

**DOCUMENTING FARMER-HERDER LIVELIHOODS, CHALLENGES AND  
ADAPTATIONS IN THE CENTER-SOUTH REGION OF BURKINA FASO**

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## **ABSTRACT**

Elisabeth Kago Nébié: Documenting Farmer-Herder Livelihoods, Challenges and Adaptations in the Center-South Region of Burkina Faso  
(Under the direction of Colin Thor West)

This dissertation treats different, but related subjects, in three distinct papers. Findings result from interviews, focus groups, participatory community mapping and GPS data collected intermittently over a period of 20 months in the Sondré-Est Pastoral Zone area in the Center-South Region of Burkina Faso.

The first paper examines the nature of farmer-herder conflicts and where they occur. Following the major droughts of the 1970s in Burkina Faso, the government resettled herders and farmers from northern drylands in more fertile areas in the southern river valleys of the country. Local chiefs – ruling over agricultural communities – conceded land to migrants. This study integrates spatial analysis with narratives to contextualize contemporary land use tensions between resettled herders and resettled and autochthonous farmers. It found that conflicts occur in very particular places along the border where key resources such as water are located. This offers an important methodological contribution to political ecology.

While most studies on herder-farmer relations have focused on conflicts, the second paper explores the nature of farmer-herder cooperation as both groups converge toward agro-pastoralism. Sondré-Est is ideal for this study as it has ethnically distinct herders and farmers who inhabit the same area. They are adapting to similar climatic stresses in very different ways. People from both groups exchange resources and technical knowledge. This study allows for comparisons within and between farmer and herder groups, which is rare in climate adaptation research.

The third paper delves deeper into within-group comparisons. This paper looks more precisely at gender differences in land use management. It shows the contrast between women's increased leadership in household decision-making as an adaptation to social and ecological changes and their persistent under-representation in community management committees. This paper highlights that the existence of quotas and parity policies coming from international donors does not guarantee the equal access of men and women to decision-making processes regarding land resources management. It argues that the exclusion of women from community land management results from the divide between local values and top-down state policies aiming for gender parity. This study questions the State's ability to regulate its constituents at the local level.

I dedicate this study to the people of Sondré-Est.

## **ACKNOWLEDGEMENTS**

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## LIST OF ABBREVIATIONS

AVV	<i>Aménagements des Vallées des Volta</i> (Planned Settlement of the Volta Valleys)
BF-WALULCTS	Burkina Faso – West Africa Land Use Land Cover Time Series
FEB	<i>Fédération des Eleveurs du Burkina Faso</i> (National Federation of Livestock Producers)
COGES	<i>Comité de Gestion</i> (Local Management Committee)
GIS	Geographic Information System
GPS	Global Positioning System
GTV	<i>Gestion des Terroirs Villageois</i> (Village Territory Management Approach)
IGB	<i>Institut Géographique du Burkina</i> (Geographic Institute of Burkina Faso)
ILRI	International Livestock Research Institute
ICRAF	World Agroforestry Centre
INSD	<i>Institut National de la Statistique et de la Démographie</i> (National Institute of Statistics and Demography)
LGACC	Local Governance and Adapting to Climate Change in Sub-Saharan Africa
LULC	Land Use Land Cover

LULCC	Land Use Land Cover Change
MECV-BF	<i>Ministère de l'Environnement et du Cadre de Vie du Burkina Faso</i> (Ministry of the Environment of Burkina Faso)
MERH-BF	<i>Ministère de l'Environnement et des Ressources Halieutiques du Burkina Faso</i> (Ministry of the Environment of Burkina Faso)
MRA-BF	<i>Ministère des Ressources Animales du Burkina Faso</i> (Ministry of Animal Resources of Burkina Faso)
NAP	National Adaptation Plan
NGO	Non-governmental organization
PASMEP	<i>Plate-Forme d'Actions à la Sécurisation des Ménages Pastoraux</i> (Action Platform for Securing the Livelihoods of Pastoral Households)

