ways. Conflicts for control over these natural resources abound, and there are a number of substantial socio-environmental impacts. For instance, the right to prior and informed consent affirmed by the Bolivian legislation is rarely put into practice in oil and gas concessions (CEDIB, 2013). Moreover, as it grows economically, the primary sector keeps expanding its influence on different political levels.

Specifically in the case of Lomerío, there are three main pressures related to the growth of the primary sector. First, the expansion of the agricultural frontier, particularly for the cultivation of soybeans, on the southern and western borders of the indigenous territory, shared with the municipalities of Cuatro Cañadas and San Ramón. Second, deforestation in order to convert land to pastures for cattle ranching on the northern border, shared with the municipality of Concepción. Finally, also from the western border, in the municipalities of San Ramón and San José, the expansion of mining activities, with serious impacts on the environment of the region.

6.2.3 Climate change projections and expected impacts on livelihoods

Besides the threats posed by the expansion of agriculture, livestock, and mining activities on the borders of the territory, an additional stressor for the livelihood security of *Chiquitanos* is related to impacts from changes in climate patterns. Local populations have indicated that some changes are already visible,

although when comparing these with other more pressing issues, they perceive climatic factors as less problematic than economic threats.

The territory of Lomerío is located on lands formed during the Precambrian, with very hard, rocky soils, which inhibits drilling or other types of access to underground water. All water available in the area, be it for human consumption or for production, originates from small natural or human-made dams, the latter constructed by the communities with support from public bodies. These water systems are clearly vulnerable to climate variability, since all supply originates from rainwater. Moreover, communities have indicated observing climate changes that are increasing chronic water scarcity during longer drought periods.

They mentioned an extended dry season as the main factor driving water scarcity. This also caused changes in cultivation periods, according to local populations. More irregular precipitation, combined with a longer dry season, are frequently causing crop failures, particular for plantains and rice, which are more water dependent products. Honey production has also been affected by these changes, since fires are more frequent in drier forests, although some families declared that radio, television, and mobile phone towers installed in the territory have disoriented the bees, causing a decrease in honey production.

It is difficult to conclude if those perceived climatic changes can be attributed to global climate change or to local climate variability. Until now, there have been no studies analysing this issue, particularly for Lomerío. What is certain is that local populations perceive climatic changes, but clearly perceive others threats, such as the expansion of primary activities on the borders of the territory, as more pressing.

Projected climate scenarios for the region suggest that climate threats will continue to be seen as less urgent when compared to other problems. Climate change projections[4] elaborated through downscaling of regional climate models indicate a substantial increase of +3.8ºC in mean temperature for Lomerío in the 2041–2070 period, compared to the baseline period (1961–1990) (Alves 2013). But only a small reduction of annual rainfall (-2.3%) is expected comparing same periods. Regarding the occurrence of extreme events, such as more occurrences of dry spells or concentrated periods of rainfall, the projections also do not suggest great changes to the current patterns (Alves 2013).

Climatic pattern in Lomerío

	Observed		**Projected** (comparison 2041–2070 to baseline period of 1961–1990)
	Records	**Perceptions** (by rural communities)	
Temperature	No long-term records are available.	No substantial changes	3.8 °C increase in mean temperature
Rainfall		More irregular precipitation	2.3% decrease in annual rainfall
Other events		Longer dry seasons, resulting in water scarcity in certain periods	Projections do not suggest substantial changes.

Table 3

Source: field work and Alves (2013)

[4] *All projections make reference to IPCC-A1B scenario.*

6.3 Options for adapting to the changing environments

The history of the Chiquitano people in fighting for the recognition of Lomerío territory in the first place, and their subsequent efforts to sustainably manage the resources belonging to their territory, suggests some relevant adaptation strategies for reducing vulnerability to changing environments. These institutional responses are part of a strategy for conserving the resources in face of external pressures and they are connected to how cultural and political factors influence which strategies are chosen (Perez and Vadillo, 2008). This section presents some elements of these cultural, organizational and political factors.

6.3.1 *Chiquitanos* and nature

For the *Chiquitanos* of Lomerío, nature contains "sacred owners", known as the *jichis*, which can be understood as the owners of natural elements, such as water, prairies, mountains, forests, animals and plants. *Chiquitanos* regard the world as dual or as composed of two dimensions.

One is related to the sphere of nature and what the universe or the gods provide. Therefore, in order to use it people have to ask permission from the *jichis* and thank them afterwards. This world is governed by respect and reciprocity between people, and between people and nature with its spirits. This is the world that the *Chiquitanos* believe they live in.

The other is related to the sphere of work, production and the outside world, where each individual is the owner of their own labour force, the owner of what they grow and produce, and the owner of the animals they breed. In this world, things are bought, sold and governed by the value of money, while in the Chiquitano world each person takes from nature only what is needed.

These are certainly non-static cultural elements which keep reconfiguring, moulding and adapting according to the interactions *Chiquitanos* have constructed with non-indigenous populations. Despite the influence of the Catholic Church, the *Chiquitanos* of Lomerío maintain their ancestral mythology about origins of the universe, nature and humankind. In their view, there is no essential distinction between humans and the other beings and things in the universe; on the contrary, all of them share a common anthropomorphic spiritual essence (Calderón, 2010).

These cultural elements allow the *Chiquitanos* to see the possibility of a degree of harmony between economic needs, environmental sustainability, social development, and policies on access to land, the territory and natural resources they use. They feed into the territory's international regulations and act as brakes against the renewed onslaught of the economy of extractivism that threaten to cross the boundaries and invade the territory of Lomerío (Cauthin, 2009).

6.3.2 Social and territorial organization

Drawing on their social and territorial organization, the indigenous people of Lomerío have started to implement a series of steps that can be considered institutional responses to external threats to their livelihoods. These measures also support the way natural resources, particularly forestry resources, are currently managed inside the territory (Birk, 2000). The measures include: i) territorial ordering, ii) the designation of areas for different uses, for instance, areas for forestry exploration, based on environmental and social criteria, iii) the implementation of a forestry development strategy based on sustainable forest management plans; iv) the introduction of internal

rules that regulate access to natural resources and their use or exploitation for economic or commercial purposes (CICOL, 2004a; 2004b; 2010).

Some local people question these measures, feeling that they act as hindrances to development and impose constraints on the possibilities for increasing local people's income. According to these views, these efforts come with costs that should not be ignored, whether financial, political or other.

But territorial management and development strategies based on sustainable exploration of resources – such as forest management plants – have enabled the territory to maintain a good level of environmental conservation. At the same time, many local people see territorial management as a means to guarantee income and provide them with greater capacity to adapt and counter external threats, such as those presented by the expansion of the primary activities on the borders or future climate change impacts.

A great deal of success in developing and instituting these semi-formal rules can be attributed to CICOL, the representative body of the indigenous communities of Lomerío. CICOL has facilitated this process, for instance, by finding external technical assistance for the development of norms for sustainably managing the natural resources, particularly forestry. This was mostly conducted as a strategy to demonstrate to the Bolivian authorities that indigenous peoples have the capacity to use their territory without exploiting the resources and it certainly helped create the TCO of Lomerío (GTI and CIDOB, 2008).

The challenge is to keep natural resources under their control. © Matheus Alves Zanella

6.3.3 Political autonomy and self-determination

Political demands from the *Chiquitanos* of Lomerío organized at CICOL currently go far beyond mere land titling, touching aspects of autonomy and capacity for self-governing, where ethnicity plays a unifying role.

The legal framework for supporting these claims is not always straightforward. On the one hand, the Bolivian constitution recognizes the right for self-determination (Article n. 2) and broad powers for the full development of indigenous autonomy. But on the other hand, the Framework Law on Autonomy and Decentralization,[5] which sets the mechanism and procedures for the constitution of Subnational Governments (departmental governments, municipal government and indigenous autonomies), limits to a great extent the likelihood of creating autonomies in TCOs. The law introduced preconditions on population numbers, territorial continuity and management capacity, three conditions that substantially reduce this possibility, since a common characteristic of indigenous territories in Bolivian lowlands is that they are constituted of small populations dispersed in vast territories (Salgado, 2010; 2011).

Until 2013, no indigenous autonomy was ever instituted, in spite of the fact that eleven municipalities have decided to consider themselves indigenous autonomies through a municipal referendum. CICOL has taken the political decision to present a formal demand for indigenous autonomy of the territory which is already legally recognized as TCO of Lomerío. Evaluation by the Plurinational Constitutional Court and negotiations are under way (Vadillo, 2011).

[5] *Law Nº 031, from 19th July 2010.*

6.4 Discussion

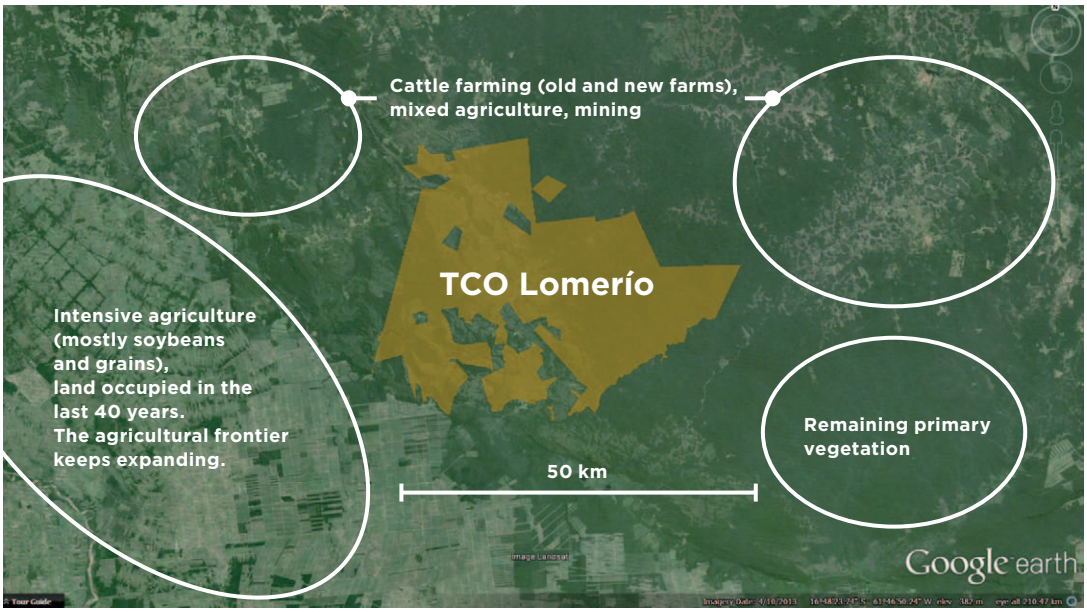
The recognition of communal land claims as territories has been an important step in reducing the vulnerability of indigenous populations. However, without more comprehensive support, land titling might not been enough for inhibiting the expansion of resource depleting and unsustainable extractive industries. This section looks at external as well as internal threats to the territory of Lomerío.

The indigenous communities of Lomerío have established rules and norms for accessing and benefiting from natural resources. Nevertheless, considering the dynamics of market forces, it is possible that these internal rules are increasingly disregarded, jeopardizing the sustainable governance of natural resource that was achieved in Lomerío. In fact, asymmetric power relations between capital-rich extractive companies (logging, mining and agricultural companies) and individual families have already led to agreements and contracts for resource exploration that might be regarded as disadvantageous for the local population.

This was observed in the communities of San Simón and Santo Rosario, which signed forest contracts with the company IMPA from Concepción that would pay, for each cubic meter of wood, a price three times lower than prices that were agreed in other areas of the territory with other communities.[6] A similar situation was found in the case of contracts for mining exploration (tungsten, tin, and antimony, among others) signed between the concessionary *Los Tusequis* and the *cacique* of the community El Pukio Cristo Rey. In this case, CICOL, with the support of environmental officers of the municipal government, has managed to interrupt this commercial agreement. The operation did not take into account the environmental and exploration licenses which were supposed to be issued by the municipal government.

These two examples indicate that the growing commercial pressures from outside the territory on natural resources constitute a threat for the control over these resources under the current governance system. This seems to be more alarming in the case of forestry resources, since illegal extraction on the borders of the territory can take place more easily than other economic activities, such as mining. Exploitation of forest resources in areas surrounding the territory is widespread, in many cases with severe environmental impacts. This process was found to already affect some areas within the southern border of the territory. Moreover, it could easily overflow into the TCO, given the enormous difficulties is monitoring the large area of the territory. An expanding agricultural frontier, for crops such as soybeans from the south-west and for cattle ranching from the north, supports this expansion of illegal logging.

[6] *More specifically, prices agreed upon for the exploration of* Punto 10 *area.*



Graph 2: Bolivia Lomerío – Land use in the region of Lomerío

Source: Google earth (Landsat imageries), CICOL

At least in terms of monitoring, locating, identifying and take measures against illegal mining is easier than for illegal logging. In fact, mining in small-scale artisanal forms – when a couple of families manually exploit small areas – has already been done for some years by some Chiquitano families, but it has not had major environmental impacts so far. Threats may arise from two possible sources: i) when large and more capitalized companies are granted concessions for large-scale operations without complying with the required environmental and social safeguards; ii) if miners from other regions of the country, particularly from the Andean region, migrate to the area, bringing more technology and more destructive mining methods, such as open-pit and the use of mercury (Tejada, 2012). As previously noted, in the context of the overall situation, these pressures pose a greater threat than climate change impacts, both current and projected.

In sum, the case of the *Chiquitanos* from Lomerío suggests that the design of internal norms and rules constructed through years of struggle and social mobilization for greater autonomy and in accordance with their cultural perspectives have favored the current governance of natural resources in the area. However, internal but mostly external pressures originating in the economic orientation of the region towards the primary sector will likely test the robustness of these institutions.

6.5 Conclusion

The struggle of the *Chiquitanos* from Lomerío for their territory, their efforts for indigenous management and the current demands for indigenous autonomy can be seen in the context of a wider strategy for the conservation of resources and lifestyles in the face of threats posed by modernity, development and market forces. As this study demonstrated, land titling is just one of many processes for resource governance oriented towards pro-poor outcomes. It is surely important for justice and distributional equity and for restoring control over resources to communities that have been dependent on those for generations.

Nevertheless, titling is not enough for inhibiting the expansion of resource depletion and unsustainable extractive industries. The growth of the primary sector poses a number of threats to the current governance system of Lomerío, particularly those activities that are currently conducted on the border of the territory and that could easily overflow into the TCO, such as illegal logging, mining and agriculture.

Our study suggests that land tenure must be built on existing rules and practices of natural resource governance. Thus, land titling must be followed by supportive measures to facilitate self-control of resources and the development of sustainable activities. In many cases, this could be translated into granting more autonomy for local control over natural resources.

Wood from Lomerío is generally destined for the local markets. © Matheus Alves Zanella

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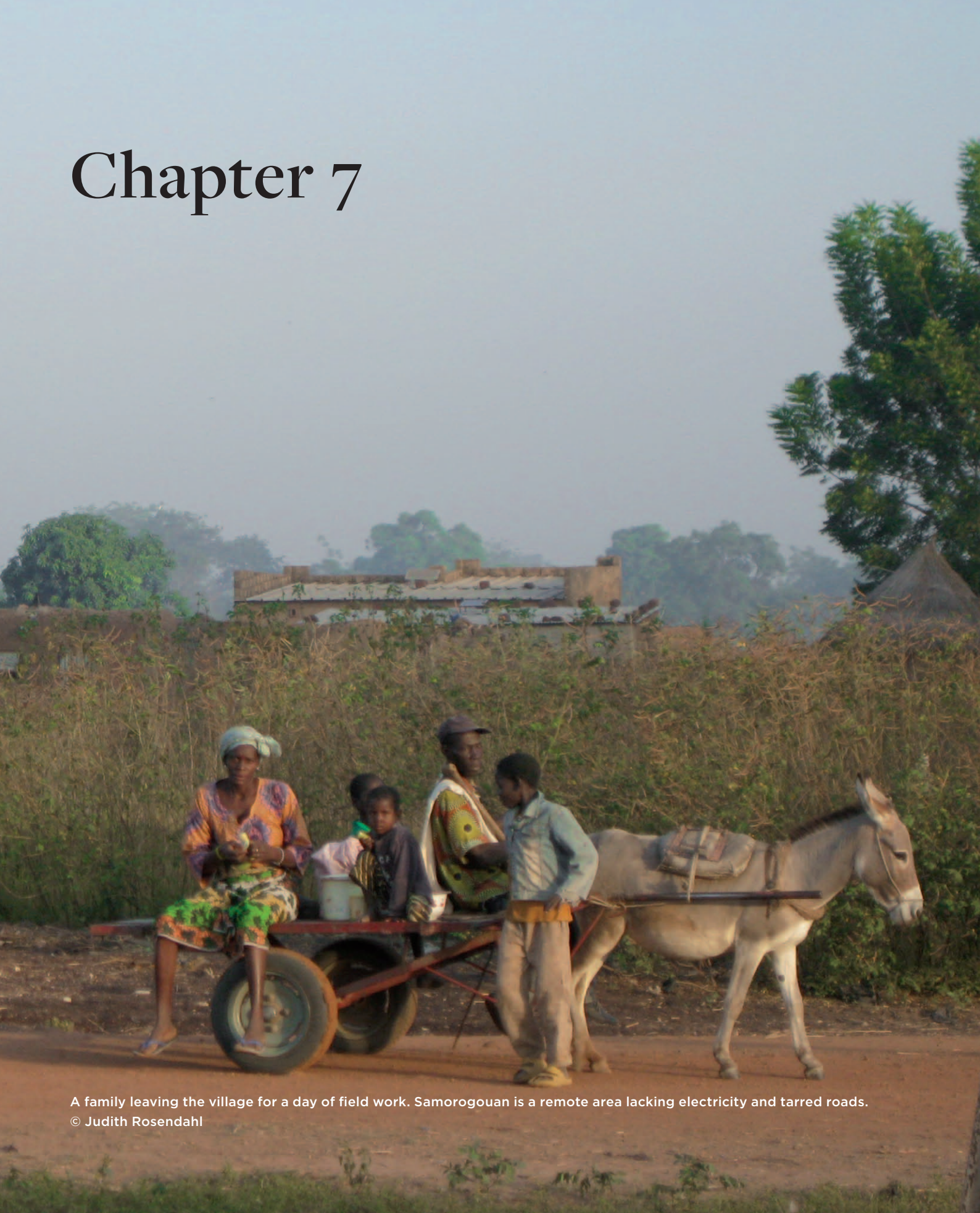
Chapter 7



A family leaving the village for a day of field work. Samorogouan is a remote area lacking electricity and tarred roads.
© Judith Rosendahl

Addressing Conflicts in a Pastoral Zone under Resource Pressure in Samorogouan, Burkina Faso

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ABOUT GRAF

Groupe de Recherche et d'Action sur le Foncier (GRAF) is a non-profit organisation founded in 1999 and a member of LandNet West Africa. GRAF is a network of people interested in land issues such as conflicts and acquisitions, decentralisation, and the governance of natural resources. The organisation focuses on research, capitalisation, publication, and advocacy. GRAF aims to conduct research on land issues at local level, to involve all stakeholders in a genuinely national debate on the political and legal options regarding land, and to acknowledge and use local expertise. It strives to diversify perspectives, analyses, and proposals, and bring together researchers, practitioners, and decision-makers.

In recent years, GRAF has received significant attention and has been consulted and involved in several governmental processes.

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7.1 Introduction

More than 80 per cent of people in Burkina Faso work in the agricultural sector and rely on natural resources for their livelihoods. A majority of 72.6 per cent live in rural areas[3] where almost every household is engaged in agriculture and animal husbandry, mainly at a subsistence level. Burkina Faso is one of the world´s poorest countries[4] and poverty is worst in rural areas. The main factors contributing to rural poverty in Burkina Faso are the scarcity and poor quality of arable land, lack of communications and other infrastructure, fluctuations in climatic conditions, and limited agricultural productivity. Apart from gold and cotton, livestock is a major export product. Livestock rearing is thus vital to both the national economy and Burkinabe livelihoods. Transhumance, sometimes across national borders, has long been part of the country´s breeding system and has been adapted to the climatic conditions, the herders´ way of life, as well as their commerce and financial power.

The country has a primarily tropical climate with two very distinct seasons: a rainy season and a dry season. It receives between 600 and 1,300 millimetres of rainfall annually and is divided into three climatic and agro-ecological zones: the hot and dry Sahel in the north, the Sudan-Sahel as a transitional zone, and the Sudan-Guinea zone further to the south with comparatively cooler average temperatures and more rainfall. Rainfall is highly variable. Water shortages are a common problem and the country has been struck by several severe droughts, especially in the 1970s and 1980s, which led to famine and dislocation on a massive scale. Natural resources are increasingly under pressure and subject to degradation processes, including desertification, overgrazing, soil degradation, and deforestation. Combined with droughts and population growth, this degradation impinges on agricultural activities, puts livelihoods at risk, and increases competition for land and natural resources. Especially in recent years, conflicts over land and natural resources have become pervasive and increasingly violent. Such conflicts are common in large parts of Sub-Saharan Africa and mainly involve farmers and herders. In Burkina Faso, these conflicts usually manifest themselves as conflicts between 'autochthonous'[5] farmers and ethnically *Fulbe* pastoralists. In 2012, the Burkinabe Ministry for Animal Resources estimated that there are in the region of 600 conflicts per year involving the death of pastoralists, farmers or government workers, the destruction of farms or houses, and the injury or death of animals (IRIN 2012).

[3] *Data from 2012, HDI.*

[4] *It ranks 183 out of 187 in the Human Development Index (HDI, based on data from 2012). According to the Multidimensional Poverty Index (MPI), 84 per cent of the Burkinabe are considered poor and 65.7 per cent are affected by severe poverty (based on data from 2010).*

[5] *Often, autochthonous denotes a self-identification and can be translated as 'long-standing residents', as some of the people who see themselves as autochthonous migrated to that locality some time ago.*

The present study examines the case of the Samorogouan pastoral zone in south-western Burkina Faso near the border with Mali. The case is a pars pro toto that shows interrelated developments and problems in the areas of land governance, population growth and migration, poverty, the degradation of natural resources, the competition for land, and increasing conflicts. Based on an analysis of the complex history and the current state of the pastoral zone, the study deduces lessons learned for resource governance and pastoralism in the broader region. It investigates how institutional weaknesses trigger resource overuse and conflicts and put vulnerable livelihoods further at risk. It furthermore examines how the projected effects of climate change might impact on this region, given its low resilience and adaptive capacity.