## CHAPTER 1 – GENERAL INTRODUCTION

### Context and Justification

Climate change is one of the main challenges to smallholder farming in sub-Saharan Africa. The Sahel of West Africa – dominated by subsistence food production (Mertz, *et al.* 2009) – illustrates the most dramatic cases of recorded rainfall variability and famine (Hulme 2001; Rasmussen *et al.* 2016). This region has experienced 1) regional desiccation (decreased rainfall) and droughts – possibly linked to global warming (Giannini, Biasutti, and Verstraete 2008); 2) rainfall recovery – increased annual rainfall, but possible increased interannual variability (Dong and Sutton 2015; Nicholson 2005); 3) land degradation (Batterbury 1998; Batterbury and Warren 2001); and 4) greening (West, *et al.* 2017; Herrmann, *et al.* 2005) toward the last two decades of the 20<sup>th</sup> century. The unfavorable environment, combined with political and social turmoil in this region, negatively affects the regional economy and agro-pastoral production (Sivakumar *et al.* 2005; Schlenker and Lobell 2010).

Over the past three decades, farmers and herders in this region have adapted their livelihood practices to these changes and the pressure on limited natural resources. Changes include a transition towards mixed crop-livestock systems and the creation of local management committees to preserve natural resources (e.g. *Comité de Gestion*). These adaptation strategies have led to new land use practices and land cover changes. While some of these changes increase farmer-herder competition, it is also important to examine how these adaptation strategies reinforce cooperation. This dissertation addresses such changes and their influence on farmer-herder relations. While most previous studies have focused on farmer-herder conflicts, this study

highlights current farmer-herder land use conflicts and examines farmer-herder symbiosis and complementarity. More specifically, this dissertation examines the three following questions:

- 1) What is the nature of farmer-herder conflicts and where do they occur?
- 2) What is the nature of farmer-herder cooperation as both groups converge toward agro-pastoralism?
- 3) What are gender differences in land use management?

Anthropologists have played a prominent role in climate change research. Within the growing field of climate change anthropology, studies have focused on adaptation (Crane, Roncoli, and Hoogenboom 2011; Roncoli, Crane, and Orlove 2009; Roncoli 2006; Orlove 2005). Adaptation in the southern regions of Burkina Faso has been poorly documented compared to northern areas of the country. Northern areas, considered desertification hot spots (Batterbury 1998), have benefited from numerous large-scale soil and water conservation development projects (Reij *et al.* 2005). However, these initiatives have largely neglected southern Burkina Faso, once “green” and “pristine.” By the mid-1980s, intense migrations from the northern drylands to southern regions had reshaped the economy, demographics, and land-use patterns in southern provinces. This dissertation contributes to anthropological studies on climate adaptation in the Center-South region of Burkina Faso. More precisely, this study uses evidence from the Soudré-Est Pastoral Zone and neighboring farming communities in the Center-South region of Burkina Faso.

In the 1970s, the government encouraged migrations of people and livestock from the central and northern regions of Burkina Faso that had been affected by major droughts, demographic pressures and a lack of arable land to southern river valleys and areas considered more fertile, but sparsely populated. Population density was low in these river valleys because of

the presence of the filarial worm *Onchocerca volvulus*. This parasite transmits a disease known as onchocerciasis or river blindness. The *Aménagements des Vallées des Volta* (AVV)<sup>1</sup> program eradicated onchocerciasis to encourage the voluntary resettlement of agriculturalists in these areas (see AVV area in Figure 1 below). It is under this program that the government of Burkina Faso created the first pastoral zones to resettle Fulbé herders in 1977 (Dianda 1981). The goal was primarily economic in nature as pastoral zones offered the opportunity to provide traction animals for AVV farmers and to boost livestock exportation. In these valleys, rapid population growth, land degradation and vegetation loss followed this migration (Ouédraogo *et al.* 2010; Paré *et al.* 2008).

These past three decades, life in the study area has been challenged by the combined effects of environmental, social, economic and political changes. In Sondré-Est and its surroundings, communities unanimously declare that “the land has died” because of rainfall variability and demographic pressure. Meteorological data from Agence Nationale de la Météorologie (National Meteorological Office) at the nearest station in Manga show annual rainfall variability in the area from 1980 to 2014. The study site of Sondré-Est is located about 30 km from Manga, the capital of Zoundwéogo Province. Data was not available for the rainy season of 1985.