The area of Samorogouan is characterised by a lack of infrastructure (roads, electricity, etc.), a high rate of poverty, and the typical features of the Sudan-Guinea zone – comparatively higher rainfall, lower average temperatures and higher fertility. Most of this zone is covered by savannah with trees or shrubs and sparse forests, and farmers tend to grow perennial crops (mangos, citrus, cashew etc.), cotton, yams and cereals (sorghum, millet and maize). Livestock is bred there and the land is also used by transhumant pastoralists in the dry season. The Samorogouan pastoral zone was created as a project after the severe droughts of the 1970s with the aim of sedenterising pastoralists and intensifying livestock rearing. However, due to a lack of funding, the project was never fully implemented and the boundaries and status of the zone remain unclear. A severe regression in the vegetative cover, soil degradation, a significant increase in population density inside the pastoral zone as a result of migration, and the unclear status of the zone have led to an increasing number of conflicts. This research was carried out using a participatory, iterative, and multi-stakeholder approach. For data collection, Focus Group Discussions (FGD) and interviews were conducted with locals, heads of peasant organisations, NGOs, civil servants in selected villages inside and adjacent to the pastoral zone, and other selected groups and persons. In total, approximately 350 persons were interviewed for this study.

The cotton harvest is mainly carried out by women and children. © Judith Rosendahl

7.2 Environmental, socio-economic and institutional changes

7.2.1 Institutional changes

In 1975, the government of Burkina Faso embarked on a World Bank-financed project to create a vast pastoral zone around the rural commune of Samorogouan, located in the province of Kenedougou in the southwest of the country. Also known as the CEZIET (Centre d´Encadrement des Zones d´Intensification de l´Élevage Traditionnel - Centre for the Supervision of Zones for the Intensification of Traditional Breeding) pastoral zone, it was originally called CARC (Centre d´Amenagement de Ranchs Collectifs – Centre for the Development of Collective Ranches). It formed one of four pillars of the Development Programme for Breeding in West Volta (Projet de Développement de l´Élevage de l´Ouest-Volta – PEOV),[6] which was financed by the Wold Bank and inspired by collective ranches in Senegal, Mali and Kenya.

The different political, technical, social and ecological motivations behind the creation of the pastoral zone can be summarised in four main points. Firstly, the great droughts of the 1970s decimated at least 30 per cent of the national herd (Ouedraogo 1991) and led transhumant pastoralists to come in increasing numbers to the south of the country. Secondly, the state had the political will to offer breeders the material and technical means to adapt to the social and economic consequences of droughts in the form of a developed pastoral zone for intensive breeding (Hochet and Guissou 2010; Nelen et al. 2004). Thirdly, the natural conditions in the area were favourable: land was abundant due to low population density; there was a wide range of natural resources; and the area offered excellent grazing zones during the dry season. Lastly, there was already a large number of livestock in the area (approximately 22 500 animals), since the region was traditionally favoured by transhumant pastoralists.

First and foremost, the project aimed to sedenterise transhumant breeders, secure land tenure for pastoralism, intensify livestock farming, and establish mechanisms for managing natural resources. Initially, it was foreseen that the transfer of management practices and the provision of infrastructure for the breeders would take place on collective ranches.[7] However, due to breeders' fears that this would threaten their attachment to their animals, this concept was quickly abandoned and the overall objective was confined to assisting the settlement of breeders and providing them with technical and sanitary facilities.

[6] *Pillars: i) To make the western region safe by eradicating the tsetse fly; ii) to encourage the rearing of livestock for the internal market and for export to the Ivory Coast; iii) to create conditions for technical training and research on location; iv) to establish a developed pastoral zone (collective ranches).*

[7] *The collective ranches were conceived as a business enterprise in which the breeders would contribute capital and entrust their livestock to a management committee for collective exploitation without losing their property rights. At the end of a fiscal year, part of the profits would go to the state (to reimburse the World Bank), and part of it to the shareholders.*

Originally, it was intended that pastoral zone would be developed from 1976 to 1978 over an area of 302 500 hectares divided among nine collective ranches. In the light of poor performance in the period from 1975 to 1978, however, the project funding agreed between the World Bank and the state was reduced. In the end, four ranches were developed between 1978 and 1981 on a total area of 124 500 hectares. This entailed the establishment of pastoral infrastructures (vaccination gadgets, wells, water storage areas, roads, etc. (Nelen et al. 2004)), the construction of administrative buildings (offices, accommodation, etc.), as well as social investments in the villages (health centres, schools, meeting rooms, etc.). The project implementation came to an abrupt end in 1983. The revolution led by Thomas Sankara, whose leftist political orientations were contrary to those of the World Bank, led to a withdrawal of World Bank funding and the hasty departure of its experts. As a result, the project faced funding shortfalls, activities in the pastoral zone were drastically reduced, and the implementation of the project was never completed. In the following years, the boundaries and status of the zone were unclear and the existing project infrastructure fell into disrepair. 124 500 hectares of the total area (302 500 hectares) of the pastoral zone were established. The area covers 16 administrative villages distributed over five rural communes. Samorogouan lies at the centre and is most affected, with more than half of the villages and approximately 80 per cent of the area of the pastoral zone in its commune. The locals describe the current situation in the established part of the pastoral zone as 'anarchy': the contours and status of the zone are unclear; migrants have settled inside the pastoral zone; an estimated 80 to 95 per cent of the zone has been transformed into agricultural fields; and there are no clear-cut institutions in place. In order to understand how this state of affairs came about, we need to look at the context of legal and customary laws as well as the rules governing land and, more broadly speaking, resource use.

Burkina Faso did not experience the same land dispossession by colonisers as in many southern and eastern African countries; nor did it see the establishment of big plantations for tropical crops as in the coastal colonies. After the revolution in 1983, the customary land tenure systems in place were completely abolished. Central government believed that it was in the best position to centrally manage land tenure in the pursuit of development goals and social justice (Traoré 1999) and it officially became the sole land proprietor. Anyone had to apply for the right to use land even though customary land holders were permitted to continue their land cultivation, yet without occupying or using additional surfaces. However, this law was not generally enforced in rural areas, where customary rules and practices pertained, along a legal insecurity. Not only the lacking legal recognition, but also market forces and the demographic transition led to an erosion of the customary authority (Bary et al. 2005).

By the beginning of the 2000s, the growing competition for land and natural resources and the increasing number and violence of land-related conflicts highlighted the need for land tenure reform. Conflicts were triggered not only by increased demand for land and natural resources, but also by the mass in-migration of different land-seeking populations (livestock producers fleeing drought, former emigrants returning from Côte d´Ivoire due to the war there, migrants from the densely populated central plateau, etc.) (Elbow 2013). It has been suggested that the legislation itself was a source of conflict as it allowed migrants to challenge the customary claims of long-term residents. The government finally initiated a participatory reform process, which led to the adoption of a new law in 2009. This law provides for the recognition and formalisation of customary land rights and the devolution of power to the local administrations. We will now turn our attention to the aforementioned demographic changes.

7.2.2 Population growth and migration

Basic implementation studies of the Samorogouan pastoral zone indicate that at the time the zone was established, the population density was less than 5–10 inhabitants per km^2 with less than 100 families reported altogether, amounting to an estimated maximum of 1,100 inhabitants. In 2006, the population of the Samorogouan commune was estimated at 35 935 inhabitants with an annual growth rate of 5 per cent and a population density of 26.06 inhabitants per km^2. At this rate, the population of the pastoral zone in 2013 is estimated at 50 600 (approximately 4,600 households) with a population density of 35 inhabitants per km^2.[8]

This population growth is due to a large extent to an influx of migrants to the pastoral zone. Here, we can distinguish between two types of migration and two generations of migrants. Pastoral migration in the form of transhumant pastoralism has always been common in the area. The pastoral zone, however, aimed to sedenterise breeders and offered them land tenure security and the means to adapt to climatic changes as incentives. This migration of pastoralists was mono-ethnic (Fulbe[9]). Agricultural migration, however, is multi-ethnic: most of these migrants are ethnically *Mossi*. *Mossi* currently form the majority in some parts of the pastoral zone and also represent the largest ethnic group in the country as a whole.[10] The other ethnic groups in the area are Samos, Bobo, Dioula, Marka, Dogon, and Mianka.

Migration to the pastoral zone can be divided into two waves: before and after the creation of the zone. In the first period (1950–1980), migration occurred subsequent to and as a consequence of the 1970s droughts. Agricultural and pastoral migrants settled in the zone, with a slight predominance of agricultural households. The second migration (1981 to the present) occurred subsequent to and as a consequence of the 1983–1984 droughts. The period from 1981 to 1985 saw a large increase in agricultural migrants: 190 agricultural households settled in the pastoral zone, compared to only 23 pastoral households, for whom the pastoral zone was actually intended.

The settlement of agricultural migrants in the pastoral zone continues to far exceed the settlement of pastoral migrants. In fact, some pastoral migrants are actually departing from the zone these days. Both types of migration during both periods are linked to two interrelated factors: natural events (droughts) and the political willingness of the state to offer pastoralists the means to adapt to these events. However, this political will was counteracted by the failure of the public administration to ensure the status of the zone as a zone reserved primarily for pastoral purposes and not for the settlement of agricultural migrants. The arrival of the agricultural migrants also affected overall land use and has led to a massive extension of (commercial) agriculture.

7.2.3 Changes in technologies, farming systems and livelihoods

Before the arrival of agricultural migrants in the pastoral zone, the peasants had worked their fields by hand. The agricultural migrants introduced draft animals to the pastoral zone. Under the influence of the agricultural migrants, the pastoralists also started to engage in agriculture, mainly commercial cotton production, and thus became agro-pastoralists. Conversely, resident and newly arrived farmers began to breed animals. In the absence of a financial infrastructure, livestock rearing is a bankable investment. In this kind of peasant economy, cattle can be sold when the need for cash arises. The long-standing farmers also started to use animals to till their fields. This led to a massive expansion of the area under cultivation within the pastoral zone and allowed the farmers to cultivate cotton as a cash crop.

[8] *Even projections of population growth that assume 3 per cent annual growth predict that the Samorogouan commune will have approximately 44 200 inhabitants in 2013.*

[9] *Also known as Fulani, Fula, Peul, etc., the Fulbe people is the world's largest migratory ethnic group spread over many countries, mainly in West and Central Africa.*

[10] *Approximately 48 per cent in 1995.*

Given the lack of infrastructure and employment opportunities in the region, the cultivation of cotton has been and remains the main source of income. Cotton farming is crucial to the inhabitants because it generates cash and allows them to buy certain accessories of modern life such as mobiles phones and motorbikes. The state's centrally organised cotton farming system traps the farmers in debt, keeps them in constant need of fertiliser (which is not only needed to cultivate cotton, but also for subsistence farming), and leaves them with no alternative options for earning cash income.

From the 1990s on, the state massively promoted the expansion of cotton production. When the current President Blaise Compaoré came to power in 1987, he restructured the country´s economy to attract foreign investment and focused particularly on the cotton industry to boost growth. During the 1990s, massive investment in the cotton industry boosted production and was a strong incentive for subsistence farmers to engage in cotton farming. They were also lured by access to credit for fertilisers, insecticides and high-yielding seeds provided by the privatized parastatal SOFITEX[11] as well as an increase in the official producer price in the 1990s, which helped cotton farmers to earn revenues (Mirza 2011). However, unstable climatic conditions for the rain-fed cotton and ample fluctuations in global cotton prices impacted directly on farmers. Furthermore, the massive expansion of cotton production increased competition for land use. In Burkina Faso, cotton is often cultivated at the expense of food. This could be a source of food insecurity if crops fail or prices sink. Finally, it also conflicts with the former policy of promoting another major export good: livestock.

7.2.4 Changes in the natural environment

The increase in population density inside the pastoral zone and the resulting intensification of both livestock rearing and agriculture have led to the severe degradation of the natural resources in the area.

Before the establishment of the pastoral zone, natural resources were, according to all elderly interviewees, abundant and very diverse. Population density was so low that

> "Before the pastoral zone was established, you could go dozens of kilometres without seeing a field and less so a hamlet."

Box 1: Statement by G.K., Foulasso, 2013

The vegetation was dense, with significant grass cover, woody savannahs and abundant shrubs. Bourgou fields,[12] which are excellent grazing zones in the dry season, were common. Animal species that are rare and threatened today – lions, buffalos, hyenas, deer, elephants, etc. – were plentiful.

Nowadays, the vegetative cover is in a state of advanced degradation due to the combined effects of climatic factors and human actions. The deterioration in the climate is seen in the downward shift in isohyets (by more than 100Om) on the one hand and in the colonisation of large swathes of land by small ter-

[11] *SOFITEX is responsible for most of the commercial and industrial activities of the sector. This monopsony is responsible for all the steps of the value chain: purchasing seed cotton, selling inputs, ginning, processing, transportation, marketing, etc. (UNCTAD, 2011). SOFITEX often sets a fixed price before a harvesting season and buys all the production from local farmers.*

[12] *Echinochloa stagnina (Burgu Millet, bourgou, hippo grass).*

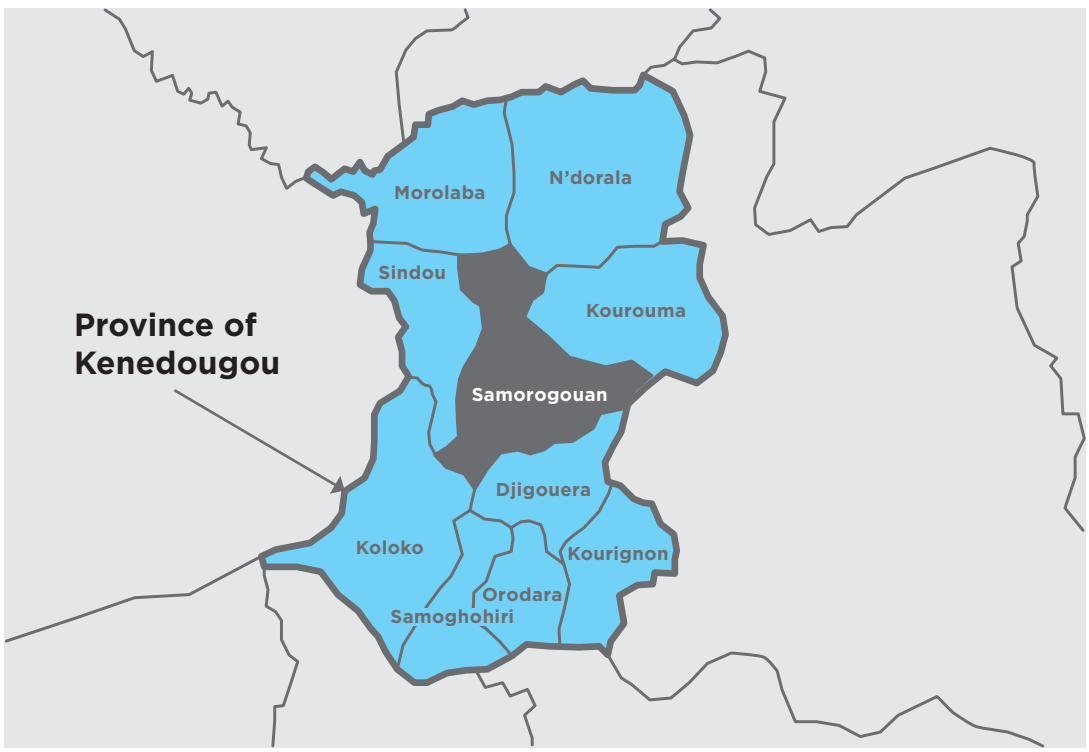
mites, which indicates water stress due to a drop in the groundwater level. From almost none at the outset, the percentage of agricultural fields in the pastoral zone had risen to 40 per cent by the end of the 1990s and at least 80 per cent in 2012. Some data suggests that agricultural fields now account for around 95 per cent of the zone. These fields – mainly of cotton and corn – are highly sensitive to degradation due to water and wind erosion, temperature variations, etc., and the production methods currently used are not sustainable. Due to the high demand for land, the former practice of leaving land to fallow has been abandoned and the same land is being used continually with the result that soils have become increasingly alkaline. Furthermore, the establishment of new fields in more humid lands (plains and lands bordering rivers) is leading to the silting of rivers and water points. As the ZATE officer of Samorogouan stated:

> "Only the rocky and stony areas of the pastoral zone that cannot be used for vegetable crops, and where there is no pasturing, are left for animals."

Box 2: Statement by P.H., Samorogouan, 2013

Alongside the degradation of vegetative cover and water resources, animals that were formerly abundant in the region have become scarce or disappeared altogether. Today, wild animals such as elephants and hippopotamuses can only be found in one of the few remaining forest areas in the western part of the pastoral zone. Further sources of degradation in the pastoral zone include bush fires, excessive woodcutting, and charcoal production triggered by increasing population growth; overgrazing and inappropriate management of paths; excessive tree trimming for fodder by pastoralists; and the construction of the Samandeni Dam, which affects a significant part of the pastoral zone and is likely to involve more clearing inside the zone, either for fields or for the reconstruction of villages that have been fully or partly affected.

Locals perceive the degradation of natural resources as a direct consequence of the disrespect for traditional rules. While they vary from community to community, the traditional rules for using resources all seek to protect spaces and species and ensure sustainable resource usage. For example, certain types of vegetation are considered holy and it is therefore forbidden to cut them, just as it is forbidden to hunt certain animal species. Further moratoriums exist with respect to certain sites, bush fires and access to land, for example, the ban on clearing forest in order to obtain a new agricultural field without the authorisation of gods and ancestors. In certain villages, there was a rule that a field could only be used for a maximum period of seven years. In others, agricultural activities were restricted to certain parts of the village lands. These traditional rules have been eroded and are rarely followed today. However, even if they were still adhered to, it is uncertain whether they would allow the current population to feed itself while guaranteeing the sustainable use of resources at the same time.



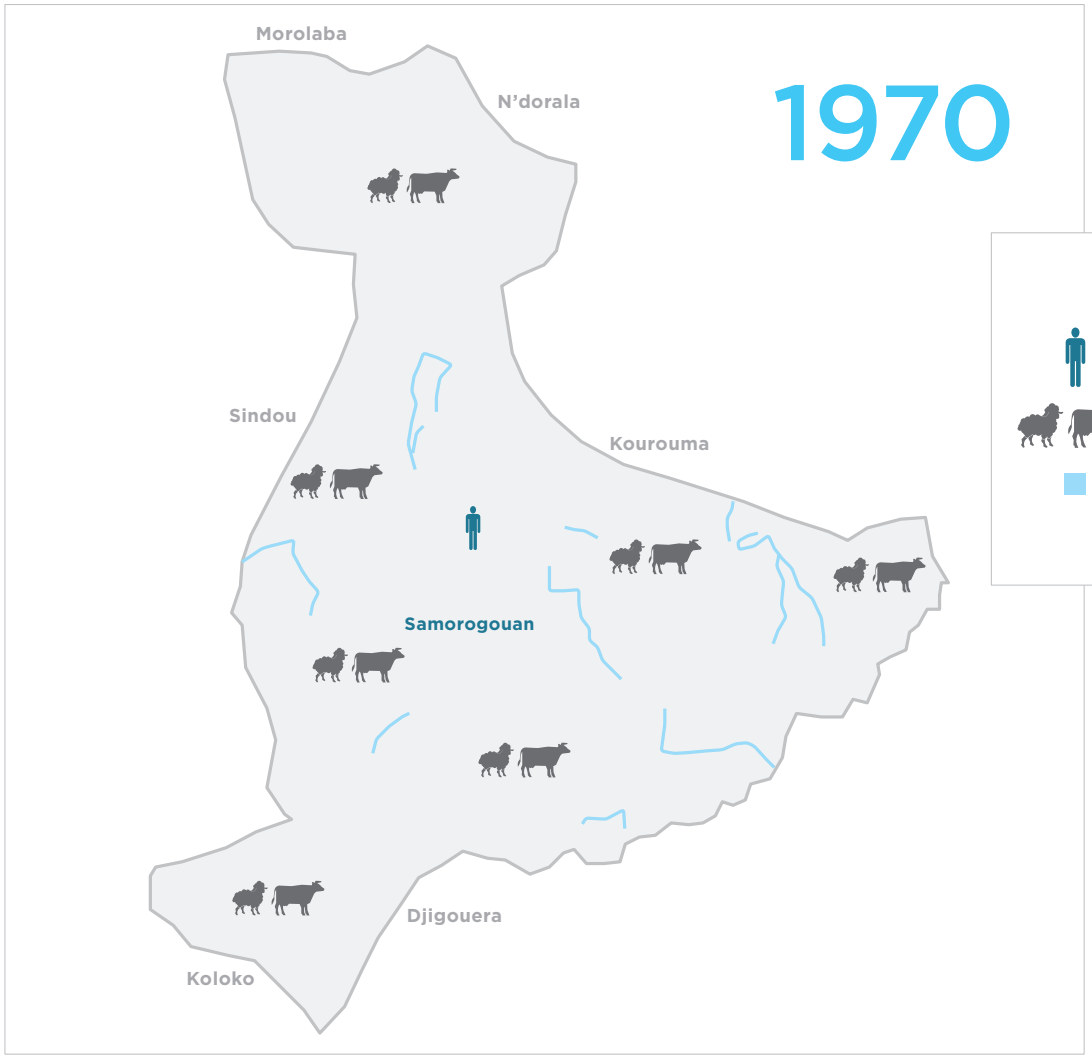
Graph 1:
Location of Samorogouan in the province of Kenedougou, south-western Burkina Faso

Transformation of the pastoral zone

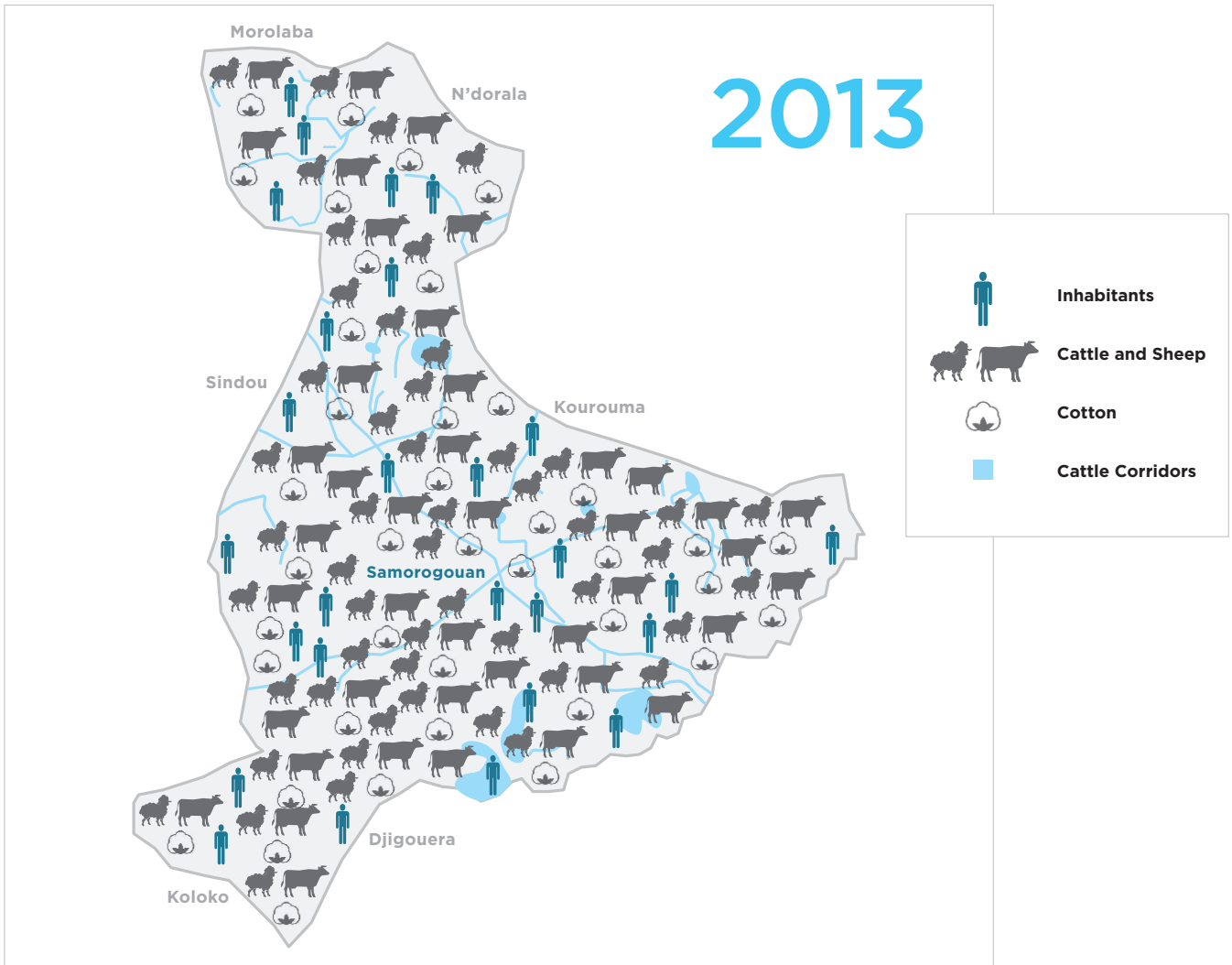
Comparison of the area	At the time of the pastoral zone was created (1975)	2013
Population	< 1,100 inhabitants	Approx. 50,600 inhabitants
Population density	< 1 inhabitant per km²	Approx. 35 inhabitants per km²
State of natural resources	■ Dense vegetation with significant grass cover, woody savannahs and abundant shrubs ■ Almost no agricultural fields	■ Vegetative cover in a state of advanced degradation ■ Approx. 80–95% covered with agricultural fields ■ Silting of rivers and water points due to establishment of new fields in more humid lands (plains and lands bordering rivers)
Fauna	Great numbers of wild animals, including lions, buffalos, hippopotamuses, hyenas, antelopes, elephants, etc.	Wild animals are and threatened; only few elephants and hippopotamuses left in a small area of the zone

Table 1

Source: field work and GRAF



Graph 2: Comparison of population and land use in the pastoral zone in 1970 and 2013


Morolaba
N'dorala
2013
Sindou
Kourouma
Samorogouan
Djigouera
Koloko
Inhabitants
Cattle and Sheep
Cotton
Cattle Corridors

7.2.5 Conflicts

The coexistence of two kinds of agro-pastoralists – cultivating pastoralists and (resident and migrant) pastoralist farmers – combined with increasing natural resource degradation and the unclear land tenure situation has fuelled conflicts over land. The lines of conflict run between long-standing residents (self-identification as 'autochthonous') and migrants and between agricultural farmers and pastoralists.

The tensions between the migrants who settled inside the pastoral zone and long-standing residents can be traced back to the process of settlement. Traditionally, land is not considered to be private property. Instead, a traditional leader manages the access to land on his territory. Custom has it that whenever a person who is starving looks for land to live on and cultivate, a leader shall give this person and his family a plot of land. He cannot deny this request. When the agricultural migrants first arrived in the pastoral zone, they asked the respective traditional leader and were all given a piece of forest to clear and settle on. Subsequently, more and more migrants came to the zone, often claiming kinship with the migrants already there. The meaning of 'kinship' is twofold in this context; it denotes either a blood relationship or the fact of belonging to the same ethnicity. Often these new migrants, mostly *Mossi*, did not ask the traditional leader, but went instead to the already settled migrants of their own ethnicity. As a result, traditional leaders lost control over the settlement process, which became increasingly chaotic. Later on, the migrants challenged the designation of the pastoral zone. Several attempts on the part of the local government to remove the migrants from the zone and re-establish the pastoral zone failed because the migrants, mostly *Mossi*, played the ethnic card and successfully activated their powerful political relations at national level.

While this was going on, long-standing residents of villages outside the pastoral zone also began to clear forest for agricultural fields inside the zone in an attempt to expand their farmland and avail of a perceived opportunity. In doing so, they often used the migrants as pretext, blaming them either for being the (only) ones doing this, or for having started this trend.

Another point of land-related conflict stems from the questioning by long-standing residents of the agreement that the state made with traditional leaders at the time the pastoral zone was created. In that 1975 agreement, traditional leaders ceded the territory of what would become the pastoral zone for 50 years to the state for the purpose of creating a pastoral zone. In the light of the current situation, some long-standing residents argue that that promise has not been met and the agreement is therefore invalid. In future, this point will become more pressing, as the agreement period is due to end in around 11 years.

Everyday conflicts, for example, when livestock damages agricultural fields and harvests, have become ubiquitous. All of this has contributed to growing awareness among locals that the current situation is no longer tenable and urgently needs to be addressed.

7.2.6 Climate change projections

Climate change projections for Burkina Faso[13] vary from region to region. For the south-western region where Samorogouan is located, temperatures are projected to increase by 1.5–2°C by 2030 and by 2–4°C by 2100. Precipitation is not expected to change dramatically in the Samorogouan region until 2030 (0–20 per cent increase), but is forecast to decrease by 40–60 per cent by 2100. Furthermore, the frequency of rainfall is projected to drop, resulting in more droughts. Changes in intense precipitation events are expected to be in line with the mean precipitation with a net increase in 2030, and a general decrease by 2100. On average, wet spells are expected to be 40 per cent shorter than today in 2030 and 60 per cent shorter in 2100. This suggests that precipitation

[13] *Using the International Centre for Theoretical Physics (ICTP) Regional Climate Model - version 3 (RegCM3; Pal et al. 2007) to downscale at 40 km the Max Planck Institute for Meteorology GCM, ECHAM5 (Roeckner et al. 2003) under the mid-range Intergovernmental Panel on Climate Change (IPCC) A1B greenhouse gas (GHG) emission scenario (IPCC, 2000).*

events may be less frequent in the future, which is likely to lead to drought conditions. The average duration of projected dry spells is forecast to decrease by about 20–40 per cent by 2050. However, they are set to be 80–100 per cent longer than today in 2100. This suggests that drought episodes may be prominent in the mid- and late twenty-first century.

In sum, Samorogouan is expected to face a hotter and drier climate with more droughts. Burkina Faso is mostly covered by semi-arid regions known for their unreliable rainfall regime, while rain-fed agriculture is predominant. Such a regime is highly variable, and this variability causes severe drought and flooding events. These conditions can have a severe impact on food security and water resources. Therefore, future climate changes pose significant threats to the region, especially in resource-poor contexts where dependence on natural resources is high and adaptive capacity is relatively low (Boko et al. 2007). However, the local population of the pastoral zone does not yet perceive the changing climate intensely and does not consider this a key concern. The possible implications of climate change for the pastoral zone will be further elaborated in section 4.

Climatic patterns in south-western Burkina Faso

	Observed		Projected
	Records	**Perceived** (by local population)	
Temperature	No data available for the site	Thre local population does not perceive substantial changes in climate patterns.	Increase of 1.5–2°C by 2030 and of 2–4°C by 2100
Rainfall	No data available for the site		Increase of 0–20% by 2030 and of 40–60% by 2100
Extreme events	No data available for the site		Dry spells are expected to decrease by about 20–40 per cent by 2050, but will be 80–100 per cent longer than today in 2100.

Table 2

Source: field work and Sylla (2013)

7.3 Adaptation strategies in a changing environment

The different stakeholders in the Samorogouan pastoral zone have adopted several strategies to adapt to their changing environment. In fact, the creation of the pastoral zone itself and the various developments since then can be understood as strategies to adapt to different processes of change in institutional, environmental, demographic, and economic settings.

7.3.1 The state

The state created the pastoral zone largely in reaction to the droughts. It was also motivated to manage livestock more effectively – a major export good now and then. The implementation of the project was halted when political changes led to the withdrawal of the World Bank from the project with resulting funding shortfalls.

The massive promotion of cotton cultivation from the 1990s on represented a shift in policy and conflicted with the original plan to reserve this land for pastoralists only. In recent years, the competition for land use has also had adverse effects on national food security. Due to the high demand for the favoured cash crop, local food production has decreased and the availability of local food is continuously declining. A population boom and the rise in urbanisation are only exacerbating the situation (Mirza 2011).

Furthermore, in Samorogouan as in many other rural areas of Burkina Faso, the land tenure situation is deficient. While traditional customary rules persist de facto, they have been increasingly eroded due to legislation and other processes. The coexistence of legal and customary rules has made land tenure insecure and added to the confusion of the rural population. Thus, the land governance system put in place by the state has proved to be too vague and ineffective.

7.3.2 Agricultural migrants

For the mainly *Mossi* migrants, moving to the pastoral zone was a strategy for adapting to droughts and several other processes that lead to the massive population movements mentioned above (war in Côte d´Ivoire, overpopulation of the central plateau, etc.). Settling in the pastoral zone was a reaction to an acute need for land. Under the influence of the pastoralists who first settled in the zone, agricultural migrants started to breed livestock in order to increase their income. In changing their livelihoods to agro-pastoralism, these migrants adapted to the economic situation and the absence of a financial infrastructure.

They followed the state's recommendations to cultivate cotton and planted cotton fields on an increasing area. Confronted with land tenure insecurity and the threat of forced eviction from the pastoral zone, the migrants used their ethnic ties to the powerful *Mossi* leaders to prevent their eviction from the pastoral zone or even the restriction of their economic activities.

7.3.3 Pastoralist migrants

By following the invitation to settle in the pastoral zone, *Fulbe* pastoralists were able to adapt to the climatic changes, gain access to a better breeding infrastructure and increase their income. Under the influence of the agricultural migrants, the pastoralists started to cultivate cotton as cash crop. As the legally legitimate residents of the pastoral zone, they took advantage of changing state policies and used draft animals to cultivate cotton in addition to rearing livestock. Some of them have accumulated significant wealth and have bought real estate in the cities. As one interviewee put it:

"When we are sick of all the dust and labour, we go to our town houses for a while."

7.3.4 Long-standing residents of the pastoral zone

After agreeing to the creation of the pastoral zone in 1975, the 'autochthonous' residents witnessed drastic changes to their environment, which they had not anticipated. Under the influence of the agricultural and pastoral migrants, they also began to farm inside the zone – mainly cotton – and increased their livestock numbers. They blamed migrants for starting to grow crops inside the pastoral zone.

While changes in land use and farming systems were instigated by the migrants, they were triggered by the state's economic, agricultural, and land tenure policies. Combined with a population increase, these changes led to the degradation of natural resources in the pastoral zone, which the locals attributed to the erosion of traditional rules for using land. Thus, the absence of clear rules and their enforcement, inconsistent state incentives for economic activities, and the absence of alternative employment opportunities resulted in natural resource degradation and conflicts. As one interviewee put it:

> "Poverty is at the root of all of this."

Box 3: Statement by D.L., Dijgouan, 2013

In this state of 'anarchy', as perceived by the locals, most people tried to take advantage of the de facto open access to the pastoral zone and blame others.

Cotton is a major export good of Burkina Faso and the main cash crop for local farmers.
© Judith Rosendahl

Cattle grazing on a harvested field, which was formerly was savannah forest. © Judith Rosendahl

7.4 Discussion of future adaptation strategies

All stakeholders in the Samorogouan pastoral zone agree that the current situation is untenable. This case clearly demonstrates that resource governance is at its core a social issue that encompasses access and tenure rights as well as transparent laws and conflict resolution. Governance of the social aspects of access and tenure rights is the key to resource governance. The state and all other stakeholders need to clearly define the boundaries and status of the zone and embark on a process of dialogue to negotiate new rights and rules for using resources. However, this process will be extremely cumbersome, as the situation is highly complex and also involves moral issues. Among others, the following questions will have to be addressed: on what grounds shall one group of actors be favoured over another? If the agricultural migrants were evicted from the pastoral zone, how could their livelihoods be guaranteed? And who shall cede land to them in this case?

Moreover, even if successful, the negotiation of new rules for using resources does not offer longer-term solutions for sustainable and resilient livelihoods in the face of natural resource degradation and climate change. The people of Samorogouan do not have a strategy or many options for adapting to the different processes of change in the zone. The study shows that they are well aware of the degradation processes and are seeking alternative livelihoods. However, given their poverty, lack of access to education and employment opportunities, and dependency on cotton production, their room for manoeuvre is currently extremely limited. The mass cultivation of cotton promoted by the state has proved to be unsustainable, both in terms of nature and the economy. Cotton is cultivated as a monoculture and is highly dependent on the use of fertilisers, herbicides and pesticides, leading to further degradation of an already vulnerable agro-ecosystem. Furthermore, the centrally organised cotton production system offers limited economic benefits to the producers due to volatile world market prices and the SOFITEX system that compounds indebtedness and dependence.

To shift to more resilient livelihood strategies, assistance, incentives, and support are needed. More specifically, an alternative to the cotton system is essential, as well as a vision and consistent longer-term policies for rearing livestock in Burkina Faso. Yet, at present, the government is hindering the former and does not seem to be making much progress on the latter. A strategy of livelihood diversification, entailing *inter alia* the diversification of cash crops such as sesame, might be part of the solution. When considering changes in livelihood strategies, adaptation to the projected effects of climate change needs to be taken into account. The region needs to be prepared for a hotter and drier climate with more droughts.

7.5 Conclusion

The case of the Samorogouan pastoral zone is an example of massive dependency and at the same time growing pressure on degrading natural resources in a setting characterised by poverty, weak institutions, increasing conflicts, and a lack of alternative livelihoods. This chapter first provided an overview of the institutional changes in this region, including the creation of the pastoral zone to sedenterise pastoralists and intensify breeding after the severe Sahel droughts of the 1970s, the abandonment of the project in the early 1980s, and the remaining unclear status of the zone. The chapter then described population growth and influx of migrants that increased pressure on the natural resources in the area and led to the replacement of an estimated 80-95 per cent of the pastoral zone with agricultural fields. The arrival of migrants and the state policy of promoting cotton production led to changes in agricultural practices, livelihoods and land use and exacerbated natural resource degradation. These developments, combined with an unclear land tenure situation, triggered social conflicts, mainly between the autochthonous population and migrants or between pastoralists and farmers. The situation is expected to be aggravated by the future effects of climate change, more precisely by a hotter and drier climate with more droughts. Section three analysed how the different actors have attempted to adapt to the various changes and showed how the long-standing residents act in a situation of poverty and de facto open access to resources.

This case highlights the role of the state in the genesis of an "anarchic" situation due to inconsistent and conflicting policies. Ultimately, the study found that resource governance is at its core a social issue that encompasses access and tenure rights as well as transparent laws and conflict resolution. In Samorogouan, all stakeholders need to embark on a process of defining the boundaries and status of the pastoral zone and negotiate new tenure and access rights. However, this will not be enough, as it does not offer longer-term solutions for sustainable and resilient livelihoods in the face of the natural resource degradation and climate change. Given their poverty, lack of access to education and employment opportunities, and dependency on cotton production, the people of Samorogouan do not have much room for manoeuvre to adapt to the different processes of change such as the dependency on cotton combined with degrading resources and the projected changes in climate in their region. Assistance will be required to develop resilient livelihoods that take the projected effects of climate change into account.

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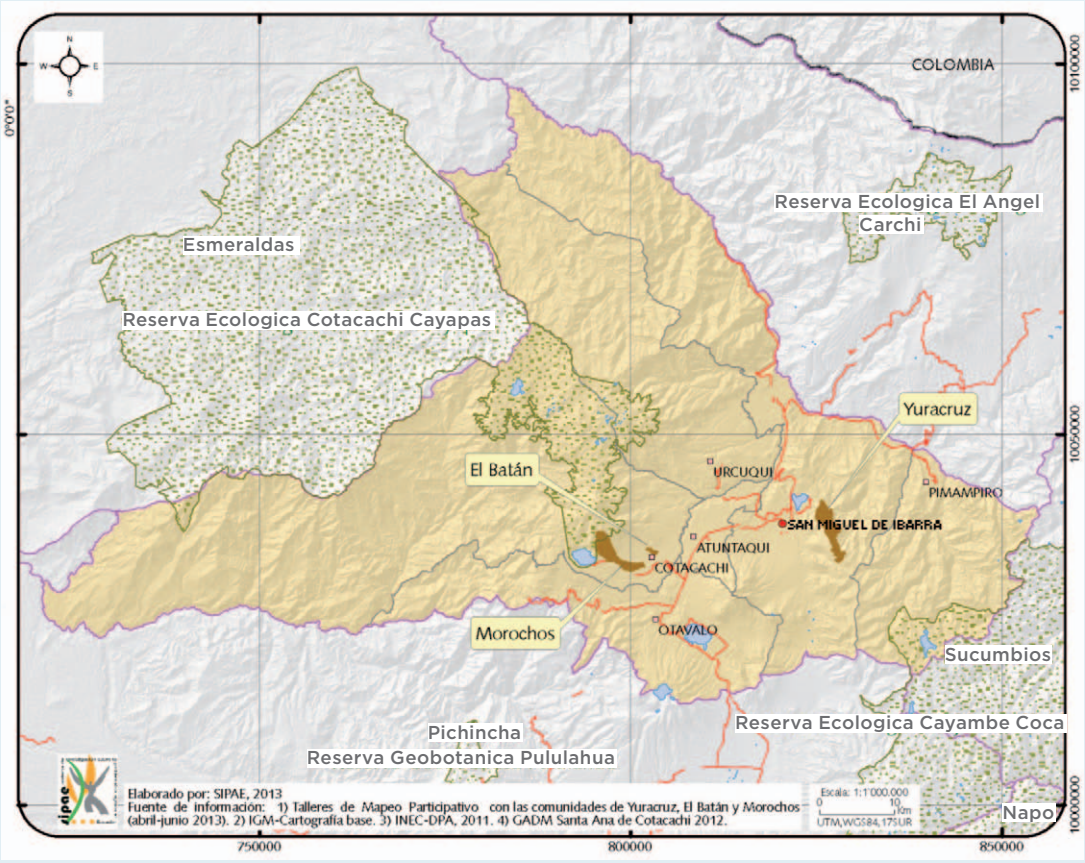
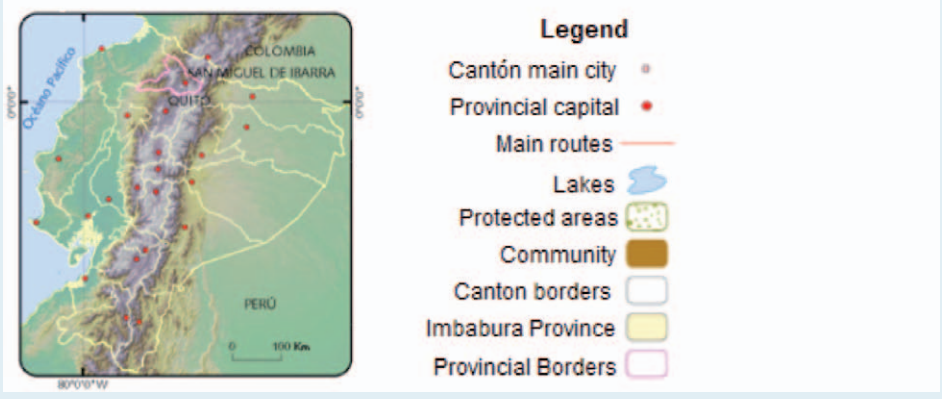
Chapter 8



Graph 1:
Location of the study in Imbabura province

Source: SIPAE



Natural Resource Governance in the Indigenous Territories of the Imbabura Andean Region, Ecuador

Authors: Francisco Hidalgo[a, 1], Matheus Alves Zanella[b], Michel Laforge[a], Viviana Quishpe Ocampo[a]

ABOUT SIPAE

Sistema de Investigación de la Problemática Agraria en el Ecuador (*Research System for Agrarian Issues of Ecuador – SIPAE*) is a research network that works on agrarian policies at local and national level. It operates a platform for action-research development, fostering social dialogues, elaborating political proposals, and connecting scientific investigation with social movements that deal with rural and agrarian problems.

As part of its mission, SIPAE supports a socially and environmentally sustainable agriculture in defence of food sovereignty and collective economic, social, cultural and labour rights. It aims to contribute to different research efforts, articulating and complementing new knowledge on rural and agrarian topics.

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8.1 Introduction

As in other Andean countries, control over land and associated natural resources has always played a central role in Ecuadorian history. How land changed hands and was politically controlled has shaped societal and political relationships, as well as modes of production and the country's economic orientation. Although there have been significant changes over the years, some structural aspects of the way natural resources are governed – and some of its implications – have remained relatively stable. For instance, rural indigenous populations tend to be affected by poverty and marginalisation despite recent and not so recent community-led and nationwide efforts to end their structural social vulnerability.

The present study examines how improved natural resource governance can remove some of the barriers that prevent rural populations from overcoming this structural vulnerability. It addresses the question whether and how secure land tenure helps to reduce vulnerability. This seems particularly important in the light of two recent major trends: i) growing demand for, and additional pressure on, natural resources; and ii) current and future impacts of climate change on the livelihoods of rural populations.

Moreover, posing these questions seems particularly appropriate in the case of Ecuador, a country with huge natural and social diversity. How are the different Ecuadorian identities and cultures reproduced? And how can new and old pressures reduce or even eliminate environmental, social and cultural diversity, with significant implications for the sustainability of certain development strategies?

Besides investigating whether improved and secure access to natural resources safeguards the livelihoods of rural populations, the chapter also discusses if and how some indigenous communities in the Andean region have managed to overcome structural marginalisation. Without neglecting other factors, the study mainly addresses the organisational, institutional and political processes that influenced the development of strategies in successful and less successful cases.

Evidence was collected and analysed using participatory observation, interviews, and participatory mapping techniques in three communities in the Andean region of Imbabura Province: in Yuracruz in the Ibarra canton and in El Batán and Morochos in the Cotacachi canton. Although the settings were very different, there were striking similarities between the three cases. Approximately 20 external and internal agents who influence the use of natural resources in the region were identified and interviewed in the period from December 2012 to July 2013. The interviews focused on understanding the livelihoods and institutional settings of the respective communities, while participatory mapping was used to better understand their views on geographical scales.