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<sup>1</sup> Planned Settlement of the Volta Valleys

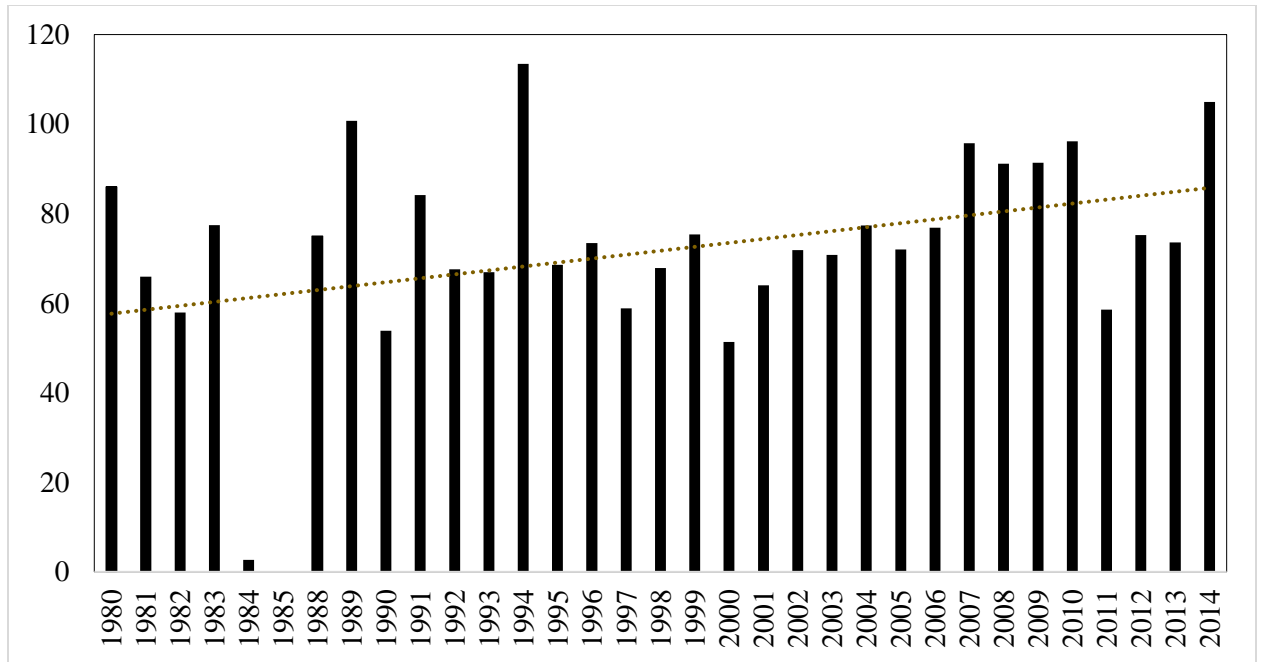


Figure 1: Average annual rainfall in millimeter (mm) from 1980 to 2014 in the station of Manga. Data is missing from 1984 and 1985. Data source: National Meteorological Office.

Figure 1 shows annual rainfall amounts from 1980 to 2014 in millimeter for the nearest station of Manga. Figure 1 demonstrates high interannual rainfall variability but a general increase in annual rainfall volume. The dotted line on Figure 1 shows an overall trend of increasing annual rainfall of about 200 mm, which is significant. In some years, rains start as soon as March, and in others they begin in April or May and end in September instead of October or even November.

Recent studies predict an increase in the frequency and intensity of farmer-herder conflicts in the future (Cabot 2017). Cabot (2017) explains that climate change has disrupted the agricultural and pastoral calendars, leading not only to a geographical, but also to an occupational overlap between farmers' and herders' activities. Rainfall variability has increased the overlap period between dry-season livestock herd movements and agricultural activities. Unreliable rainfall has stimulated the convergence of farmers and herders toward agro-pastoralism, as a way to adapt to their challenging environment. The pressure on depleting



natural resources such as water and land has increased competition among and within communities in the area. The relationships between these two communities is not only stressed by land use disputes, but also reinforced by material and technical resource exchange as they seek solutions to strengthen their adaptive capacity. As farmers and herders face these increasing challenges, this anthropological study will help policy makers and development and research institutions to:

- 1) Identify conflict hot spots to better understand and address land-use conflicts.
- 2) Document cooperative relationships to better reinforce them.
- 3) Understand within-group differences.

## **Methods**

This dissertation consists of three papers, plus a general introduction and a conclusion. The first and second papers are to be respectively submitted to the journals of *Political Ecology* and *Human Organization*. The third paper will be part of an edited book on gender studies. Data was collected for 20 months in the Sondré-Est Pastoral Zone area in the Center-South region of Burkina Faso. Data collection involved interviews, focus groups, participatory community mapping and GPS data collection in Sondré-Est and the neighboring villages of Kaïbo Nord V2 and Sondré. Each paper of this dissertation uses these methods differently to address the research questions.