The chapter is structured as follows: after the introduction, section 2 briefly describes some of the environmental, socio-economic and institutional changes that are important for understanding the issue of land and natural resources in the region studied. This section gives insights into the Ecuadorian agrarian context and the coexistence of different governance systems. It also describes the relevance of growing pressure on natural resources and climate change to the local context. Section 3 presents the cases of Yuracruz, El Batán, and Morochos, giving an empirical account of the adaptation strategies that these communities have pursued in the face of the structural context and the aforementioned tendencies. Section 4 discusses, in the light of the three cases, the relationship between secure land tenure and vulnerability and the relevance of political and institutional settings when it comes to addressing the sources of vulnerability. Section 5 presents the main messages for further research and policy implications.

Indigenous communities generally live in upper areas, while *mestizos* occupy the valleys.
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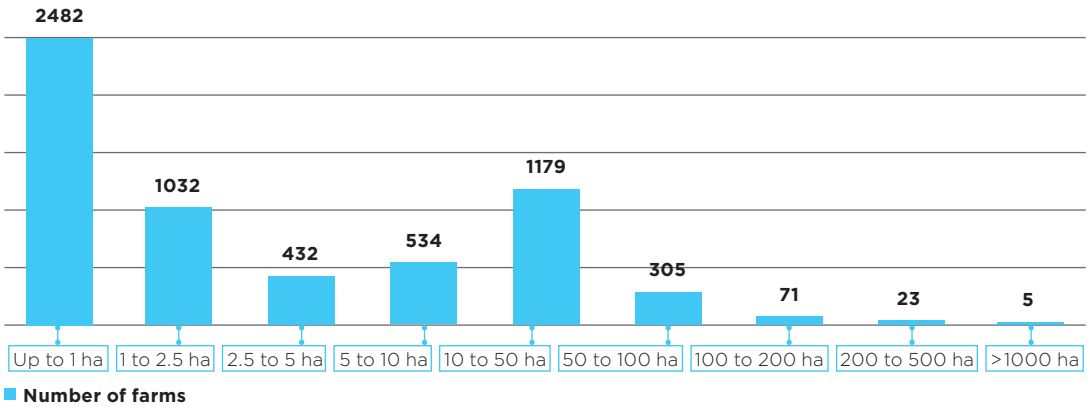
8.2 Environmental, socio-economic and institutional changes

8.2.1 Land distribution and the coexistence of governance systems

Historically, resource tenure, in particular land tenure, has been a disputed issue in Ecuador. The Andean region, once occupied by diverse indigenous groups, was forcibly colonised after the arrival of the Spanish. Its northern zone, where Imbabura is located, was strongly influenced by the the 'haciendario system' (Gondard and Mazurek 2001). This term denotes a historical system of production and social organisation that predominated in many Andean regions until the mid-twentieth century and shaped asymmetric relationships between large land-owners and mostly indigenous peasants. Land was monopolised by a small number of owners, who usually gave peasants rights to small plots in exchange for exploitative labour and/or produce (Guerrero 1991).

Despite developments over the course of Ecuadorian history, the basis of the *haciendario system*, including the extremely unequal land distribution, remained relatively unchanged until the 1960s and 1970s. During these two decades, influenced by similar peasant and indigenous revolutionary movements throughout Latin America, Ecuador initiated a process of agrarian reform that would last until the mid-1980s. These reforms were stalled by structural adjustments programs promoted by the International Monetary Fund (IMF) (Chiriboga 2006). In some regions, the state directly re-distributed land to peasant and indigenous populations. However, in many instances, land-owners themselves, conscious of the winds of change in the political landscape, began negotiations with the families that lived on their land in order to agree on more favourable terms before potential state expropriation (Gondard and Mazurek 2001).

This was precisely the case in many parts of the Imbabura Province, where the land access conditions agreed between land-owners and peasants were more restrictive than processes regulated by the state (Guerrero and Ospina 2003). In practical terms, this meant that more fertile and accessible land remained in the hands of large land-owners, while plots of less fertile and drier land in less accessible areas were given to peasants. Furthermore, despite efforts to improve land access for vulnerable populations, land ownership remained largely concentrated and the livelihoods of the majority of rural families could not be ensured. By way of illustration, in Cotacachi, the district where field work was conducted, 58 per cent of all land holdings are less than 2.5 hectares in size. And 74 per cent of all land holdings are smaller than 10 hectares. Indeed, only 1.95 per cent of all properties (119 units) control 35.2 per cent of all land (III Censo Nacional Agropecuario 2000).



Graph 2: Land tenure in Cotacachi

Source: III Censo Nacional Agropecuario 2001

It is important to note that under the *haciendario* system, due to a set of social, political and religious control mechanisms, farms served not only as production units, but also as instruments for political domination (Guerrero 1991). In analysing community organisation in this region, Ospina notes that many attempts at self-organisation on the part of peasant and indigenous communities that sought to put an end to this political domination were made in the context of large farms. Thus these resistance organisations also have their roots in the *haciendario* system, rather than just in pre-Hispanic or pre-colonisation ethnic configurations. When the *haciendario* system began to break down, these peasant and indigenous organisations assumed a more prominent role and became formally recognised as legitimate units for political and economic representation (Ospina, 2006).

Even though the formalisation of these organisations dates back to the time after the *haciendario* system, it is important to stress that many informal indigenous institutions[2] were maintained, transformed and followed by peasant communities in the years prior to that (Guerrero and Ospina 2003, Martínez 1998). For instance, many rural communities that gained access to land as a result of the agrarian reforms opted to consolidate some areas for private tenure – normally those corresponding to the plots previously occupied by families – while placing other areas under communal management. Moreover, some land-related resources, such as water and forests, are generally communally managed by local and informal councils.

Therefore, in this study, we refer to the coexistence of two very different resource governance systems: i) a 'white-mestizo' governance system where formal and private rules predominate, which is more common in those communities composed of *mestizo* or white farmers; and ii) an indigenous governance system with more communal and informal institutions, which tend to be followed by indigenous people only. Needless to say, these categories are used for analytical purposes only, since combinations of the two systems are found on the ground. Relatively often, the coexistence of these two systems assumes a conflictive nature, with opposing rules and incentives.

Finally, it is worth noting that the growing presence of an indigenous agenda and indigenous representatives in national politics has been influencing the recognition of indigenous institutions by state organisations – not without friction, however (Hidalgo and Laforge 2011). The approval of the new Ecuadorian Constitution in 2008, which included regulations for the formal recognition of communal lands and indigenous territories, was a watershed. Many new constitutional provisions regarding the process of land demarcation still have to be regulated by further legislation and the outcome is open. However, this illustrates how the coexistence of two different natural resource governance systems is subject to recurrent processes of negotiation and re-arrangement according to how political forces are organised at any given time.

[2] *Used here in the sense of 'rules of the game' in a society, i.e. the formal and informal rules, values, and norms that constrains or serve as an incentive for individual actions and reliability (North, 1990). It differs from the term 'organisations', which refers to bodies in which people organise themselves to act collectively (Haller, 2012).*

8.2.2 Growing pressure on natural resources

In this context, two major tendencies have been observed in rural parts of Ecuador: i) growing pressure on natural resources and ii) environmental and climate change. These tendencies, combined with structural vulnerabilities due to the asymmetric relationships between those who have access to resources and those who rarely have such access, are likely to put additional pressure on the livelihoods of many rural communities.

The first tendency is connected to the growing demand for – and consequently growing pressure on and disputes over – all types of natural resources, particularly land and water. Several studies have pointed to the impacts of increasing competition for natural resources on a global scale (Peluso and Lund 2011). The increasing global demand for food, animal feed, fibre, and biofuels has been acknowledged as a major cause of the recent food crisis of 2008/2009. It has also generated incentives for severe violations of land and human rights, particularly in contexts where land rights are insecure or blatantly disregarded (Künnemann and Suárez 2013, De Schutter 2011). Furthermore, it has triggered an academic debate on whether this growing demand generates more opportunities for or threats to rural populations (Borras et al. 2011, Cotula et al. 2009, Von Braun and Meinzen-Dick 2009).[3]

In Ecuador, this phenomenon has stimulated new agrarian transformations and reinforced changes that were already under way. The area covered by oil palm plantations, for instance, has practically doubled in less than ten years, particularly in the Province of Esmeraldas (Chipantasi and Alvarado 2012). In Napo and Pastaza in the Amazon region, the growing number of concessions for oil exploration – an industry with a dirty history of environmental catastrophes in the country – has led to conflicts between companies and indigenous communities, which are rooted in different concepts of territoriality and land tenure (Pástor and Alvarado 2012). In Cotacachi, the price of land has increased because of an influx of retired foreigners who want to settle in the appealing landscape of the Andean region (Quishpe and Alvarado 2012) – a case explored in more detail later in this chapter.

It is important to stress that these are examples of processes that are characterised by increasing conflicts between local rural communities and external actors. As with any transformation, potential benefits – in terms of employment opportunities or spill-over effects, for instance – depend on the capacity of communities to mobilise their asset base. The secure tenure of those assets, for example land, is therefore crucial to determining whether families will be able to respond to these changes or whether they will be pressurised into handing over their assets to external actors.

In the areas studied, many interviewed groups expressed the view that these tendencies are external threats to their livelihoods and way of life. This suggests that very few families are in a position to profit from these changes – normally only those that are better connected or wealthier. This is case, for instance, in the tourist hotspot of Cotacachi, where only a few families can afford new services such as restaurants, hotels or supermarkets that specialise in imported goods and are aimed primarily at tourists and newcomers. In this context, a formal education and knowledge of foreign languages have proved to be very important assets, which tend, however, to be found only among young and well connected locals. Given the increasing difficulties they face to access natural resources and secure their land rights or livelihoods, the majority of families in the study area view the increasing demand for natural resources as a risk rather than an opportunity.

Moreover, apart from the risks it brings, growing pressure on natural resources also has significant environmental impacts. The country's ecosystems have already been substantially altered during the different phases of land occupation (Larrea 2006), but recent trends have exerted additional pressure on fragile landscapes. In the Andean region, for instance, degradation of water catchment areas is contributing to a 'water problem' related to land use and climate change, which will be discussed in more detail in the next sub-section.

[3] This debate has usually been associated with discussions around the term 'land-grabbing', although its formats, nuances and implications are much more complex than usually portrayed in the general media.

8.2.3 Climate change projections and the 'water problem'

The relief of the Andean region contributes to the existence of different local microclimates, which makes the task of understanding and modelling climate projections even more complex. Nevertheless, several studies have consistently pointed to long-term surface temperature increases in the tropical Andean region (Ecuador, Bolivia and Peru) of around 0.11° per decade in the period from 1950 to 1998. (Vuille and Bradley 2000, Vuille et al. 2003). It is, however, unclear how this trend is related to the local microclimates of Imbabura. Moreover, long-term precipitation tendencies vary considerable. While in some regions – such as northern Peru and Ecuador – precipitation seems to have increased, in other regions there have been decreases in average precipitation (Vuille et al. 2003). The perceptions of local populations in Imbabura generally tally with data from climate stations. Several farmers said that temperatures have generally been on the rise in their communities, particularly in higher-lying areas. This has induced shifts in the cultivation range of certain crops. Traditionally, communities used to plant potatoes or other more cold-resistant crops in higher-lying areas (more than 2,800m above sea level), while different varieties of maize were cultivated in lower-lying areas. Nowadays, maize is increasingly planted in higher-lying areas, and other crops have also been gradually 'climbing' towards areas where there used to be only natural pastures.

Farmers have also observed that the distribution of precipitation has become more unpredictable:

> "There are some periods when the climate changes completely. [...] They say it is global warming, I do not know what it is. But the climate before was different, there were those months that one could say this month it rains, the other it does not. Today we cannot say this. Today we have summer, but it does not rain, or sometimes it rains when it should not."

Box 1: Statement of P.J., Yuracruz, 2013

While average rainfall has not changed significantly, rains are stronger and fall over shorter periods of time. In the mostly cultivated slopes of the Andean Region, this has exacerbated soil erosion.

Projected climate scenarios for the region suggest that local populations will continue to face changing climate patterns in future. Climate change projections[4] elaborated through downscaling regional climate models indicate that there will be a substantial increase (2.6ºC) in mean temperature in the Imbabura region in the period from 2041 to 2070 compared to the baseline period (1961–1990) (Alves 2013). Projections of rainfall and the occurrence of extreme events are even more alarming. They forecast a significant decrease in annual rainfall (by 30.5 per cent) in the same period and more dry spells (consecutive dry days – CDD – increase to 6.5 days/year) (Alves 2013).

Nevertheless, the greatest climate threat to the livelihoods of local populations lies in the water cycle in higher areas, especially in the progressive reduction – in some cases extinction – of Andean tropical glaciers and the degradation of páramos, a type of highland tundra ecosystem that plays an important role in water absorption and regulation (Vandermolen 2007). Over the last three decades, tropical glaciers in the Andes have been receding (Andean Community et al. 2007). For instance, the ice mass of the Cotopaxi Vulcan glacier in central Ecuador has decreased by 38.5 per cent in the last thirty years (Cadier et al. 2007). Vulcan Mama Cotacachi, on whose slopes two of the three communities investigated in this study are located, was perhaps the first glacier in the world to have its extinction documented (Rhoades 2008).

[4] *All projections make reference to IPCC-A1B scenario.*

The water regulation function of the páramos has also been threatened by land use and climate change. The reduction in glacier size and the degradation of páramos have a huge impact on rural communities for several reasons. Besides the cultural and religious significance of glaciers, many communities depend on glacier melt as their main source of water. Glaciers play an important regulatory role in the water cycle and hydrologic regime and they can be, directly or indirectly, potential causes of natural hazards. Moreover, water absorption by páramos is the main source of water for downstream communities.

Climatic pattern in the Andean region of Imbabura Province

	Observed		Projected (comparison 2041–2070 to baseline period of 1961–1990)
	Records	**Perceptions** (by rural communities)	
Temperature	For the tropical Andean Region (Ecuador, Bolivia and Peru), a 0.11°C increase per decade in the period from 1950 to 1991, but no records for Imbabura	Temperatures have been rising, especially in upper areas. This has favoured the shifting of cultivation ranges.	2.6 °C increase in mean temperature
Rainfall	For Andean region, mixed observations. No specific records for Imbabura	Precipitation has become more unpredictable. Average rainfall stays the same, but rains are stronger and fall over shorter periods of time.	30.5% decrease in annual rainfall
Other events	Substantial receding of glaciers. The ice mass of the Cotopaxi Vulcan glacier has decreased by 38.5% in the last 30 years. The glacier of Vulcan Mama Cotacachi is extinct.	A reduction in the glacier size, coupled with the degradation of páramos (non-climatic factor) has disrupted the water cycle and the hydrological regime in some regions.	Increase of consecutive dry days (CDD) by 6.5 days/year. Glaciers will continue to recede.

Table 1

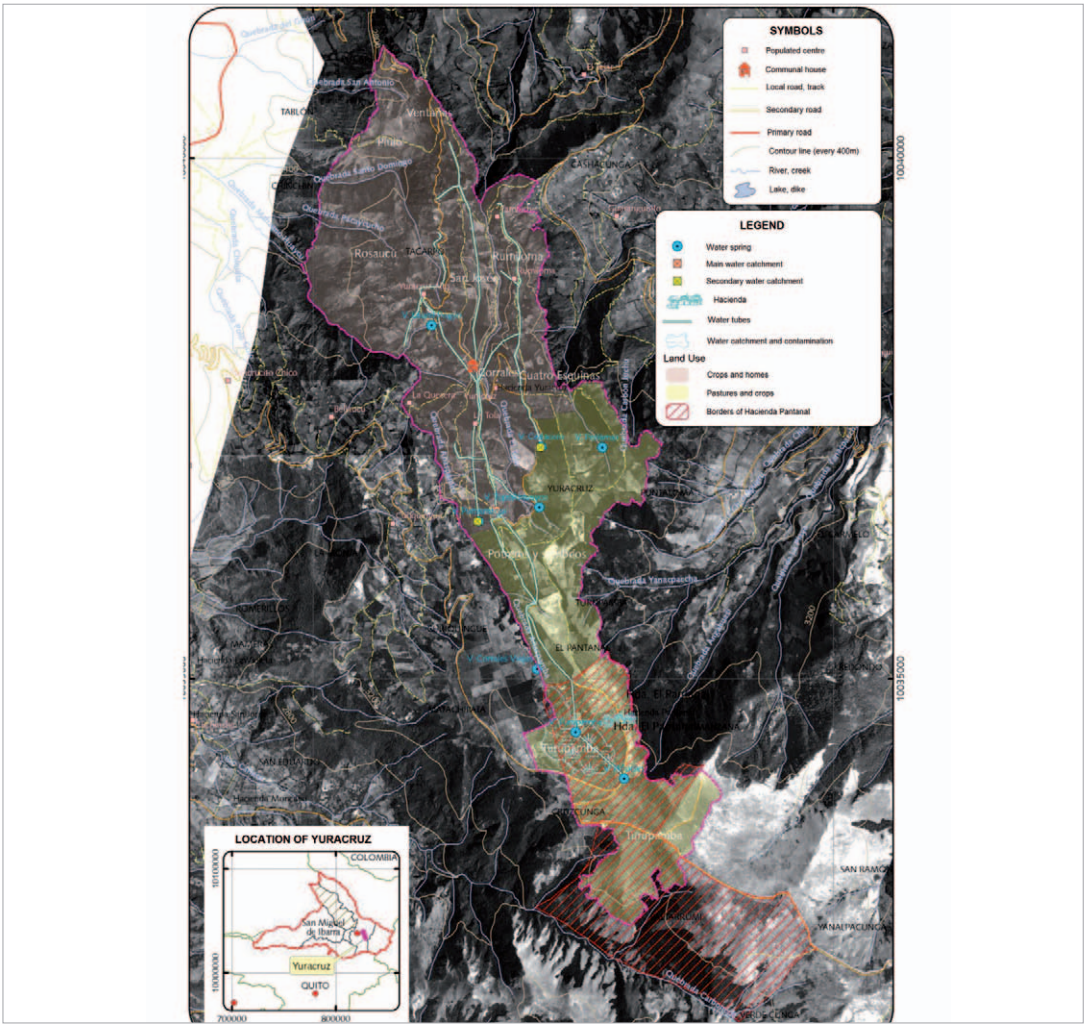
field work, Alves (2013), and Andean Community et al. (2007)

Most communities cultivate the land by hand. © Matheus Alves Zanella

8.3 Options for adapting to the changing environment

As suggested above, some aspects of rural areas in Ecuador – such as land-ownership inequalities and the coexistence of different governance systems – determine how structurally vulnerable some rural communities are. To cast more light on these factors, this section presents three case studies.

8.3.1 Yuracruz: the downstream impacts of upstream agricultural intensification



Graph 3: The community of Yuracruz
Source: SIPAE

Yuracruz is a small community with approximately 1,300 inhabitants – mostly of Karanki ethnicity – located between 2,600 and 3,800 meters above sea level in the Ibarra canton. The landscape is characterised by very steep slopes, and the community occupies an area of approximately 1,000 hectares. Agriculture is the main economic activity of 83 per cent of the population, although livelihood insecurity forces many families to diversify their livelihoods with off-farm activities, such as small-scale trading, migration or labouring in farms (INEC 2010). Yuracruz' isolation compared to communities located closer to the city of Ibarra restricts the livelihood options of its inhabitants.

During the agrarian reform of 1964, the indigenous occupants of what used to be a large farm secured formal recognition of the small individual parcels of land that they had occupied historically. This was one case where a land-owner entered into negotiations with the families, for fear of having the entire farm expropriated by the state. The complicated history of how the farm was dismembered – today only a collective oral history in the minds of the oldest members of the community, which is supplemented by a few newspapers articles kept by some families – had two specific implications for the community. Firstly, some families secured access only to the parcels they had occupied (normally less than 3 hectares), while others, in exchange for labouring on the farm or as a result of acquiring land, secured up to ten hectares. Secondly, and much more importantly with regard to current resource governance patterns, the *hacendado* retained an area of approximately 700 hectares of fertile and water-rich land in the páramo zone (higher than 3,400m). The community tried to buy this area by forming an association (*Asociación de Trabajadores de* Yuracruz) composed of 51 families of former farm workers. However, the area was sold to an external company (*Agroindustrias* Yuracruz S.A.) in a litigious – and allegedly corrupt – process that fostered conflict and physical violence against the community in the 1980s and 1990s. In 1999, the company sold the land to the current owner.

From 2000 on, according to the interviewees, the current owner started to intensify dairy production in the area, draining the wet areas – a large part of the property was a swamp known locally as *cienaga* – and progressively changing the land use from natural páramo pasture (*pajonal*) to planted pastures (rye grass). Tractors and mechanisations were also applied on some parts of the land, a very drastic intervention in the fragile páramo ecosystem that disrupted its water absorption function in particular. Although not all of the farmland is currently being used for agriculture, drained and planted pastures represent an important share of that land and are located in a water catchment area with water infrastructures that serve the downstream community.

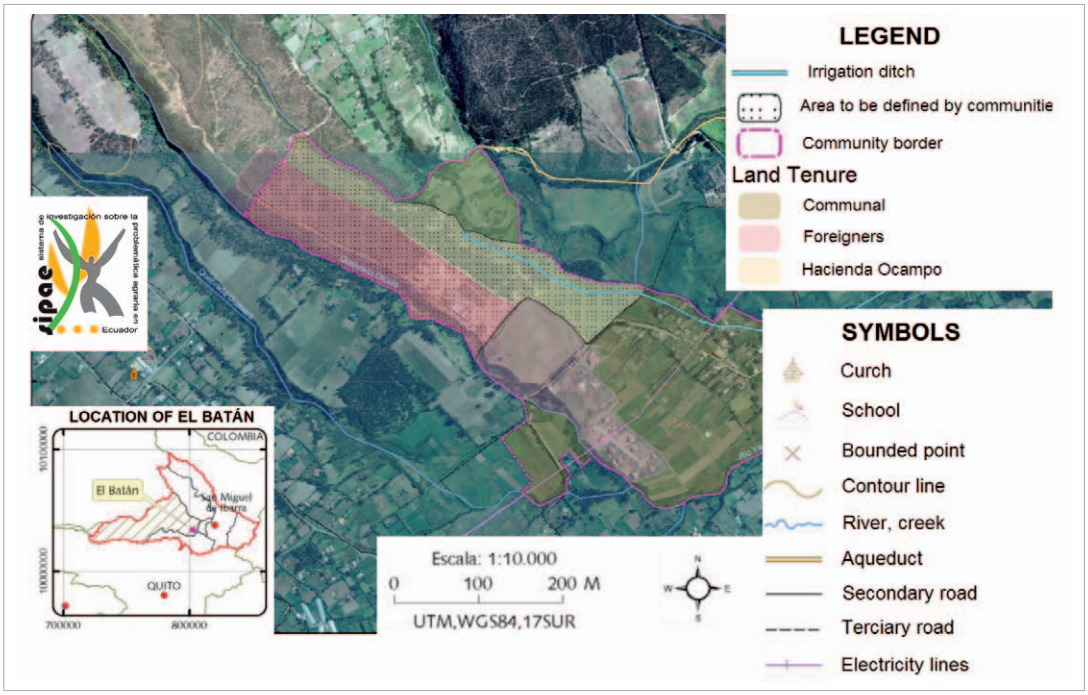
Interviewed community members and some external actors (for instance, local school teachers) reported increasing problems with the water supply, both in terms of quantity – periods without water during the dry season – and quality – polluted and dirty water during the rainy season. They associate this problem with land use change in the water catchment area; although the problem is also thought to be aggravated by projected changes in the climate regime of the region (see 2.3).