The first paper incorporates qualitative data (focus groups and semi-structured interviews), along with spatial data (hand-drawn maps, GIS and GPS). This study used vector administrative boundaries from the National Geographic Institute (IGB) of Burkina Faso (IGB 2015) and the raster Burkina Faso – West Africa Land Use Land Cover Time Series (BF-WALULCTS) of Burkina Faso to spatially represent narratives of agricultural expansion and

encroachment. The research team also recorded GPS coordinates and integrated photographs of contentious locations into the GIS maps.

The second paper is based on focus groups and semi-structured individual interviews conducted with herders in Sondré-Est and focus groups with farmers in Sondré Village and Kaïbo-Nord V2. This study only conducted individual interviews with herders because this research was part of the focus of a larger project which mainly focused on herders within the pastoral zone. Focus groups in farming communities were conducted during the rainy season when most of them were busy in their fields. Mainly leaders participated in these discussions. They provided key information about farmers in the area. There were also informal individual discussions with farmers outside the pastoral zone. This study relied on the wide literature on Mossi farmers to fill in data gap.

The third paper is also based on focus groups and semi-structured individual interviews, but with men and women herders. Women participated most in focus group discussions; they poorly participated in individual interviews. This could be explained by social, religious and cultural factors which restrict Fulbé women's participation in the public sphere. Sondré-Est is a reserved and solidary community where the majority of the population is Muslim. Conducting focus groups was the best way to collect Fulbé women's narratives as they were less willing to participate in individual interviews. In addition, the facts that the research assistant was male, and that the main researcher was a female, but from another ethnic group, could have negatively influenced Fulbé women participation in the study. This was relatively offset with their higher participation in focus group discussions.

## **Analytical Framework**

This study uses political ecology to answer the research questions. It uses an old definition of political ecology from the two renowned geographers Piers Blaikie and Harold Brookfield (1987) to analyze the relationship between natural resources management, power and ecology. This dissertation focuses on the relationship between social positions such as ethnicity (Mossi farmers and Fulbé herders) and access to resources (such as land more precisely grazing and farm land) and their impact on the environment. The researcher creates land use and land cover change (LULCC) maps to look at this relationship historically from 1975 to 2013 within and outside the boundaries of Sondré-Est. Political ecology was essential in exploring the differentiated access to resources inside the pastoral zone. This lens also enabled a better understanding of the different land use and adaptation strategies of Mossi farmers and Fulbé herders at different spatial and temporal scales.

The first paper integrates ethnography with spatial analysis to examine the nature of farmer-herder conflicts and where they occur throughout time and space. Local narratives define conflict hot spots as usually located around water points or places where farm land encroaches on grazing areas. However, a map of Sondré-Est could not be found to identify these hot spots. This study re-recreated the administrative boundaries of Sondré-Est and overlaid historical land use and land cover (LULC) data on these boundaries to identify conflict hot spots on the map. Though farmers and herders argue in focus groups and individual interviews that they do not rely on each other, especially in the times of land use conflicts, observations in the field have shown that these communities actually do cooperate.

The second paper documents the precise nature of this farmer-herder cooperation. Cooperative relationships include the exchange of farm equipment, traction animal, livestock and

agricultural management advice, fodder seeds and subsistence crops. This complementarity reinforces adaptative capacity to environmental, political and social changes in the study area. The Intergovernmental Panel on Climate Change (IPCC) defines adaptive capacity as: “the ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences” (IPCC 2014:118). This paper explores the different ways farmer-herder households build on each other to boost their adaptive capacity. In this process, women play key roles in household adaptation though access and control of natural resources are gendered.

The third paper treats gender as an essential variable in resource access and control. Different gender groups will differently experience the effects of climate change. Thus, it is crucial to assess gender positions in resource management, more importantly in the times of climate change. This study uses the case of a local management committee known as *Comité de Gestion* (COGES) to highlight the poor participation of Fulbé women in the Zone’s management. It draws on political, cultural and religious factors to explain this gender disparity.