Since late 2000s, the Yuracruz community articulated the desire to expropriate the farm and recover their ancestral territory. The community organised protests and demonstrations, published political statements and tried to initiate a judicial dispute in the local courts. However, this strategy of 'recovering the páramo' has so far been unsuccessful. The municipal government has chosen to not get involved in the dispute and both the local court and the regional representation of the Ministry of Environment have declared that there is no legal basis for expropriation, a response that has outraged some community members.

Also thinking strategically, the owner contacted the Ministry of Environment and set up an 'environmental adjustment plan'. The Ministry representative affirmed that the plan is valid and the farmer is acting in accordance with what was decided. This totally contrasts with the community's view that the plan is loose and pretentiously applied for the sake of appearances. The community claims that the plan was prepared by a personal contact of the farmer inside the Ministry bureaucracy and doubts its real capacity to change current land use. In sum, Yuracruz remains an area of open conflict between indigenous populations

and the farmer. After more than 50 years of ongoing disputes, it is an example of how insecure access to resources can induce persistent structural vulnerabilities among rural populations.

8.3.2 El Batán: increasing pressure on land prices as a barrier to land access



Graph 4: The community of El Batán

Source: SIPAE

The community of El Batán is located quite near to Yuracruz in the Cotacachi canton at an average altitude of 2,500 meters. Unlike Yuracruz, El Batán is very close to an extremely dynamic and touristic urban centre, the city of Cotacachi, in a zone that could be characterised as peri-urban. That implies that the livelihoods of its approximately 330 inhabitants – almost all of whom see themselves as indigenous – are less dependent on agriculture and natural resource-based activities. For instance, 42 per cent of the economically active inhabitants are engaged in construction work (INEC 2010).

Most families do engage in agriculture, but only as supplementary source of food and money. However, that does not diminish the importance attached by the community to controlling land, and more broadly, controlling what they regard as their territory. Following a holistic understanding of land that is usually found in indigenous worldviews (*cosmovisión indígena*), land does not just serve an economic function, but it is also a communal space for social and cultural reproduction (Dávalos 2002). Moreover, a shared understanding of territory is inherent in the political discourse of community leaders.

> "The territory belongs to the community. Inside the territory, there is land, and this land should be in the hands of the community. We do not want this land to be handed over to other persons who do not know the community rules (institutions), who do not participate in common work (mingas), in community meetings, etc."

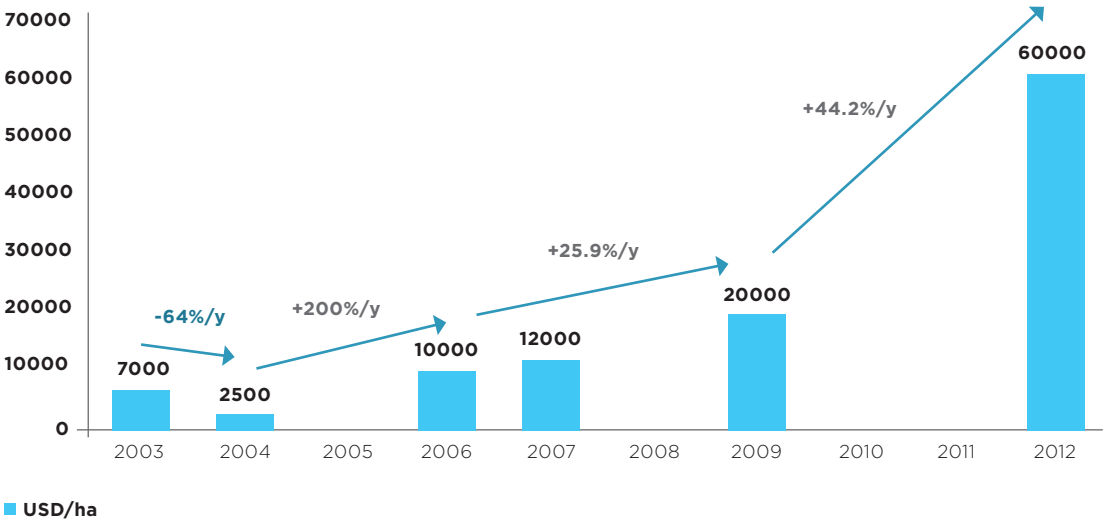
Box 2: Statement by A., El Batán, 2013

As in Yuracruz, El Batán used to be part of a *hacienda*. Here too, indigenous occupants managed to secure property rights over the small plots (less than 1 hectare) they traditionally occupied under the *haciendario* system in the course of agrarian reforms in the 1960s and 1970s. Today, small parcels of the land are evenly distributed among the indigenous population and two large parcels – approximately 60 percent of the total area of approximately 60 hectares – are owned by the heirs of the ancient *hacienda*.

With the cooperation of the community and the support of credit cooperatives, some of which are connected to faith-based international development cooperation agencies, the local population has managed to slowly and progressively acquire areas inside what they consider their territory. In 2003, six hectares were bought by a pool of families. Another five hectares were bought by two groups in 2005 and a further four hectares were purchased in 2006 by other families.

Nevertheless, a new tendency has put an end to this option of 're-conquering' territory through market mechanisms. From 2006 on, but especially after the 2008–2009 crisis, many retired families from North America and Europe started moving to the Cotacachi canton, attracted by the beautiful landscapes and the promise of a life close to nature and lower costs of living. Seeing this development as a new opportunity to make a profit, many owners of former *haciendas* started investing in the construction of houses. *El Batán* is as a typical example of a community affected by this new dynamic. In the past years, two large condominiums was built and are now inhabited by foreigners.

Apart from the obvious cultural and communication problems,[5] this has created tensions between foreigners and rural communities, particularly with regard to the understanding and application of communal institutions. But speculation on land prices is probably the main impact of the growing foreigner presence. Data collected from the local population and the city council shows that land prices have massively increased from USD 10 000 in 2006 to USD 60 000 per hectare in 2012. Although the implications of this process for structural vulnerability are less direct in the case of a community like *El Batán* that is not solely dependent on natural resources, this phenomenon has made it virtually impossible for locals to access land and gain territorial control.

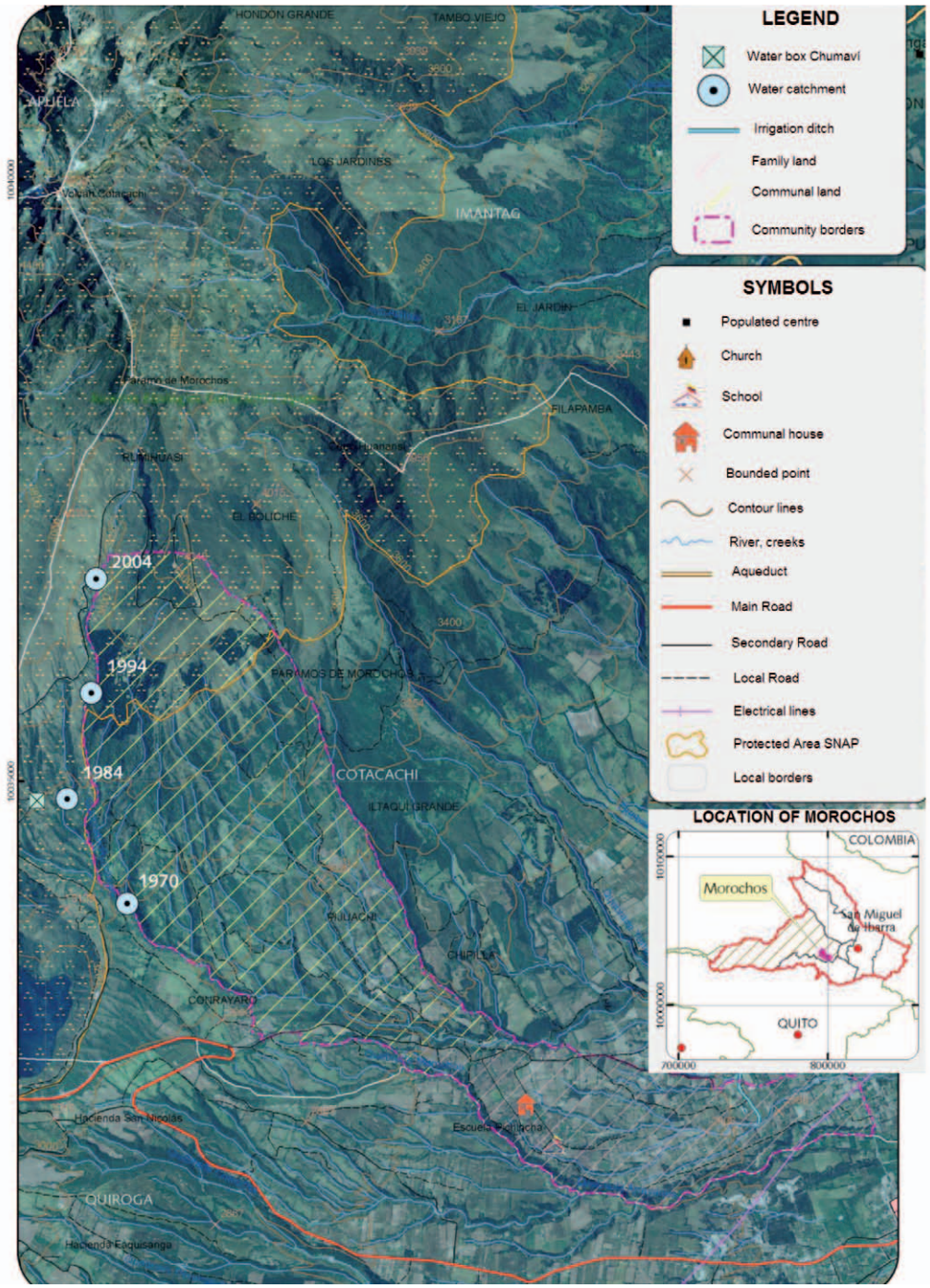


Graph 5: Land prices in El Batán

Source: field work.

[5] *Some of the foreigners are elderly people with little interest in learning Spanish, who do not realise that they are living on what is perceived as indigenous territory by locals.*

8.3.3 Morochos: an organised and politically connected community in the face of environmental change



Graph 6:
The community of Morochos
Source: SIPAE

The community of Morochos is also located in the Cotacachi canton. Its population numbers about 860 people, most of whom (92 per cent) describe themselves as indigenous (INEC 2010). The livelihoods of the locals are diverse (construction work, trading in handicrafts), but agriculture is still an economically and socially vital activity.

Located between 2,600 and 4,000 meters above sea level, the territory of Morochos amounts to approximately 1,100 hectares. It has some distinctive features, such as a lower, less inclined plateau and a higher part (páramos) closer to the Mama Cotacachi Vulcan. As with the case of the two aforementioned communities, the area used to belong to a large property (*hacienda Cuicocha*). Once again, under growing pressure exerted by political changes and agrarian reforms throughout the 1960s, landlords autonomously dismembered the farm, distributing rights to the small plots traditionally occupied by the indigenous population (normally less than 2 hectares per family).

However, according to interviewees, compared to other neighbourhoods, Morochos has always been an organised and politically active community, a feature that is clearly visible in its vibrant community life. It is difficult to ascertain if this is due to the different institutional context or to other factors, but the fact is that over the decades, community members have been progressively acquiring land that was previously in the hands of *hacienda* heirs.

As a result, today the community members hold almost all of the land that they consider as their territory. Some parts of this land, predominantly the upper páramos zones, are today managed by common institutions. This is an example of the coexistence of different governance systems mentioned above. Although in the lower community area, plots are regarded as private, some upper parts are dedicated to common pastoral or agricultural activities as decided in assemblies and other community gatherings. Common institutions also determine how some natural resources are distributed and accessed, for instance water for household consumption or irrigation and, in some cases, wood for construction.

Compared to El Batán, Morochos seems much better prepared to respond to the increasing pressure on land prices that can also be observed in the area. Controlling almost all of their regarded territory, the community has established a number of rules for land sales. In general terms, preference has to be given to community members, after that to indigenous families of neighbouring communities, and only thereafter to an external, non indigenous person. This has not ruled out the possibility of external buyers acquiring land, but it has given the community some control over the process.

Although Morochos seems to be better prepared to face certain external stressors, it is not spared other important challenges, such as growing water scarcity due to a combination of land use changes, population growth and the extinction of the Mama Cotacachi glacier (see 2.3). The main water source used to supply Morochos has dried up since the 1970s, forcing the community to build another water catchment infrastructure in an area approximately 200 metres higher than the previous one in 1984. This also went dry, and the community built another infrastructure 300 metres higher than the second in 1994. History repeated itself, and in 2004 another well was built 200 metres higher. The third has already gone dry and a fourth is subject to scarcities during the dry season. The community is now concerned about how to proceed in the future, since there is simply no more space for building a fifth water source. Thus, it seems that even better prepared communities could face significant stressors related to climate change and water, which may increase their structural vulnerability in the future.

8.4 Discussion

The three presented cases show how access to resources can influence the vulnerability of poor rural populations. Secure access to land and water is not only vital to the livelihoods of indigenous communities; it is also culturally and socially significant for indigenous identities. In this section, access to resources will be discussed in the light of the three cases with a view to identifying factors that allow some communities to be more successful than others in adapting to the changing environment.

Yuracruz is an example of a marginalised community, where most families have insecure livelihoods due to very limited access to fertile land and restricted livelihood options. This situation is substantially aggravated by the aforementioned water supply problems and the community's incapacity to mobilise the political forces needed to resolve the disputes over the upper páramo. The community already found itself in a powerless situation when the former farm-owner redistributed land in the 1960s in order to retain control over the páramo area. It seems that the balance of power has not shifted significantly in favour of the Yuracruz community since then. While many efforts have been made, government officials are still reluctant to get involved in an open conflict over the páramo. For instance, the legalistic approach taken by regional courts and the Ministry of Environment could be challenged in the light of several new constitutional provisions.[6] But this would require legal support, political advice and other costly investments that the community has not yet been able to mobilise or afford.

The cases of El Batán and Morochos demonstrate how better prepared communities are in a more favourable position to face external stressors, such as the land speculation. The impact on livelihoods may be less than that on the water supply. However, the indigenous people's understanding of their territories ascribes a central role to land.

Different historical developments have allowed the community of Morochos to regain control over practically all of what it considers to be its ancestral territory and define its own rules for land transfers. Given that it does not own the majority of the territory, the community of El Batán is not only unable to profit from the influx of foreigners, but also sees decisions being taken out of its hands. This influences internal community dynamics and has already generated conflicts, which are exacerbated by cultural differences and communication difficulties between locals and newcomers. The foreigners we interviewed mentioned that they received no advice on cultural profiles or communal institutions from the companies that manage the housing market.

They were basically dragged into a long history of tensions between indigenous and former farm-owners.

Also in the case of Morochos, the community was better able than Yuracruz to adapt to the effects of environmental change on water supply. Having secured control over the páramos, the community opted to use this fragile ecosystem for low-impact

[6] *For instance: the fundamental right to water (Art. 12); the right to a decent life, which includes the right to drinkable water (Art. 66, 2nd paragraph); the state's responsibility to promote food sovereignty, which includes the development of redistributive policies ensuring access to water (Art. 281, 4th paragraph and Art. 282); and specifically the Art. 411, which states* "The state guarantees the conservation, recuperation and integral management of hydrological resources, water basins and ecological flows associated with the hydrological cycle. Any activity posing a threat to water quality or quantity or to the ecosystem equilibrium will be regulated, particularly in the case of water springs and water catchment areas. The sustainability of the ecosystem and human consumption will be a priority for water use." (Asamblea Nacional 2008).

activities, such as alpaca grazing. It is currently trying to convert a pine plantation, which is extremely water-intensive, into natural pastures (*pajonal*). It has also invested in new infrastructure for water catchment. But this relative success is limited, as the drying water springs suggest. Given the climate projections for the area, it is likely that the community will again be vulnerable to water stress in the near future.

Two main messages can be derived from this evidence. Firstly, redefining rights to resources is clearly a political process with winners and losers, where power plays a decisive role. A pro-poor approach would not only require an acknowledgement of power imbalances, but also a 'levelling the political field' in favour of those who are most vulnerable. In the case of Yuracruz, for example, it would require that the state understands that the vulnerability of a 1,300-strong community should not be allowed to increase in exchange for economic benefits enjoyed by only one better-off (and less vulnerable) household.

Secondly, increased land access and tenure security opens up avenues to reducing vulnerability. In the case of the indigenous communities in Ecuador, however, the ability of those communities to regain control over all of their territory, instead of just certain parcels of it, proved decisive. This not only strengthened community ties, but also supported the emergence of communal institutions that favoured the sustainable management of land and water. It was the strengthening of this 'indigenous governance system' that helped the community in Morochos to adapt to pressure on land prices and manage the páramos, for instance.

Thus regaining control over their territory appears to reduce or eliminate structural sources of vulnerability in the Andean Ecuador. However, this assertion should be qualified. It does not ignore the fact that communities have their own internal imbalances in terms of power, income, etc., which also have to be regarded when assessing vulnerability. These differences are much smaller than in other contexts, such as urban areas, but they are not negligible.

Furthermore, many communities are already constrained by limited access to land, even if their currently claim of territories would be accepted. This can be explained partly by the fact that the distribution of territory among many peasant and indigenous communities has its roots in resistance movements against the *haciendario* system, rather than only in ethnic configurations. That means that in many cases, communities only claim as their territory land formerly occupied by an ex-*hacienda*, instead of broader territorial spaces. In these cases, secure land access for the purpose of meaningful livelihoods would possibly need to be based on ethnic configurations.

To meet this challenge, political organizations based on ethnic configurations are certainly a key in facilitating dialogue and increasing influence on local political decisions. The example of the Union of Peasant and Indigenous Organisations of Cotacachi (*Unión de Organizaciones Campesinas e Índigenas de Cotacachi* – Unorcac) and the *Karankis* people's leadership can shed some light on the role of these organisations. Unorcac has played a key role in consulting with the local administration and setting up new rules for land acquisition and territorial development in Cotacachi. The Karakis leadership has initiated campaigns and fostered mobilisation to raising public awareness of the situation in Yuracruz.

These are important steps towards securing access to natural resources for indigenous and vulnerable populations, although it remains to be seen if Ecuadorian players will be up to facing the challenges described here. The national and political contexts seem to point in different directions. On the one hand, there is a strong indigenous political presence at national and regional levels. The growing recognition of indigenous rights and experiments with local alternative governments are also noteworthy. On the other hand, a conception of the state based on productivity still dominates the Ecuadorian political spectrum with two consequences: i) decisions that favour the fundamental rights of poor rural populations over economic rights (a pro-poor or rights-based approach) are still rare, and ii) communal management is being diluted as a result of divisions and the weakening of indigenous organisations and alliances. The strategy of weakening indigenous organisations has already led to some setbacks, for instance, in the recent municipal elections in Cotacachi, where the opposition prevailed.

8.5 Conclusion

New tendencies that affect natural resources will continue to interact with established agrarian structures in defining the vulnerability of poor Ecuadorian rural populations. This chapter briefly outlined the broader context of two important observed tendencies: growing demand for natural resources and climate change. It showed how both tendencies come into play in three specific cases, focussing particularly on issues and disputes fuelled by increasing pressure on land prices and growing water scarcity.

By analysing structural sources of vulnerability related to access to resources, the chapter suggests that pro-poor adaptation can deliberately imply political processes that redefine rights to natural resources. The redistribution of rights is certainly a controversial process and the importance of power distribution within rural communities should therefore be highlighted.

Moreover, specifically in the case of Andean region, with its significant share of indigenous populations, the particular ethnic configuration of rural spaces has served to foster social organisation and resistance. This in turn has allowed many indigenous communities to maintain their ethnic identity and communal institutions. To reduce vulnerability, we need to acknowledge this diversity and strengthen the institutions that govern natural resources for the benefit of poor rural populations. Legislation could be reformed to this end by recognising access and control rights to territory as part of a comprehensive pro-poor rural development strategy that favours institutional diversity.

Potatoes and other crops are cultivated on steep slopes. © Matheus Alves Zanella

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Chapter 9
Climate Change Impacts, Institutional Resilience and Livelihoods Vulnerability: A Comparative Analysis of Climate Change and Adaptation Strategies in Asia, Africa and Latin America

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9.1 Introduction

The chapters in this volume focus on climate adaptations in the Global South, taking into account changed economic, political and ecological conditions. While previous research on development focused on poverty and sustainability goals, the focus is now on impacts of climate change. Such debates often tend to leave out political and property rights issues and were labelled to be anti-politics machines by James Ferguson (1994). This idea of hiding political contexts behind development projects was a central argument in most political ecology literature (see Blakie and Brookfield 1987) and later adapted to issues of climate change (see Adger et al. 2001, 2004, Brockington, Igoe and Duffy 2008). For this project funded by the International Fund for Agricultural Development (IFAD), the policy driven demand was central, as was the will of the donor to address a timely topic. Thus, the project is based on transdisciplinary research by staff from the Institute of Advanced Sustainability Studies (IASS) together with smaller and larger civil society organisations (CSOs).

Research has departed from the view that climate change falls on already transformed and changed political, institutional and economic conditions. The latest report by the International Panel on Climate Change (IPCC) issues clearly that global warming generates negative impact processes that will affect everyone. But taking a closer look indicates that not everyone will be affected immediately and with the same intensity. The major hypothesis is that although similar outcomes of climate change will be experienced on the local level, different societies and groups are differently equipped with the tools and knowledge to deal with increasingly less predictable climate conditions.