## **Site Description**

### *Geography and Landscape*

This study site includes the Sondré-Est Pastoral Zone as well as Kaïbo-Nord V2 and Sondré, two of its surroundings villages (Figure 2). Covering an area of 16,460ha, Sondré-Est is located at the north-east corner of the Zoundwéogo Province in the Center-South region of Burkina Faso. The study area receives about 880-900mm of annual rainfall with a five-month rainy season from May to October (Nébié 2005:192). Savanna is the major land cover type in the pastoral zone, where herders rely on pasture land to feed livestock. In Kaïbo-Nord V2 and Sondré – where the majority of the population is involved in agriculture – the most dominant

land use type is agriculture. The Zone is divided into four sectors with no clear demarcation among them. Each sector consists of a delineated residential zone and a pasture zone. While the two neighboring sectors of Sectors 2 and 3 share natural resources and infrastructure, other sectors (Sectors 1 and 4) share resources with others to a lesser extent. Key resources in the pastoral zone include pastures, forest products and infrastructure such as dams, pumps and vaccination parks.

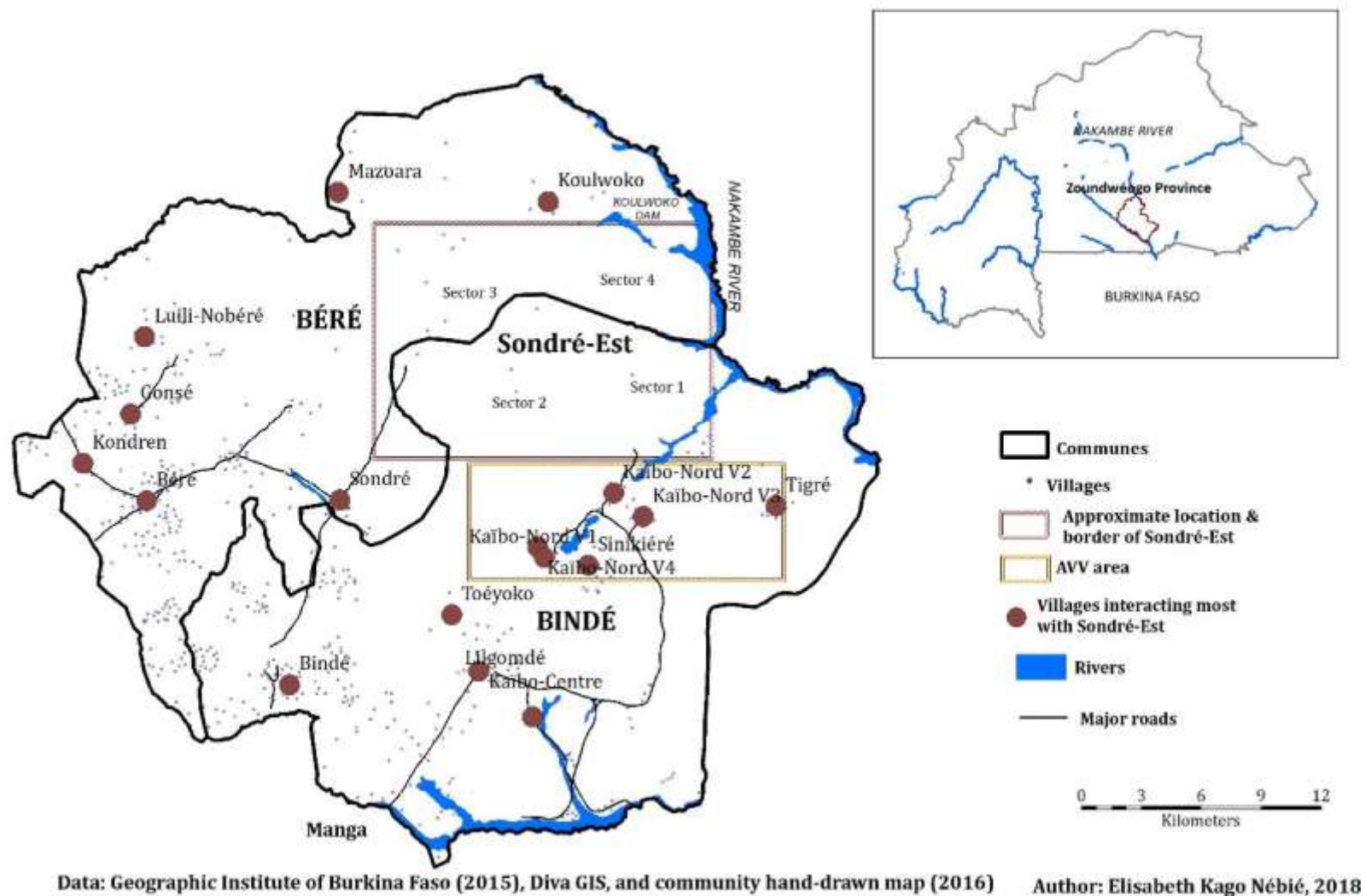


Figure 2: Sondré-Est. Data source : IGB, Base Nationale de Données Topographiques, Version 1.

### *The People*

Most of Soudré-Est's population are Fulbé, who compose one of the largest transhumant pastoralist groups in West Africa. The main activity in the Zone is pastoralism. Secondary activities include agriculture and the commercialization of livestock and dairy products at nearby markets. In the 1980s, the first settlers in Soudré-Est received parcels with portions dedicated to housing, fodder and subsistence agriculture and pasture areas. In many cases, male children born into these households eventually married and stayed to live and farm with their extended household where their fathers remained the patriarch until his death. In other cases (or following disagreement among family members after the death of the patriarch), children relocated to other areas of the same sector or to other sectors. The main provinces of origin for migrants in S-E are shown in Figure 3.

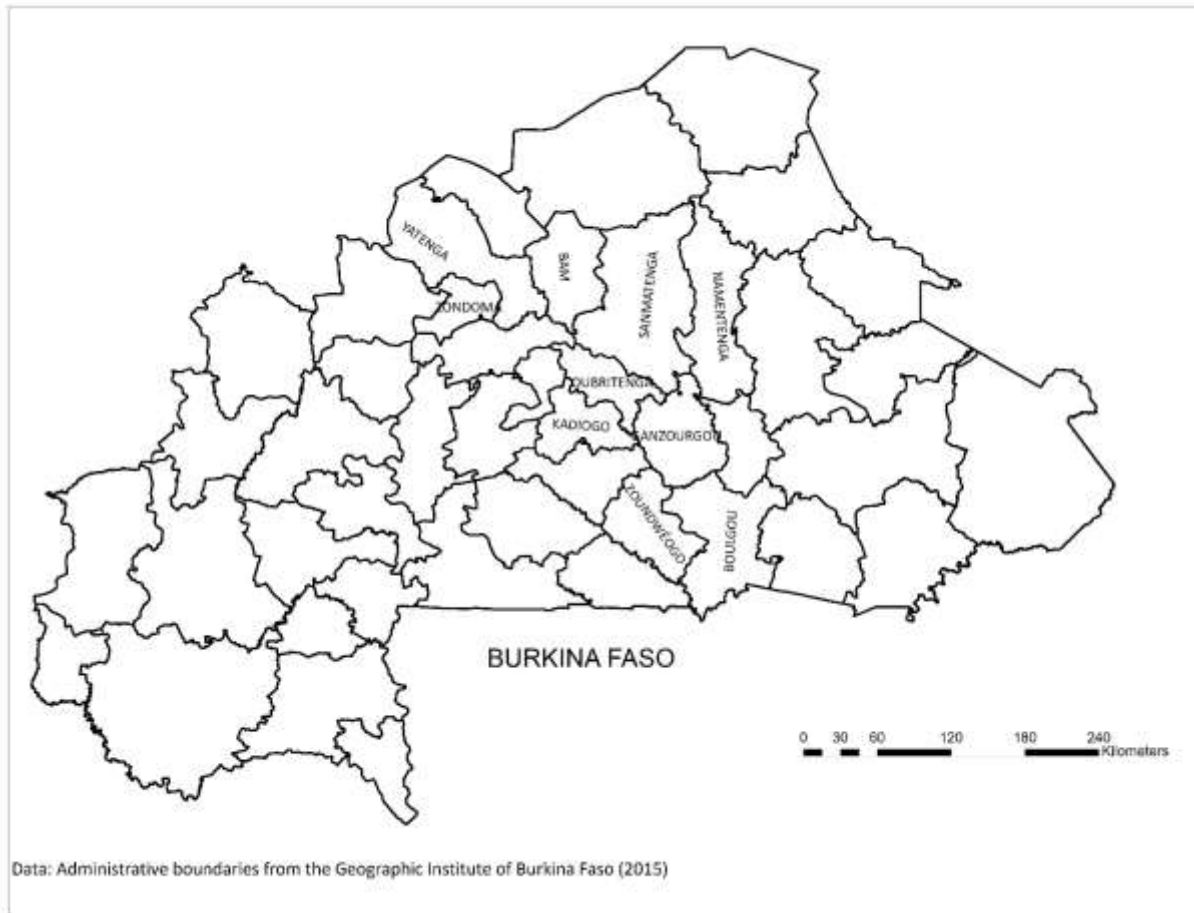


Figure 3: Provinces of origin of the residents of the study area

Other ethnic groups inhabit the surrounding villages (see Table 1), but this study focuses exclusively on Mossi farmers and Fulbé herders. The Mossi and Fulbé are the largest groups and the ones that interact most with one another in the study site.



Table 1: Ethnic groups in the study area

Local names	French names	Village of residence (province)	Province of origin	Approximate time of arrival
<i>Moossé</i>	Mossi	Sondré (Zoundwéogo)	Zoundwéogo	Autochthons
		AVV area (Zoundwéogo)	Zoundwéogo, Bam, Sanmentenga and Boulgou	1970s
<i>Boussanssé</i>	Bissa <sup>2</sup>	Garango (Boulgou)	Boulgou	Autochthons
		Sinikiéré (Zoundwéogo)	Zoundwéogo	
<i>Yadsé</i>	Yadsé	AVV (Zoundwéogo)	Yatenga, Zondoma,	1970s
<i>Silmissi</i>	Fulbé	Sondré-Est (Zoundwéogo)	Zoundwéogo, Bam, Yatenga, Zondoma, Sanmentenga Boulgou Namentenga, Oubritenga, Ganzourgou and Kadiogo.	1980s
		Sondré and AVV (Zoundwéogo)		1970s

The Fulbé from Sondré-Est interact most with villages located South of the pastoral zone in the Bindé commune (see Figure 2). The herders have fewer interactions and/or an avoidance relationship with villages located North and West in the Béré commune. Politico-administrative and physical factors explain the much stronger ties between Sondré-Est and villages located in the Bindé commune compared to Béré. This pastoral zone depends administratively on the rural commune of Bindé and customarily on Sondré, which, in turn, depends administratively on Béré. This dependence means that all political and administrative decisions on the pastoral zone are decided by the Department of Animal Resources of the Bindé Commune, while customary issues are regulated by the traditional chief of Sondré, located at the western borders of the zone. Even so, the administrative link to Bindé is stronger than the customary dependence on Sondré.