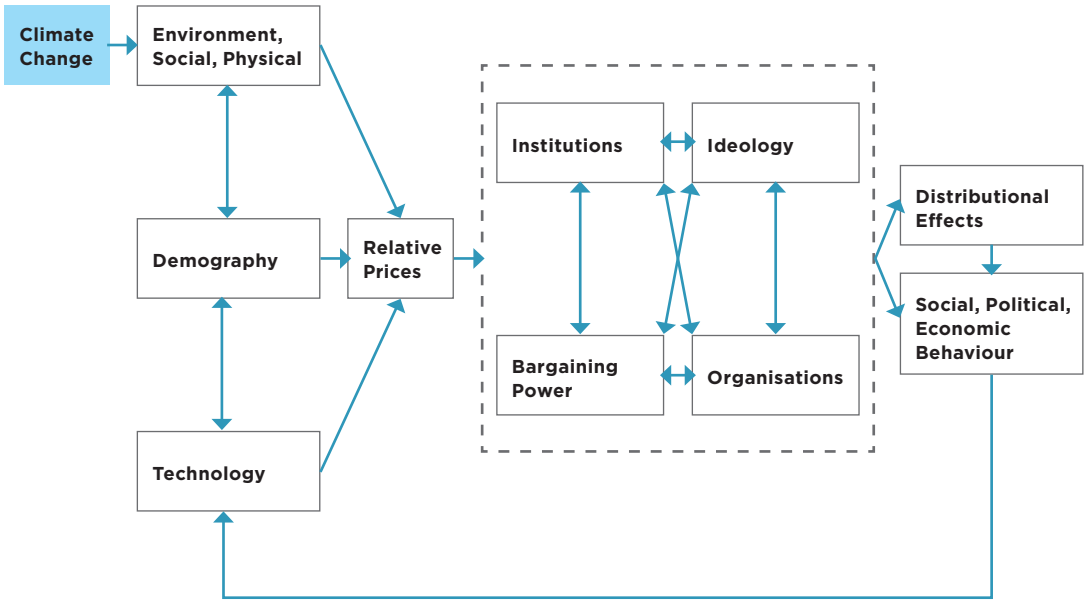
Research in social anthropology and human geography indicates that local groups in the Global South have been able to cope with climate variability by diversifying production strategies, social networks and reciprocal access and use rights. This leads to a large variety of family household and communal production systems, which are based on common pool resources (land, water, pasture, fisheries, wildlife and forestry) that are governed in multiple property rights institutions, combining private family and common property systems of access to resources. Such interlinked property institutions provide secure access to vital resources, enhanced cooperation and a reduced risk of lack of food as an adaptation to fluctuating climatic conditions. However, people have not only adapted to so-called natural but also to political conditions. In the past these were threats from being attached and controlled by more powerful political groups. For example, settlement patterns and adaptations to natural conditions in mountain areas and wetlands in African contexts were also driven by the need to protect and hide from slave raiding. Most social anthropological literature or ethnographies studying pre-colonial settings highlight such variables (see Haller 2007a,b and Haller ed. 2010 for an overview). Property institutions stemming from such conditions and the resource use governed by them led to the production of cultural landscape ecosystems. These were often 'misread' by colonial powers and were labelled 'natural' and thus free of property (see Fairhead and Leach 1996, Escobar 1999, Haller 2007a,b, 2013, Haller and Galvin 2008, Miller 2008, Sheridan 2008, Haller et al. 2013). Understanding this misreading has major consequences: if local groups have created landscapes and institutions to govern these, they hold rights in their areas and have found-

ways to adapt to several conditions, among these being climate variability. Since colonial times major political, economic and legal changes led to transformations of these landscapes, as these were first viewed as 'natural' and then as state-owned resources exposed to market conditions (see Wolf 1982, Ferguson 1999). Climate change now falls on such changed conditions and reinforces or changes the impact of these transformed settings.

Following this logic, this chapter provides an analysis of the institutional change of landscapes and related resources based on a new institutionalism approach (see North 1990, Ostrom 1990) from a social anthropology perspective (Ensminger 1992, Haller ed. 2010). This is an actor-oriented approach that integrates issues of power and ideology in the ways that rules and regulations are crafted, chosen and justified.[2] The approach firstly defines institutions as rules of the game that reduce so-called costs of transactions (costs for information gathering on actors and their behaviour, monitoring and sanctioning). Important institutions are for example property rights of land and access to land related resources (water, forests, pasture, wildlife etc.). In order to understand which institutions are created or chosen by local actors, the approach focuses on how external and historically-shaped macro changes in the natural, political and economic environment, in demography and in technology affect changes in relative prices and thus the value of a resource or an area. This again has implications on local settings and affects the bargaining power of actors, their forms of organisation, their ideologies and finally the way that actors choose, transform and justify formal and informal institutions (laws, rules, regulations, norms and values). Through these institutions the distribution of resources took place and influenced the behaviour of actors (see Haller 2007a, ed. 2010).

This approach can serve for the analysis of institutional transformations of local livelihoods and be related to issues of climate change in the following way. Research indicates that local actors have developed institutions to ensure their livelihoods and were able to cope with risk regarding climate variability often by common property arrangements, storage of food, reciprocal arrangements etc. (see summary in Haller 2007b, Haller ed. 2010). During colonial and post-colonial times external processes led to changes in the relative prices of goods and land and related resources. This again leads to shifts in the bargaining power of different actors, who then opt for changes in property rights (mostly state and private property) regarding land tenure and access to resources. They then often try to use ideologies (such as modernity) with discourses and narratives to legitimate their claims (such as, for example, 'development' or 'progress'). This leads to an uneven distribution of land and related resources by which marginal actors lose property rights and access. From a new institutionalism and related political ecology perspective, these political and economic changes also partially explain poverty and the vulnerability of actors. An example can illustrate this process: a common property area grants access to a variety of resources to all members, including the poorer actors. If such an institution is then transformed into exclusive state or private property rights – which are often also fragmented, meaning rights for land (as soils for cultivation), water, fisheries, pastures and so on separately – poorer actors are excluded (see case studies in African contexts in Haller ed. 2010). Therefore, in such cases institutional resilience – the institutionalised way to recover after shocks and events – is undermined, and livelihoods of local actor groups are rendered more vulnerable. Climate change as an additional external factor (see graph 1) then falls on this already transformed area and exacerbates the impacts that are related to previous institutional change.

[2] *On old institutionalism, see Ensminger (1992), Haller (2007), and Olivier de Sardan (2013).*



Graph 1: Model for Institutional Change based on Ensminger

Source: Ensminger (1992), Haller (2013), modified by author

Policy development can profit from such institutional and historic comparisons because technical solutions might be part of strategies to adapt to climate change, but in situations of lacking local institutional resilience and increasing livelihood vulnerability, these tools will not suffice.

Based on these theoretical considerations the comparison is organised around the following thematic topics:

- Environmental preconditions and cultural landscapes
- Livelihoods, socio-political structure and institutions
- Major changes (external and institutional) and key problems
- Perception of key problems and relation to scientific and local climate change perceptions
- Adaptation strategies

Each of the six thematic sections starts with the South Asian cases of Bangladesh and India, followed by the African case (Burkina Faso) and the four Latin American cases (Brazil, Ecuador and two cases from Bolivia).

9.2 Preconditions for adaptation to variable climates and cultural landscapes

As a starting point of the analysis, and in line with general reflections on the topic, the ecological, climatological and anthropogenic contexts are given in Table 1. Generally we adopt the Köppen-Geiser classifications defining the climate conditions of the areas.

Bangladesh: The most obvious features are the river delta setting with high, monsoon-driven rainfall and strong sedimentations in the delta stemming from the Himalayas. These sedimentations develop into newly-gained pieces of land called *Chars* at the coast. Such new land is always vulnerable because of cyclone storms and flooding leading to salination and erosion. On the other hand, *Chars* offer cultural landscapes for irrigation cultivation, mangrove forestry and fisheries use.

India: The case study in *Rajasthan* was performed in an arid to semi-arid climate with low irregular rainfall patterns in a hilly landscape with dry forests in higher areas and more valuable agricultural land in the lower parts. Between these two sections are forest grassland areas, which are to a large extent deforested. The high parts are vulnerable regarding soil erosion. Water stress is a central factor because of scarcity and unpredictability in the rainy season. Therefore, prolonged droughts and regular high precipitation can lead to gully erosion.

Burkina Faso: The *Samorogouan* area is characterised by semi-dry land and is located between the Sahel and the forested zones in a Sudan-Guinean climate zone where agrarian land and pasture meet. The region has a cooler climate and more fertile soils than other areas in Burkina Faso, although it also suffers from high variability in rainfall.

Ecuador: The area of *Imbabura* is located in the Andean part of Ecuador with elevations over 3000 m.a.s. Volcanoes contain glaciers and grasslands in the higher areas followed by mountains and lowland forest cover that has been transformed to a specific agro-silvo landscape ecosystem from the times of the old empires, several centuries before colonial times. In some parts, due to high altitude, there is heavier rainfall and areas are covered with forest, but the territories above tree level are dry. Temperature conditions pose restrictions to cultivation other than for potatoes in areas above 2,800 m or higher for anything other than grazing.

Brazil: The Brazilian case deals with a region in the *Paraíba* state, in the semi-arid northeast of the country. Its rainfall of between 300 and 800 mm is very low, and concentrates itself into a period of three months. Mobile nomadic indigenous peoples had used this dry land before the arrival of Europeans. The indigenous groups were then evicted, and some possibly moved to areas in the Amazon. In the 17th century white settlers put an end to this extensive use and commenced large-scale farming and cattle husbandry. The landscape afterwards became more uniform with patches of large pastures, and smaller as well as large-scale agricultural fields dominating the landscape.

Bolivia (Alto Beni): The *Alto Beni* region is located close to the Amazon but also reaches mountain areas up to 800 m. Climatically the area is humid, with high levels of rainfall (1500 mm annually, temperature of 26 °C), labelled as rainy tropical with a several-month dry season between December and January. Local groups using this landscape were, in the past, mainly indigenous hunter-gatherer groups of the Moseténe who were made sedentary in the 18th century. Due to immi-

gration by other indigenous groups from the Andes (*Aymara*, *Quechua*) the landscape was transformed and partially deforested.

Bolivia (Lomerío): The Chiquitanos community in *Lomerío* in El Oriente region live in typical tropical climate, with clearly defined rainy and dry seasons. The *Chiquitanos* were once hunter-gatherers and fishermen but became agriculturalists based on slash-and-burn and later on more permanent agriculture building semi-urban centres around Jesuit Mission stations. There is high pressure to turn the land into intensive agriculture, cattle ranches and mining areas.

All areas need to be considered as having been cultural landscapes for a long time, but the cases differ in the degree of local transformations and kinds of transformations based on the time and intensity of the colonial process. In all cases water availability and predictability is a fairly pressing problem for local groups, which they address in multiple ways through the diversification of subsistence strategies (hunting and gathering combined with slash-and-burn systems or agro-pastoral interacting systems: see Burkina Faso, India and Bangladesh).

Table 1

Ecological preconditions and cultural landscapes

Country/region	Basic ecosystem	Climate (Köppen classification)	Cultural landscape features
Bangladesh/Ganges Delta	River delta, high soil erosion	Tropical monsoon (Aw): monsoon, wet, high rainfall, cyclones, and high temperatures	Mangrove areas used, new alluvial land cultivated, land made more stable
India/Rajasthan	Hilly forest landscape and grasslands	Warm semi-arid (BSh): short wet and longer dry seasons, moderate to high temperature	Mosaic landscape of severely degraded forest/ grasslands with signs of extensive use, valleys
Burkina Faso/Samorogouan	Savannah forest drylands	Tropical Savannah (Aw): clear rainy season (short) and longer dry season, medium to low rainfalls, high temperatures	Agro-pastoral landscape with livestock influenced pasture and rain-fed farming, extensively used dry forests
Ecuador/Imbabura	Glacier-Tundra (páramos) and lowland forest	Warm summer Mediterranean (Csb): Cold-humid to warm semi-dry, mountainous temperate	Alpine highland-grassland lowland transects of forest-agro-meadow landscape
Brazil/Paraíba	Dry forest and grassland	Warm semi-arid (BSh): short rainy season with low rainfall, moderate to high temperature, regular occurrence of droughts	Dry pasture agriculture landscape
Bolivia/Alto Beni	Lowland rainforests, highland to lowland transitional forests	Oceanic climate (Cfb): High rainfall, with high humidity and moderate to high temperatures, short dry seasons	Patches of small slash-and-burn cultivations and mosaic agricultural landscape
Bolivia/Lomerío	Lowland rainforest	Tropical savannah (Aw): clear wet and dry season, typical tropical climate	Rainforest with patches of slash-and-burn cultivation, hunting territories

9.3 Local livelihoods, socio-political structures and institutions

This sub-chapter provides background information on living conditions and economic activities as well as basic information on political organisation and basic land tenure and other institutions, including property rights.

Bangladesh: Most people in the *Chars* areas in the delta are poor and have immigrated because they were marginal[3] in their areas of origin. From there they were pushed to the delta, where *Chars* land is unstable and vulnerable to erosion. Nevertheless they cultivate, keep some animals and work in the informal sector or as day labourers. But their bargaining power is low as they remain marginal to the area due to powerful middlemen and leaders (*Bahini*), who control the *Chars* before immigrant settlers can act as pioneers in cultivation. The price of land varies according to how old the *Chars* are – the older they are, the higher values these lands have – and how far these are located from the river and potential destructive floods. The *Bahini* landlords act as patrons, who receive money, loyalty and services from the users. *Bahini* extend their power as they are elected by their clients to represent the government. Without this process based on patron-client institutions, no settler is able get access to land in an area.

India: The political structure of the villages and access to resources is based on the caste system. High caste groups own and use the best farmland and herd milk animals in the valley. Scheduled tribes and non-casted people live in the upper parts of the areas. These areas are used to gather non-timber forest products and to herd small livestock (small numbers of cattle, goats etc.) in silvo pastures. Poorer people also make an income by cutting and selling wood. Due to the intensive use of highlands their natural resources are deforested and degraded. Before colonial times the upper parts of the area were common property. During colonial and post-colonial times until the 1970s these areas became state property, and local use of forests was forbidden. Forests were legally held in three forms: reserves, protected forests and village forests. Since the 1980s, a decentralisation and tribal support-oriented policy was adopted by the state. However, village forests are hardly regulated. In these areas pasture should be set aside and managed by the village council (*Panchayat*) under the Land Revenue Act. However, encroachments by all actors occur and sites are not sanctioned as planned. Nevertheless, poorer and more marginal actors with lower numbers of animals and bargaining power will suffer most.

Burkina Faso: The local firstcomers group (the *Samoghos* and others) were originally subsistence-oriented agriculturalists with a small number of animals and a relatively low population density of less than 20 hab/km^2. Common property institutions governed access to fields and to pasture areas. These institutions regulated membership of individuals within groups, access and use rights: different traditional bans existed regarding the removal of tree cover and other vegetation cover. These bans were based on cultural taboos linked to ancestral and other spirits, who had to be 'asked' ritually for approval of resource use. In addition, rotation rules for farm plots existed that demanded a seven-year fallow period after cultivation. Regarding property institutions for land, a system of

[3] *Locally there is no caste discourse, but scientists working in Bangladesh argue that these are in fact low-caste groups; see report on low-caste groups (Dalit, 2014).*

combined private family and collective common property existed that was managed by leaders. They could also grant access to immigrant households based on their religious and redistribution duties. Therefore, immigrants could clear forest plots for agriculture in a controlled way. The area was also a zone of transhumance based on agreements (migration routes, coordination of harvest and pasture use etc.) between sedentary and pastoralist groups (the latter are *Fulbe* and others) and thus of great importance in a zone of high climatic variability. French colonial and state post-colonial powers did then *de jure* change this flexible land tenure system by imposing state property regulated centrally by the state. The area was transformed into a so-called state-owned pastoral zone in the 1970s. But it also allowed and attracted more immigration of the dominant *Mossi* ethnic group, who are politically centralised. In this process, leaders of the firstcomer groups were increasingly bypassed.

Ecuador: Before colonial conquest the whole Andean region was inhabited by diverse indigenous groups (*Colorados*, *Quitos*, among others) who became part of the centralised Inca Empire. This empire controlled institutions of resource use including common property for agricultural and pastoral purposes. In the 16th century Spanish colonial conquest was followed by major transformations, as the land became colonial crown property, and was later converted to private property for large *haciendas*. Only in the mid-20th century did the power of these rich settlers become reduced through a land reform initiated in the 1960s–70s to return land to the indigenous peoples. However, this reform did not really reduce large holdings. The indigenous groups themselves continued using the pre-colonial technical agricultural strategies such as occupying several niches of the topography with production techniques and crops adapted to several altitudes and microclimates. These ranged from low to high lands, wit a) forests with shifting cultivation and hunting and gathering on lower lands; b) maize and vegetable gardening in mid-level areas; c) potatoes at higher areas, and; d) pastures and water catchment in the highest areas. Institutions that included timing of use and restrictions originally under a system of combined private and common property, transecting the topography and offering a wide range of resources to members of that group, regulated the territory of a group.

Brazil: The former indigenous population who occupied the area were hunters and gatherers, who were evicted after colonial conquest. After their eviction the semi-arid part of the northeastern region of Brazil was controlled by a small number of cattle ranching groups with very large land holdings as private property. Within these large cattle raising farms small family-based agriculture plots served as a subsistence activity of farm workers and cattle keepers. However, land and related resources were extremely unequally distributed and perceived as the basis of poverty, as 90% of farmer families hold less than 27% of the total agricultural area. These smallholders today cultivate maize, beans and tubers, raise small animals and sell their work force as day labourers.

Bolivia (Alto Beni): In contrast to the previous example, the indigenous inhabitants of the area in Alto Beni, the *Moseténes*, are still present, although in relatively small numbers. They lived as hunter-gatherers in community-owned areas until Franciscan monks made them settle down, and introduced new crops and agricultural techniques. From the 1960s onwards, government supported migration by *Aymara* and *Quechua* immigrant peasant from the Bolivian highlands. Today, these groups compose the vast majority of the population in Alto Beni. They are smallholders using shifting cultivation techniques for subsistence (rice, bananas, plantain and fruits) in combination with cash crop production (cacao, banana, citrus). The agricultural frontier is increasingly encroaching into the remaining rainforest landscape and land is mostly transformed into private property. The exception are territories for the *Moseténe* under common property, now registered as a Communal Territory of Origin (TCOs), granted to them by the state.

Bolivia (Lomerío): Similar to the previous case study, the local indigenous group, called *Chiquitanos*, had a diversified economy as hunters-gatherers and small-scale agriculturalists, and used the landscape and related resources before conquest as common property. After colonial control, the leaders of white settlers organised access to natural resources based on state and private property. Indigenous peoples were pushed into rubber collection and were highly dependent as semi-slaves of the rubber entrepreneurs and large-scale farmers. As a reaction to this dependency,

some of the indigenous groups moved back to marginal areas, which they later tried to legalise via the state in order to receive communal rights under a TCO. The political organisation changed from a more egalitarian political system to a centralised type of leadership. In addition, the values and norms of the Jesuit missionaries were adopted. Later, however, immigrants from other areas were encroaching on local territories, among which private property under state control dominated.

From this section it can be concluded that there is evidence for pre-colonial strategies and institutions to adapt to climate variability with economic diversification, and this diversification is again based on a local combination of private and common property systems in many of the cases, with the exception of Bangladesh (see table 2). From the political structure some cases show decentralised political systems governing access to resources (Burkina Faso, Ecuador, Bolivia II), while others show more political centralisation and marginalisation (Bangladesh, India, Brazil, indigenous groups in Bolivia I). In all cases except Bangladesh and Brazil, combinations of common and local private property institutions before colonial times prevailed, which were then dismantled by state and new forms of private property, a change predicted by the new institutionalism perspective as the value of the area rises. Bolivia and Ecuador, however, show the possibility of gaining commons back, but the majority of the territories remain as transformed state and private property. However, these findings need a deeper comparative analysis before discussing climate change issues:

Table 2

Livelihoods, political structure and institutions for access to land

Country/region	Local livelihoods	Socio-political structure	Institutions
Bangladesh/Ganges Delta	Peasants; small animal husbandry informal sector trade, rural workers, share croppers	Migrant landless peasants, poor marginal groups	Mafia-like patron-client system for land titles
India/Rajasthan	Agro-peasants, forest products	Caste system, lower castes most dependent on commons, high inequality	Pre-colonial common property institutions in caste system; transformation into state property and open access and encroachment predominately by local rich people
Burkina Faso/Samorogouan	Peasants and nomadic pastoralists with rain-fed millet and sorghum production and cattle husbandry; newly immigrated focus on cash crops (cotton)	Segmentary groups with leaders but no centralised political system; immigrated group with centralised system	Pre-colonial common property for forestry and pasture (pastoral-peasant agreements) transformed into state property labelled pastoral zone
Ecuador/Imbabura	Peasants on several niches in mountains, mixed planted forest, agriculture and livestock systems		Pre-colonial common property systems adapted to topography; for 450 years transformed into state and private property (large white farmers) and transformed into private property for peasants after land reform (1950s)
Brazil/Paraíba	Large cattle ranches and many smallholder peasants and rural workers	Indigenous peoples are segmentary groups; newly immigrated groups are mestizos and white land owners; patron–client relationships, highly hierarchical	Pre-colonial commons systems (presumed), transformation into state and private property, very unequally distributed
Bolivia/Alto Beni	Main ethnic groups previously hunters, fishermen and gatherers; now combined with shifting cultivation farming and timber (cash), agricultural workers, peasant immigrant groups with cash crop market production	Segmentary groups, newer groups more centralised; both have now formed political organisations (indigenous associations)	Private property system implemented by the state; incentivised immigration by the state facing the common property system; state property transferred into private property for immigrants
Bolivia/Lomerío	Hunter-gatherers, now combined with shifting cultivation farming and timber (cash)	Segmentary groups but leaders and political structures influenced by the Jesuits	Pre-colonial common property systems, transformed into state property/privatisation of immigrants; later with rights of indigenous peoples by new commons property system granted by the state (TCOs)

9.4 Major changes and key problems

Following the theoretical position of the new institutional approach, this chapter discusses external variables in order to understand changes in relative prices and changes of institutions in the different case study areas. This analysis leads us to the key problems related to these changes but not yet to climate change itself, which will be the topic of the next chapter.

Bangladesh: The *Chars* area is demographically pressured due to immigration, as a strategy of the most marginal people to get access to land is not available in their regions of origin. Therefore the *Chars* area experiences a high relative price or value. This high relative price attracts powerful land grabbers acting as patrons (Bahini), and thus local actors have low bargaining power. The Bahini chose patron-client institution and profit from the land titling process in order to ideologically legitimise that they have the knowledge of how to get access to land titles, and to show that they could provide 'protection' for smallholders. Formally *Chars* were state lands with the option of privatisation for smallholders. However, without external help their political and economic transaction costs are too high and their bargaining power too low to receive these titles on their own, as they cannot easily sideline the Bahini.