<sup>2</sup> The Bissa were not part of the study but occupy villages outside this study area.

This situation could be explained by the fact that the Sondré-Est territory, that is under customary dominion of Sondré, was not directly given to the pastoralists by Sondré. It was given to the State, which then passed it on to the pastoralist settlers. This clarification is important, for it underlies the degree of allegiance that the zone's pastoralists show to the customary land custodians. Allegiance was not deemed necessary at initial settlement stage; and the perpetuation of this habit has transpired into the pastoralists' current perception of power center; which they seem to view in the State. Yet, the irony is that whenever herders have conflict with agriculturalists, they send a representative before the Chief of Sondré to plead their case. Besides, for his annual feast, the Chief of Sondré instructs that dry wood be collected in the pastoral zone, without a fee, for brewing the local beer.

### **Significance**

The study described here was carried out as a part of the Local Governance and Adapting to Climate Change in Sub-Saharan Africa (LGACC) project led by the International Livestock Research Institute (ILRI) and the International Centre for Research in Agroforestry (ICRAF). The LGACC study investigates the most successful adaptation strategies in vulnerable pastoral and agro-pastoral societies that are highly dependent on natural resources. The strategies that each community and household adopt to tackle the combined effects of climate stress and land pressure vary based on available human, financial, institutional and material resources. The LGACC project in Sub-Saharan Africa compares two distant sites: one in the pastoral zone of Sondré-Est in Burkina Faso and one at the Il'Ngwesi Conservancy in Kenya's Laikipia County. This dissertation, which focuses on Sondré-Est, provides insights into adaptation case studies at a smaller-scale among two communities living next to each other. These adaptation case studies include fodder cultivation, securing the borders of the pastoral zone, and the creation of a

management committee of the pastoral zone. Overall, the LGACC research aligns with Burkina Faso's National Adaptation Plan (NAP). The NAP aims to reduce vulnerability, increase adaptive capacity and alleviate poverty (MECV 2017). It identifies securing pastoral zones and promoting the production of fodder among its twelve priority projects.