India: A demographic increase in people and animals occurs, while private plots of valuable land in the valley zones are getting smaller. In this process, poorer people rely more intensively on the common pool resources in higher areas. But in addition to demography, inequality of access to good land is an important process, resulting in higher pressure on common pool resources and thus raising their value. Land and related resources had been a mix of private and common property before colonial control. During colonial times, however, resources were labelled as state property under state law, turning some into de facto open access or de facto privatised by the more powerful high caste actors. Thus, common village pastures and forests lack institutional security. As a result, richer local actors add bargaining power via the encroachment of land, which increases pressure on the small remains of the forests and pastures by the poorer people in the local group, who again use the remaining resources more intensively.

Burkina Faso: After changes during colonial times, the government and the World Bank tried to create a large pastoral zone with the aim of erecting collective ranches in order to modernise cattle husbandry. This seems to have been a reaction to pressing local droughts in the 1970s and the will to offer breeders technological inputs for better adaptations. The ranches should push commercial production and improve health facilities, making the area attractive. The project was abruptly halted in 1983, after the revolution led by Thomas Sankara. However, the area experienced an increase in attraction as a free space. The pastoral zone witnessed the immigration of pastoralists but more importantly of agricultural producers, mainly from the *Mossi* ethnic group. Traditional land tenure ruled by family private and common property institutions were undermined by badly enforced state property. This attraction was further reinforced by demographic pressure from other areas of Burkina Faso, which further increased the value of the area for immigrants. In addition, citizens of Burkina Faso who had migrated to the Ivory Coast now returned, following the political turmoil in that country. At the same time, pastoralists from northern areas affected by drought moved in. One of the major key problems is the extension of cotton production by immigrants into areas previously used by pastoralists.

Brazil: As most of the land is in the hands of a few large owners, demographic pressure on land is experienced among smallholders. On the one hand, they opted to diversify through off-farm activities in the informal sectors or as day labourers. On the other hand, this area of Brazil shows a high number of organisations in rural community associations that try to fight for smallholders' rights. The government that pushed for large-scale industrialised agriculture increasingly undermined these rights. While in the 1980s in the context of re-democratisation the discourse on strengthening the subsistence sectors prevailed, the promotion of modernised agriculture continued afterwards and was adopted in special zones for agricultural production with a focus on irrigation, while smallholders were neglected by the government.

Ecuador: The *hacienda* system, with large-scale private property granted by the state to elite farmers, undermined the *Quechua* commons system of land use. Their resource areas became smaller and based on the establishment of a political and economic dualism between the powerful large-scale colonial land-owning minority and the indigenous majority with little land and bargaining power. A land reform aimed to change this injustice in distribution of land, but failed in reducing the *hacienda* landholdings. However, the elite is increasingly challenged by indigenous groups who try to defend their commons. Nevertheless, recent changes in legislation are confusing: on the one hand, the New Constitution of 2008 recognises formerly indigenous territories and common lands for villages. On the other hand, the law allows the privatisation of land and its use for external capital, which will work against keeping the commons. This is especially the case in the context of the international economic crisis, which results in a rise in relative prices for land and subsequently large-scale land acquisitions in the areas, as they become commercially interesting and accessible for international actors such as US-American pensioners.

Bolivia (Alto Beni): The area is exposed to immigration from the high Andes by groups that have experience with market production based on cultivation. They establish larger agricultural plots and transform the previous cultural landscapes that developed from local users with shifting cultivation, hunting and fishing. Despite badly developed infrastructure, local people develop strategies to reach the markets. Regarding land tenure rights, the two groups show majorly different strategies: while immigrants aim to have land officially privatised, indigenous peoples were able to receive communal land titles (TCOs) acknowledged by the new government in the remaining marginal land. However, the development strategy of the Bolivian state based on extractive industries, by which the development approach (*vivir bien*) shall be financed, could endanger local livelihoods in the future.

Bolivia (Lomerío): In contrast to the previous case, the indigenous peoples in *Lomerío* were strongly influenced by Jesuit missions until the 18th century. The following missions, and the colonial as well as the post-colonial state, exposed the local people to a system of colonialisation and resource extraction (rubber) as well as large-scale agriculture and forced labour. Based on state and private property institutions, large land tracts were occupied by immigrants for cattle farms, undermining local governance of land and associated resources. But agrarian unions that formed in the 1960s helped to gain land titles for communal lands and later enabled collective action in order to defend land against loggers. Therefore, the key problems are the continual defence of the area against outside interests.

There are many similarities in the case studies showing that institutional change has been triggered by external factors (see table 3). In many cases we have a combination of demographic and economic changes, in some with technological change triggering changes in relative prices (not just real prices but also the general value of an area in terms of attraction). Under these conditions, mostly poorer actor groups with little bargaining power face difficulties in coping with the new situation of institutional change, as actors with more bargaining power can profit from state and private property institutions as well as with constellations of de facto open access, while resilient local institutions (common property and family private property) are undermined. This then leads to unequal distribution of resources and to the key problems of scarcity and vulnerable livelihoods (in cases including Bangladesh, India, Burkina Faso and Brazil). However, where local self-organisation assisted by international or national support occurs (Ecuador, Bolivia I and II),

poorer groups might gain more bargaining power and have greater capability to protect, reinstall or refer to new common property and more secured private property.

Table 3

Major changes and key problems

Case	Demography	Technology	Economy	Institutional	Key problem
Bangladesh	High pressure due to migration induced by erosion	Mostly traditional	Small-scale	Commons to state/private, unbalanced power and high transaction costs for land	Scarcity and insecurity of access to land, high vulnerability
India	High pressure	Traditional extensive	Small-scale and extensive use (pasture, forests)	Commons and private to state and private, unbalanced power relations	Scarcity of agricultural land, pressure on commons as open access/ privatised, high vulnerability
Burkina Faso	High pressure (partly due to immigration)	Traditional and larger scale market crop plantations	Mostly subsistence, but also with cash crops	Commons and private to state property and open access	High pressure and degradation of natural resources, loss of commons, conflicts between peasants and pastoralists, high vulnerability
Brazil	Low pressure, natural growth compensated by out-migration of youth	Small scale agro-ecological farming systems vs. 'modern' technology	Mostly subsistence vs. market-oriented	Early loss of commons and state/privatisation	Scarcity of land and water for smallholders, marginal area, high vulnerability
Ecuador	High pressure due to immigration and commercial use of land	Small scale vs. more intensive use and 'modern' agricultural methods	Subsistence-based diversified vs. market-oriented production	Early loss but regaining commons, dangers of external loss as land prices are rising	From land scarcity to local land resource governance, put in jeopardy by commercial use, lower vulnerability
Bolivia/ Alto Beni	High pressure due to immigration and commercial use of land	Conventional farming vs. agroforestry systems vs. natural resources extraction (timber)	Subsistence-based low market exchange vs. highly market dependent	From early loss to regaining communal land titles, private titles for immigrants	Partial land autonomy for governance, high external pressure on land but lower vulnerability
Bolivia/ Lomerío	Pressure at margins of area but not overall, natural growth compensated by out-migration of youth	Rubber, timber and large-scale use of land at the margins of the territory	Subsistence-based vs. market-oriented	Same as above	Same as above

9.5 Key problems related to concrete issues of climate change

Up to this point an external analysis is presented that does not pay much attention to local people's views of these changes and their relation to climate change perceptions. Nevertheless, knowledge of local perceptions is central to understanding the way people adapt to institutional transformations that are then further exacerbated by climate change impacts.

Bangladesh: In the *Chars* areas, the ongoing sea-level rise is likely to increase saline intrusion and temperatures, and cause changes in rainfall patterns, devastating floods, a higher frequency of tidal waves in the Bay of Bengal, and reduced agricultural output. Climate change projections indicate higher temperatures, more rainfall of a higher intensity, increasing floods, droughts, storms, and heat waves and cyclones, all involving shifts in seasonal patterns (Chakrabarty 2008). The *Chars* inhabitants perceive changes in temperature, rainfall, and the frequency and intensity of storms. People have expressed the view that temperatures have been increasing and that there have been more temperature extremes. Rainfall has become less predictable, and heavy rains can occur at any time of year, with a rising number of storms increasing their vulnerability. Where embankments have been installed and property rights have been secured by the local CSO – called the *Chars* Development and Settlement Project (CDSP) – people seem to be less vulnerable.

India: Poorer and low caste local people, who are already excluded from many resources, perceive that precipitation is more extremely distributed and becoming highly unpredictable. This is a challenge for agricultural production as well as for the provision of fodder for domestic animals, which is already reduced as a result of privatisation and open access situations. Farmers often face the challenge of adapting to too little or too much rainfall and increasing temperature extremes. Pasture grasses recover less quickly and fruit trees age faster than before the time that climate change is perceived to have begun, while fruit yields are reducing under increasing climate instability.

Burkina Faso: Projections talk of temperature increases of 1–2 °C and highly irregular precipitation with less frequency and with a total decrease in annual rainfall in the coming years. However, this is not generally perceived by local farmers and pastoralists. Due to high immigration and expansion of agricultural production, especially for cotton in the pastoral zone, the vegetation in the former transition zone suffered and was heavily reduced from woody grass savannah to poor grasslands. Fields are established in areas that suffer from reduced humidity. On the other hand, pastoralists have to use other areas more intensively. A further addition to the humidity stress is a dam at Samandeni, which impacts on the pastoral zone. Local people, especially the autochthonous ethnic groups, do not mention climate change but instead profess their disrespect for local institutions for using the space for other kinds of activities, and for not respecting bans on the removal of tree cover, as a reason for environmental change.

Ecuador: Newer studies have indicated higher temperatures and the upward movement of vegetation and agronomic possibilities (maize can be grown where formally only potatoes were possible, and pastures on higher levels can now also serve for agriculture). The reliability of water is to become a real problem in the area. Projections indicate the area will become drier, with longer dry periods and an increase in extreme events (including high rainfall at one moment followed by drought). A central issue is the melting of glaciers and changes to tundra area, result-

ing in potential water availability problems and a loss of natural water storage. In line with scientific modelling, local people perceive climatic changes in the sense that – especially at higher areas – temperatures are rising significantly, leading to shifts in cultivation patterns and to unpredictable water availability during shorter periods. Therefore, there exists significant livelihood vulnerability that could make a communal water system even more importantly, and the keeping of large vegetation clusters in common areas essential.

Brazil: Average temperature rise of 2–3 °C, and more frequent and longer droughts are expected. According to the research presented in this publication, people do not associate the latest occurrences of drought with climate change but rather with normal climate variability. Therefore, not climate change but lack of available land because of land concentration by large-scale farmers, and the low bargaining power of smallholders to demand their share of land and water, are perceived as key problems. However, smallholders seem to be well connected, represented and organised in associations and backed by farmers' groups and support CSOs.

Bolivia (Alto Beni): In this case climate change is not perceived through the change of total amount of rainfall but regarding its timing and situational amount. In local views, rainy seasons are viewed as being shorter, unpredictable and linked to increasing heat. Work in the fields becomes an unbearable burden and fruit yields are affected. In addition, local climate change effects might also be increased by logging and large-scale citrus fruit plantation. However, this case also shows that institutional capacities are available to defend land and land use by local indigenous groups with the support of the government. Therefore, moderate climate change impact meets with a relatively high degree of institutional resilience.

Bolivia (Lomerío): This second Bolivian case shows similarities with the first, as climate change is not a central issue to be addressed: climate projections speak of less rainfall and higher temperatures, but this information is not reliable. However, local people share the opinion that there is greater climatic variability or a general trend towards a more chaotic pattern of seasonal changes. Seasonal lack of water could be dealt with if the communities have the capacity to establish resilient institutions, for example defending and institutionally managing their land and providing access to associated resources such as water.

These perceptions of key problems and their impact on the felt or not-felt effects of climate change show how climate change is influencing the livelihoods of local poor actors in different ways. This is summarised in table 4, where two out of seven cases show a negative combination of high-level key problems and low institutional resilience, and low levels of bargaining power leading to a double-negative effect of low resilience and high livelihood vulnerability (Bangladesh, India), while one case showed high vulnerability to be due not to climate change but to low institutional resilience (Burkina Faso). In the Latin American cases there are three examples, in which resilience is much higher compared to the other cases due to much better institutional conditions and moderate climate change (Brazil, Bolivia I and II), while only one case showed high resilience and high impact (Ecuador). What does this mean as a preliminary finding? Graph 2 shows that, despite a large heterogeneity of constellations, three major settings can be distinguished: 1) cases in which climate change impacts can be adapted by institutional resilience; 2) cases of low institutional resilience with high climate change impacts needing institution building, and; 3) cases with low institutional resilience but low perceived climate change impacts.

Table 4

Change contexts, climate change trends and outcomes

Case study	Key problem	Climate trends	Outcome institutional key problems/climate trends
Bangladesh	Environmental hazards, land loss due to erosion, and low bargaining power of peasants	High instability, extreme conditions (rainfall, storms, flooding, cyclones)	Increase in key problems: highest risk **Low institutional resilience/high impact (recently addressed by CDSP)**
India	Land and commons insecurity (access), low bargaining power of poorer peasants	High instability, increase in extreme droughts, rainfall and heat	High risk of loss of land and forests **Low institutional resilience/high impact**
Burkina Faso	Open access, insecurity and intensification of use, conflicts	Moderately higher temperature and higher water stress	High risk of reinforcing intensity of use of pasture, extension of using agricultural and common lands **Low institutional resilience/low impact**
Ecuador	Land and water scarcity for smallholders, but farmers are organised in associations	Higher temperatures and drought periods, high water stress	Highest risk of reinforcing scarcity of water and loss of water and land **High institutional resilience/moderate impact**
Brazil	Reduction of land due to higher external interests but local organisations and rights	Greater instability of rainfall, shorter and more intensive erosion, lack of water	Risk of reinforcing land and resource loss, but institutional strength combined with extreme weather/loss of water **High institutional resilience/high impact**
Bolivia/Alto Beni	Partial local autonomy but high pressure on land, local organisations and rights	High instability, floods, increasing heat, shorter rainy season	High risk of losing land and commons resources and commercial resources **High institutional resilience/moderate impact**
Bolivia/Lomerío	Same as above, more pressure on extraction (timber and possibly mining)	Increasing heat, shorter rainy season	Risk of losing territory but strong collective action **High institutional resilience/moderate impact**

9.6 Adaptation strategies of different actors and actor groups

As these institutional changes, key problems and perceptions are related to climate change, the adaptation strategies of different actors are of interest. In all case studies CSOs of different sizes are involved, and influence local actors and their strategies in the context of nation states that shape adaptation capabilities. A central issue is how to raise the bargaining power of marginal groups so that they are able to choose institutional options that strengthen their livelihoods.

Bangladesh: In the mid-1990s, the government established the CDSP in collaboration with the Netherlands in order to mitigate poverty in the *Chars* regions. The first phase was followed by three more phases to date to improve livelihoods, and focussed on the land rights for small-scale farmers. This strategy included large CSOs such as BRAC, and included the following strategies: a) securing land rights and claiming land back from the Bahini, often with military support; b) a number of livelihood support measures; c) the provision of climate-proof infrastructure (dykes, sluices, roads, cyclone shelters) and training people to deal with natural disasters. Two challenges remain, however: first, the Bahini did not change their activities but simply moved to other areas. Second, shelters need to be secure and reachable and fields need to be protected against salination. These problems demand the building of resilient institutions to meet these challenges, as these are not just technical issues.

India: While the richer members of the communities increase their control over the land, the poorer actors, often members of scheduled tribes, are increasing their use of the common pool resource in open access or are trying to de facto privatise smaller plots. However, they have to diversify through a combination of out-migration and wage labour (labour migration). Nevertheless, only few jobs are available and access to the common pool resources through open access is one of the basic local strategies. Impacts on soil and vegetation include landslides and soil erosion, which also endanger fields in the valley of higher caste people. Another more successful adaptation strategy pushed by the CSO in place is to re-establish the common property institutions for village land, which is legally possible but not easily achieved, as much land with common pool resources is either semi-privatised or regarded as open access. Cases where this has worked out have been characterised by a) leadership and perceived benefits as well as support from a CSO in order to discuss with encroachers; b) receiving legal titles on the state level; c) low heterogeneity of interest of local actors, and; d) less resistance from wealthy and powerful people. Therefore, the new establishment and strengthening of resilient common property institutions to regulate and manage the common pool resources depended on the high bargaining power of poorer actors. A challenge to this process is that the state pushed for a modernisation process that undermined common property institutions.

Burkina Faso: The new tenure situation of the pastoral zone, changing immigration and new crops created the possibility for several actors to pursue their own goals. Firstcomer groups have tried to stress their identity to control the land against the immigration from other agricultural groups and returnees from Ivory Coast. In addition, several immigrant agricultural groups claim access to the area as a pastoral zone on state property, which is now de facto open access. Therefore, as citizens of the state they are ideologically able to override local land tenure institutions. Following this ideological justification, everybody tries to obtain a share of the land, while the state is absent and so cannot control the area. These agricultural migrants then combine cattle husbandry and

agriculture production, especially in the case of cotton. Pastoralists, on the other hand, have also started to grow cotton themselves, while their cattle sometimes feed on farmers' fields. Firstcomers imitate this diversification strategy but blame immigrant agriculturalists for expanding their fields into the pastoral zone. A sustainable adaptation strategy in this context of legal and institutional pluralism is difficult to achieve in a situation where the state is present (citizens have access to state land) and absent (de facto open access) at the same time (see Haller ed. 2010 for the concept of the present-absence of the state). New common property institutions for the use of the resources based on a participatory negotiation process are urgently needed (see Chabewla and Haller 2010 and Haller et al. 2013 for successful cases of such a process in Zambia and Tanzania).

Ecuador: The paper on Ecuador illustrates one case as to how local collective action for resistance and crafting of institutions could work. Historically, community members received small landholdings after the agrarian reform, while the local *hacienda* owner kept the largest track of the most fertile land for himself. He then sold it later to a company, who then re-sold it to the actual owner. This owner now extended his operations in the pasture area of local people, changing the water drainage system and taking the water belonging to the community. The community organised protests and tried to reclaim what they called ancestral land, crafting new institutions for water management based on older institutions. Similar strategies are used in other villages where people – using the ideological label of indigeneity – claim to have a special relationship to the territory. This provides a sound legitimation to resist the neoliberal framing of land as private property. However, this process is exposed to a new tendency of globalisation that changes relative prices for land: retirees from the US acquire land to retire in small-scale towns in the area, and therefore have more purchase power than local indigenous groups. In order to mitigate these problems, some communities have started a self-organising process by which they have acquired private land on the market, which they transform into common property to be managed under a common property institution: this refers especially to the highland pastoral zones. Being organised as a community with clear rules and regulations reduces the transaction costs in acting collectively in order to build water storage facilities as an adaptation strategy. In this way they are able to buffer reduced water through glaciers melting in the very high mountain areas, which is an impact of climate change.

Brazil: The semi-arid part of northeast was transformed into two kinds of agricultural landscapes: the best land was turned into pasture for cattle ranches by large land owners, and the less fertile areas were inhabited by smallholders, turned into highly diversified small-scale subsistence production-oriented agro-landscapes with small livestock and rain-fed agriculture. Throughout the 20th century, the state rushed through a modernisation process in agriculture that was ideologically justified, further pushing the process of concentration and privatisation and leading to the loss of land of smallholders: as these smallholders are highly indebted, they are vulnerable to land grabbing and expulsion. Adaptation strategies are rooted in the popular Catholic movement for liberation. In addition, in many families farming associations were formed, inspired by early left-wing collective experiences. These organisations, however, are active in a politically contested field and are often exposed to the discourse of revolution and of trying to increase pressure for substantial land reform. In this context of strong grassroots organisations the label of 'coexistence with semi-arid regions' could be developed as a basic technical discourse for the movement. This approach focuses on small-scale adapted strategies, or what is called agro-ecology. In short this means the establishment of a workforce-intensive gardening agriculture based on decentralised water storage techniques (cisterns) under conditions of secured small-scale tenure landholdings.

Bolivia (Alto Beni): According to the three major groups there are different adaptation strategies to be recognised: the indigenous *Moseténe* are part of a TCO, an indigenous territory, in which they decide themselves. The *Moseténe* adapt to the new markets by small-scale logging, and also receive payments from loggers. However, if indigenous peoples acquire the possibility of crafting their own rules, the stronger local commons institutions could help to limit logging and reduce negative climate change impacts in the area. The other groups are small-scale farmers coming from higher areas. These had an indigenous status

before immigration but lost this political label when they out-migrated. This group is now trying to adopt agroforestry techniques through the production and sale of products on the basis of organic techniques and fair trade institutions. They adapt to new market conditions in Europe and parts of the US that guarantee fair prices, thus reducing pressure to diversify with other activities (such as logging etc.). The third group of actors is smaller but has larger landholdings under their control, and is using land for large plantations (fruits for export). In order to adapt to the outcomes of climate change, be these higher temperatures, storms, and so on, collective action to coordinate activities is needed. The report shows that this might be possible in the future.

Bolivia (Lomerío): This case study shows many similarities but the framing and education in the Jesuit tradition seems to be important for collective action purposes that makes the groups relatively strong. After subordination and slavery, the group was able, with the help of trade unions, to strengthen their position by being able to organise and keep an indigenous identity based on animistic and Catholic religions. The *Chiquitanos* have developed a vision of cultural landscape ecosystems that creates a unity between them and the environment. It seems as they have found a way to reconsolidate contradictions of economy and sustainability for themselves, and they also use international legal frameworks such as the International Labour Organisation (ILO) convention 169 and thus the ideology of indigeneity to boost their collective action.

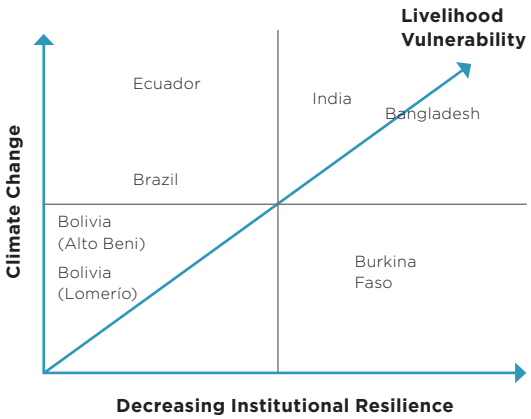
Table 5

Adaptation strategies of different actors

Case	Adaptation by local actors	Adaptation by other actors
Bangladesh	High mobility, high dependency and flexibility of people with low bargaining power, use of violence or mobility of patrons	Secure private property, state-driven protection of land rights and physical shelters for protection, etc.
India	Increase in intensive use of the common pool resources in open access by poorer and less powerful households	CSO foster common property institutions in the communities
Burkina Faso	Earlier common property transformed into state land and use of parts of pastoral zone for agriculture, diversifying livelihoods (farming and cattle), making use of different sources of legitimacy including using autochthonous identity	Securing cooperation between peasants and pastoralists, local interest in re-institutionalising use of the pastoral zone
Ecuador	Increase in use of different resource zones, protest campaigns (water grabbing)	Buying land, indigenous identity, setting up local institutions for pasture, build-up of communal water storage and distribution facilities
Brazil	Intensive use of remaining small land plots of lower quality by smallholders, link to associations and high level of self-organisation	Establishing secured land rights and decentralised water facilities, institutionalised collective action for raising bargaining power and self-determination over their land,
Bolivia/Alto Beni	Indigenous groups with their territories and logging for small cash needs, immigrated peasant groups from the highlands, large-scale land owners with monoculture plantations	Self-help groups and cooperatives and CSO support (fair trade, market-oriented agroforestry), fully market-oriented
Bolivia/Lomerío	Same as above with diversification and selling labour. Also presence of logging, mining and fossil fuel companies in the surroundings of the territory	Self–determination on their land as a commons, self-help groups and cooperatives and CSO support, not fully market-oriented, revitalising culture for collective action

9.7 Discussion and conclusion

All the cases indicate that we are dealing with pre-colonial cultural landscapes based on locally developed institutions related to land and associated resources for their management. These institutions have mostly combined local private and common property and included more rules and regulations for resource use, and have also served as a means to adapt to climate variability. In some cases, such as Brazil and Bangladesh, these no longer exist, while in others, such as Bolivia and Ecuador, they can serve as a basis for new institutions. However, several processes of colonialisation, and political as well as economic differentiation made poorer actors increasingly vulnerable in terms of maintaining their livelihood strategies as they faced institutional instability and lower bargaining power. In this context, then, climate change scenarios of different impacts occur (see Graph 2): four cases (Bangladesh, India, Ecuador and Brazil) show an impact that can be linked to changing climates that are emically strongly perceived, and not just to climate variability. For the other cases climate change might be relevant in the future, but local actors in these contexts rather face variability. However, these cases show great difference regarding institutional resilience for securing livelihoods. This includes stable institutions such as land rights and private-common property mix of institutions for fair access to common pool resources and joint management, high bargaining power and organisational and institutional capacity for collective action. Ecuador, Bolivia (Alto Beni and Lomiero) and Brazil are on the strong institutional resilience side, while India, Burkina Faso and Bangladesh are rather situated on the weaker side of the matrix. Now, the highest number of cases of reduced institutional resilience facing increasingly vulnerable livelihoods are also those located in the high climate change impact and low institutional resilience section (see the arrow of increasing vulnerability, which includes India and Brazil; Burkina Faso also belongs to this but faces lower levels of perceived climate change). The cases that are best adapted to climate change impact show institutional resilience through: a) reinforcing poorer actors' bargaining power; b) long-term land rights on a combination of private and common property; c) collective action capabilities to mitigate market and land grabbing tendencies. However, these need to be installed in a participatory process and should be based on collective action.



Graph 2: Climate Change, institutional resilience and vulnerability matrix

Source: author, based on case studies

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Chapter 10
Conclusion: Advancing Pro-Poor Resource Governance

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10.1 Pro-poor Resource Governance under Changing Climates: core results

Seven case studies were elaborated as part of the Pro-PoorGov project: two in Bolivia (Alto Beni and Lomerío) and one each in Bangladesh, Brazil, Burkina Faso, Ecuador and India. The previous chapters described the context, the social and environmental changes in each area, and discussed current and future adaptation options as well as policy implications for that particular setting.

Apart from those conclusions, some insights go beyond the particular cases and can be of relevance to broader contexts. These are presented in this section as four core results. Here, we discuss evidence and draw conclusions in relation to how vulnerability is generated and affects the livelihood security of poor rural people, which strategies these people use to react to environmental and socio-economic changes, and how pro-poor resource governance can be promoted.

10.1.1 Social and environmental dimensions of vulnerability

1ST CORE RESULT

Climate change vulnerability is influenced by environmental and social factors related to how resources are governed.

Vulnerability is increasingly recognised as an outcome of the complex interplay of both social and environmental factors. Vulnerability is normally defined in terms of exposure, sensitivity, and adaptive capacity[1] (Gallopín 2006, Akter and Mallick 2013). Adopting this understanding, the recent IPCC AR5 assessed the sources of vulnerability, pointing out that they arise from "multidimensional inequalities often produced by uneven development processes" (IPCC 2014). In a similar vein, earlier contributions explored concepts such as resilience and adaptation, trying to link the academic communities studying natural hazards and climate change. They have brought the concept of "multiple stressors" to the forefront of the debate (Nelson et al. 2007, Adger 2006), insisting that vulnerability originates in different interrelated sources

[1] *Exposure is generally understood as "the degree, duration and/or extent to which the system is in contact with or subject to a disturbance", while sensitivity is seen as "the degree to which a system is likely to be affected by an internal or external disturbance". Response capacity is generally seen in the context of a reaction to a present disturbance and is thus defined as the "system's ability to respond to or cope with the disturbance" (Akter and Mallick 2013). Finally, adaptive capacity projects response capacity onto future disturbances.*

with both environmental and social dimensions. Other scholars have claimed that interpretations of vulnerability have too often focused on one or other dimension, "manifesting different discourses and framings of the climate change problem", and that bridging these different views might not be simple and straightforward (O'Brien et al. 2007). The arguments of those that call for more emphasis on the social factors that cause vulnerability are strong: the poor continue to be disproportionately vulnerable in the face of changes, and "vulnerability of the poor, marginalized and underrepresented people remains widespread" (Ribot 2010). Thus, analyses that take a close look at the social factors that determine the vulnerability of poor rural groups are needed.

The case studies have demonstrated that many of these social factors are related to how natural resources are governed. Social factors define actors' social positions and their degree of marginalisation. The social position of poor rural people also restricts their access to resources, their tenure security, their possibility of benefiting from rents generated by resources, their income, etc. Given poor rural people's high dependency on natural resources, these limitations restrict their livelihood options and their adaptive capacity, especially in critical moments when they cannot access alternatives. Therefore, considering only one dimension of vulnerability – be it the environmental or the social dimension – precludes a comprehensive understanding of its fundamental interrelated causes and the range of measures related to actors' bargaining power that can be taken to reverse this situation.

Evidence to support this argument was found in the case studies of Bangladesh, Brazil, India and Ecuador. On the east coast of Bangladesh, marginalised people who lose their land to riverbank erosion move to newly accreted *char* lands where they look for opportunities to gain new land. Initially, these sandbanks do not have any physical infrastructure; they are poorly connected to the main land and exposed to frequent natural hazards with unfavourable conditions for agriculture and very harsh living conditions (e.g. lack of freshwater). The migrating landless peasants find themselves in a vulnerable position, which is being exploited by different groups who illegally assume power over *char* areas. The illegal leaders are linked to the political sphere and determine the conditions of the migrants' settlement. Their regime is established and perpetuated through violence. The government and local people use different adaptation strategies in this environment: the government reacts by implementing a comprehensive development project, whereas the people's daily reaction is to maintain and rebuild their livelihoods in these hostile surroundings. They need not only to adapt to the *char* environment as such and the natural hazards, but also to slow-onset, longer-term environmental changes, amongst them climate change. This case clearly shows how the interplay of environmental and social factors results in livelihood vulnerability and low resilience to climate change.

10.1.2 Technological solutions in the social context

2ND CORE RESULT

If adapted to small farmers, technological solutions can surely improve the livelihoods of poor rural people, but as technologies are deeply embedded in history and politics, they face significant barriers to scaling up at local governance level.

Technological solutions are often used to adapt livelihoods to changes, including climate change (Vermeulen et al. 2012). Water-harvesting technologies, for instance, are proposed as a solution for farmers in drought-prone areas (IWMI 2007). And agroforestry systems are recommended as a way of adapting agricultural systems to climatic variability, e.g. trends such as prolonged dry seasons (Verchot et al. 2007). Indeed, many different technologies – in some cases adapted for smallholders – can be found in different rural contexts (IFAD 2012).

Notwithstanding the applicability of these technologies, in most rural areas the availability of climate-smart solutions is limited. This beggars the question: how can the barriers to such solutions be overcome or circumvented, so that these technological solutions can become mainstream.

One answer is not to consider technologies as apolitical mechanical devices that can simply be replicated from one setting to another. Technologies are deeply embedded in their particular context, which itself is the result of history, social relationships, and power relations, among other social interactions. Any attempt to scale up these technological solutions without considering context-specific social factors is liable to fail, resulting in limited adoption or capture by wealthier and more powerful local groups. Technological solutions that have been adapted to the local culture do not conflict with current practices and are thus much more likely to be successful in the long run. This is exemplified by the case study on Brazil. Having been put to the test by local farmers, technologies developed within the framework of the 'Coexistence with the Semi-arid' narrative were not abandoned by farmers as soon as the supporting organisations left them to their own devices. On the contrary, since they are strongly embedded in their social context, these technologies have been very well received and their adoption has been sustained. In this case, the main barriers to technology are found in local governance structures dominated by the political and economic interests of traditional rural elites, who are indifferent or even averse to the expansion of CSA technologies. This again highlights the importance of considering the social and political context in order to understand how technologies are adopted. Family-farmer organisations are trying to gain access to higher-level (national and regional) policy-making arenas, thus circumventing local government structures in order to scale up locally designed technologies.

The relevance of the social context for understanding the adoption of technology was also highlighted in the case of Alto Beni, Bolivia. As shown in that case study, agroforestry is no longer an experiment in this region, given its relatively long history and the number of farmers putting its principles into practice. Here too, barriers are found at local governance level, although power asymmetries are not as critical as they are in Brazil. In Alto Beni, the lack of concerted action between the different local organisations was found to be a major impediment to the adoption of agroforestry. For farmers, having to deal with different organisations and projects increases their costs and prevents synergies between different types of public support. This is linked to a second major barrier identified in this study: the focus on ad hoc interventions by small projects as opposed to comprehensive and long-term strategies for developing the value chain. These are some examples of the challenges that technological solutions face, which are not directly related to the solutions per se (in this case, the agroforestry system), but rather to the social, economic and political context in which they are supposed to be implemented.

10.1.3 The role of commons in reducing vulnerability

3RD CORE RESULT

Recognition of community rights, including common property institutions, can help to reduce the vulnerability of poor rural populations. However, if they are not accompanied by other supportive measures, they may not be able to initiate a comprehensive development process that ends poverty.

In response to scepticism about local communities' ability to sustainably manage common resources (CPR), Elinor Ostrom and many other scholars have demonstrated that natural resources can be and are being sustainably managed by communities through the design of rules for using and accessing them. Adherents of this school of thought put community land rights at the forefront of land governance debates. As they see it, community land rights "strengthen the internal governance institutions that enable lands and resources to be managed in an equitable and accountable manner" (RRI et al. 2013). Community rights movements, which attempt to scale up the amount of land under communal tenure, are prominent and influential in many national and international debates.

In fact, the current quest for community tenure rights is often part of a historical struggle that has seen its first successes in recent years, especially in Latin America and Asia. However, the implementation of new land tenure legislation is often hampered. For example, in India, the so-called Forest Rights Act in acknowledged the tenure rights of communities to forests in 2006, but its implementation has been flawed.

The case studies on India and Bolivia (Lomerío) demonstrate that even in those cases where communities dispose of secure land rights, this does not necessarily lessen the pressure on resources, and on its own, it might not be enough to initiate comprehensive development processes to end poverty.

In Southern Rajasthan, India, tribal communities are often marginalised; they are extremely dependent on natural resources for their livelihoods and lack livelihood alternatives. The study shows that even in cases where community rights are secured and supportive measures such as land rehabilitation and rules for using resources are in place, communities still have limited opportunities to expand their livelihood options. The households in question may be able to obtain larger amounts of resources from common lands such as fodder and fuelwood, but given the huge population pressure, these benefits are not enough to lift them out of chronic poverty.

The case of Lomerío, in Bolivia, corroborates this conclusion. Land titling is certainly an important achievement of the indigenous populations of Lomerío in recent years. This has been a milestone in terms of justice and equitable distribution, and it has helped the local community to regain control over the resources of a territory where it has been living for generations. The establishment of an indigenous territory has also curbed the expansion of an advancing agricultural frontier onto the margins of the community's land. However, given the economic orientation of the region and internal as well as external economic pressures, titling alone has not been sufficient to stop unsustainable resource exploitation inside the territory.

10.1.4 Redefinition of rights to resources as a political process

4TH CORE RESULT

Pro-poor adaptation can entail the redefinition of rights to resources, and this process is manifestly political. In order to reduce vulnerability, resource governance reforms have to consider how poor rural groups are integrated into that political process, i.e. to what extent are they represented in and incorporated into decision-making?

As discussed in core result 1, vulnerability results from the complex interaction of environmental and social factors. Moreover, many social determinants of vulnerability are strongly related to how resources are owned and accessed, particularly in the case of poor rural groups who depend on natural resources for their livelihoods.

This leads us to the following general conclusion: reforming resource governance in a way that involves poor rural groups directly in the decision-making process and generates outcomes in their favour is a significant step forward in the reduction of vulnerability. Furthermore, it must be acknowledged that any governance reform is by definition a political process that involves power disputes. In the renegotiation of rules and the redefinition of property and access, political groups must articulate their opinions and expose themselves to political debates. Conflicts cannot be avoided. If the inherently political nature of resource governance (reform) is ignored, well-designed rules may not be implemented properly on the ground. Finally, since poor people are often politically marginalised, ending this structural disadvantage can encourage pro-poor reforms of governance systems.

This is the main conclusion of this study, which is corroborated by all the case studies. In the Imbabura Province of Ecuador, for example, political action managed to end the structural marginalisation of certain indigenous communities. In the face of rising pressure on natural resources, increases in land prices and water provision difficulties, some communities were better prepared to face these external changes. Morochos, one of the better prepared communities, managed to regain control over almost all of the territory it claimed as its own. This was the result of a clear political engagement, supported by and articulated within local indigenous organisations, i.e. a clear political struggle for more pro-poor policies that address natural resource governance. By regaining control over their territory, instead of just certain parcels of dismembered land, the inhabitants of Morochos were able to establish a mix of private and communal-based institutions that support them in managing external changes. For example, new rules for land sales are helping them to cope with the surge in foreign interest in land, and changes to the rule for using land in fragile ecosystems are protecting water sources.

In south-western Burkina Faso, the state created the pastoral zone of Samorogouan to sedentarise pastoralists and to intensify breeding after the severe Sahel droughts of the 1970s. As a result of political changes and funding shortfalls, the project to establish the zone was never fully implemented and the demarcation and status of the zone continues to be unclear. In the following years, the region experienced significant population growth coupled with an influx of migrants. The arrival of migrants and the state policy of promoting cotton production led to changes in agricultural practices, livelihoods and land use. Today, both farmers and pastoralists rely on breeding as well as cotton production. This has accelerated the degradation of natural resources. While the pastoral zone was, before its official creation, cov-

ered with dense woody savannahs and plentiful animal species, an estimated 80 to 95 per cent of the land has been transformed into degraded agricultural fields.

These developments, along with an unclear tenure situation, have triggered social conflicts, mainly between autochthonous and migrants or between pastoralists and farmers. Given the widespread poverty and de facto open access to resources, the different actor groups have different strategies for adapting to the aforementioned changes. Yet, all stakeholders perceive the need to define the boundaries and status of the pastoral zone and negotiate new tenure and access rights. The fact that the different actor groups have different bargaining power and different capacities to voice their perceptions, needs, and demands makes this process highly political. This case study demonstrates that resource governance is at its core a social issue that encompasses access and tenure rights as well as transparent laws and conflict resolution.

10.2 Policy implications

ProPoorGov had two main objectives: i) from the content point of view, to better understand how vulnerability stems from historically interrelated social and environmental factors, and ii) from a policy point of view, to strengthen the link between different levels of policy-making in natural resource governance. This section presents the conclusions of the study, starting with the second objective.

10.2.1. Strengthening the link between different levels of policy-making

This objective is directly related to the initial assumptions of ProPoorGov regarding collaboration with local civil society organisations. According to the first assumption, part of the implementation gap of pro-poor policies can be explained by discontinuities between different scales of governance. That is, more knowledge is needed to understand the role that bargaining power plays in hampering the implementation of certain rules. Even when this knowledge exists, it is often not taken into consideration in decision-making arenas. According to the second assumption, local CSOs have been trying out different strategies to cope with these discontinuities and are, thus, in a privileged position when it comes to understanding the local context that might be restricting or preventing the implementation of pro-poor policies. Finally, according to the third assumption, building knowledge bridges between the grassroots level and international arenas can be extremely useful when it comes to advancing resource governance. It was not the intention of ProPoorGov to assess these assumptions with evidence found in the cases. Nevertheless, after implementing the project, some points directly emerge, especially when it comes to the third assumption regarding the importance of strengthening the link between different levels of policy-making in resource governance.

Evidence from three cases shows how resource governance can be improved by establishing stronger links between high-level decision-making arenas and local CSOs. Prompted by ProPoorGov, the responsible ministry in Burkina Faso began to negotiate new resource-use rules in the pastoral zone with the support of the partner organisation GRAF. This organisation is perceived as a legitimate and capable actor by the government and local populations, given the expertise demonstrated in this study and its impressive track record in mediating similar negotiation processes in other parts of the country. In Ecuador, an ongoing policy process to elaborate new rules for land acquisition in the Imbabura Province was initiated as a result of political pressure exerted by local indigenous groups and supported by the local partner SIPAE. The municipality of Cotacachi invited SIPAE to contribute to the design of these new rules. SIPAE's knowledge was crucial to advancing a mediated solution that both indigenous groups and local government could accept. In Lomerío (Bolivia), local indigenous groups and the partner organisation used ProPoorGov to lobby for a more proactive response by the regional authorities to the intrusion of miners and loggers on the territory. Rather than merely exerting political pressure, Fundación Tierra's expertise in this and many other land conflicts in the country allowed it to make constructive recommendations on how to stop external miners and loggers. As acknowledged by the national government representatives who participated in ProPoorGov workshops, local CSOs can make meaningful contributions to policy design, going beyond the role of a watchdog that they are normally associated with. In a similar way, international organisations can profit from the knowledge and experience of local CSOs by working closer with them.

10.2.2. Addressing vulnerability through pro-poor resource governance

Apart from the specific conclusions for each case study, ProPoorGov arrived at four main core results that are potentially applicable in areas beyond the specific localities of the different case studies. These results suggest that in order to adequately address the complexities of adaptation, vulnerability has to be understood as something that is caused by multidimensional environmental and social factors. Thus vulnerability to climate change cannot be attributed to climate change alone (core result 1). Furthermore, the way in which resources are institutionally governed defines to a great extent how poor rural groups can overcome their structural marginalisation and effectively increase their bargaining power to adapt to change and increase their resilience (core result 3). In order to address these challenges, technical or legal measures focussed on land tenure do not suffice (core result 2). Rather, more participatory and multi-layered institution-building processes are needed (core result 4) (Haller et al. 2013).

As the case studies demonstrate, the livelihoods of the rural poor are often vulnerable in the face of growing pressure on natural resources and environmental changes such as climate change. This mostly results from the inferior bargaining power of these people and their limited capacity to shape institutional change. Climate change manifests itself in this already complex and dynamic setting. In other words, changes in climate patterns interact with a pre-existing socio-environmental setting. In some cases, the studies show that new sources of vulnerability can be attributed to recent changes in climate patterns and not only to general climate variability. In others, climate change is expected to pose additional threats in the future – as suggested by climate change projections – but for the moment they play a minor role in defining the vulnerability of poor rural groups.

The cases have highlighted a variety of adaptation options for addressing vulnerability. However, we have to distinguish between short-term and ad hoc measures (coping) and more long-term solutions for structural transformations (adaptation). In fact, in most of the cases studied, this distinction is blurred. With regard to vulnerability, even measures that are considered to be 'adaptation' do not necessarily decrease vulnerability to the extent necessary to make livelihoods more sustainable. To cite an example from the study, in Rajasthan (India), communities took measures to rehabilitate land and harvest water on common property resource (CPR) sites with the help of the partner organisation – an adaptation measure. As a result, households have been able to obtain larger amounts of resources from community lands, which has put them in a better position to sustain their livelihoods and cope with droughts and climate variability. Nevertheless, these resources cannot replace the required additional livelihood options that would allow them to escape from chronic poverty, and they remain highly vulnerable.

The following policy reactions could promote pro-poor resource governance:

- The bargaining power of poorer actors can be reinforced by boosting their **collective action** capabilities to react to economic and environmental pressures. Communities may sometimes need or benefit from support in establishing collective action. The study shows that community organisations, such as water-user or rangeland-user associations, cannot simply be understood as managerial entities. To a great extent, these associations mobilise and unify marginalised groups, with the aim of empowering them, and often reduce local power asymmetries. Governments can provide levels of institutional security or a platform to develop these measures. CSOs can also provide platforms and serve as hubs for collective action. Other organisations, such as development agencies, can financially support and collaborate with CSOs, making them weightier players.

- In some problematic cases of resource governance, where there is a high level of conflict and complexity, the inclusion of multiple actors in a participatory and inclusive **deliberative process** can be promising. However, it should be acknowledged that this only the case when stakeholders share a strong common interest and when power asymmetries between and within communities do not ultimately impede trust-building. One possible building block is the use of participatory planning at community level, particularly for the options available as development pathways for communities based on climate risks and the natural resource asset base.

- Several proposed adaptation measures build on 'traditional' practices that communities have been using for generations to deal with climate risks. However, given the fact that the various challenges communities face are increasing in magnitude and frequency, smallholders' ability to adapt is being compromised. In these cases, it is worth acknowledging that tried and tested **'traditional' measures can be supplemented**, for example, through technological innovations such as improved species and varieties to increase the adaptive capacity of farmers.

- Structural transformations such as those necessitated by climate change adaptation call for long-term approaches, i.e. thinking in terms of generations rather than short-term project cycles. Such long-term perspectives usually assume continuous political and financial commitments, which entail the possibility of using **public funds**, either from national sources or development cooperation funds. These funds can be used to support approaches like those identified in the study, for example, to cover the initial costs of adopting a certain technology or to scale up approaches designed at grassroots level. This view acknowledges that rural people actually manage landscapes through their activities and are both victims and agents as they adapt to climate change.

- On the whole, the study shows that the multidimensionality of vulnerability requires **comprehensive and integrated approache**s. Governing resources with and for the benefit of poor populations is a significant step in reducing the vulnerability of the rural poor. Nevertheless, in settings of chronic poverty and marginalisation, improving resource governance alone might not be enough to overcome poverty. In these situations, integrated approaches need to consider the multitude of actors at local level, take existing governance structures into account, and build on the good structures that already exist. The latter include local pro-poor CSOs that have been working for and with the poor for a long time and know the local context and how to address the hindrances to pro-poor development.

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