The study presented here specifically feeds into the social differentiation and governance assessment work packages of the LGACC project. On the one hand, the social differentiation work package involves the disaggregation of social groups (by ethnicity and gender) to examine how intersecting social positions affect access to and distribution of natural resources. This work package also does this to investigate how these positions influence or do not influence the adoption of particular adaptation strategies (see Nébié and Yogo 2016 and Nébié 2016). This analysis seeks to improve vulnerable people's access to adaptation resources, thereby strengthening their adaptive capacity. On the other hand, the governance assessment identifies the adaptation landscape, stakeholders, formal and informal institutions as well as key issues related to climate adaptation at the study site (see Nébié, Somé, and Yogo 2016). The adaptation landscape is a geographic space influenced by a set of interrelated problems to determine at what levels it is appropriate to evaluate governance systems and institutions (Robinson *et al.* 2015). All villages labeled in Figure 1 were part of the adaptation landscape for this study because these are places that matter most to the herders of Sondré-Est. This current assessment suggests ways to efficiently bring together various stakeholders within the study site and how to address governance failures. The point is to achieve a more efficient and sustainable climate adaptation.

## **Dissertation Overview**

The first paper titled “‘Where's the Map?': Integrating Ethnography, Geographic Information Systems and Remote Sensing to Map a Pastoral Zone” examines farmer-herder land

use tensions. Following the major droughts of the 1970s in Burkina Faso, the government resettled farmers by moving them from the northern drylands to more fertile areas in the country's southern river valleys. At the same time, it also created secure spaces reserved for grazing in the margins of the resettlement areas to resettle Fulbé herders. Local chiefs – mainly constituted of agricultural communities – conceded land to incoming herders. Autochthons (original inhabitants), who claim ancestral land use rights, are increasingly challenging the borders of these pastoral zones. Farmers and herders discuss border tensions, but narratives alone could not shed light on underlying causes of tension. Farmers and herders both refer to a map showing the exact borders of the pastoral zone. This study could not locate such a map, and so it re-created a map of the pastoral zone to locate contentious areas and understand these mechanisms. This study integrates such spatial analysis with narratives to contextualize land use tensions, thereby offering an important methodological contribution to the field of political ecology.

The second paper titled “Farmers and Herders’ Adaptation to Climate Change: Between and Within Group Complementarity” examines contemporary farmer-herder relations, aiming in the process to reinforce adaptation. The convergence of livelihoods toward agro-pastoralism increases farmer-herder competition. Different land use practices on the same land have increased tensions between farmers and herders. For example, competition can happen when farmers clear land to create fields for agriculture, while herders rely on the same land to graze their livestock. This is also true when farmers garden near major water points and thereby reduce livestock access to pastures and water for herders. In this process, ethnic and gender differences that many perceive as antagonistic may strengthen the transition to crop-livestock systems, reinforcing capacity for adaptation. The researcher explores the complementarity between

traditional pastoralists and agriculturalists living adjacently. Sondré-Est is ideal for this research because its residents include ethnically-distinct pastoralists and agriculturalists who inhabit the same area. This study allows for comparisons within and between farmer and herder groups, which is a rare pursuit in climate adaptation research.

The third paper, titled “Gender Parity in Land Management: the Disconnect between Top-Down State Policies and Local Social Values” delves deeper into within-group comparisons. It examines socially differentiated participation in land resource management, focusing on the case of COGES, which is a local umbrella management committee in charge of protecting natural resources and pastoral infrastructure in Sondré-Est. The idea is to shed light on the complex relationship between resource management, land ownership and gender. Participation in rural land resource management is gendered, even though studies have demonstrated women’s aptitudes for contributing to sustainable resource management. This paper explores the contrasts between women’s increased leadership in household decision-making as an adaptation to social and ecological changes, as well as how they are persistently under-represented in community management committees. This study examines the divide between top-down state policies aiming for gender parity and local values. More precisely, it assesses the relationship between the existence of quotas and parity policies stemming from international donors, while simultaneously looking into the actual involvement of women in decision-making processes on the ground. Much of the importance of this study lays in the fact that it questions the State’s ability to regulate its constituents at the local level.

## **CHAPTER 2 - ‘WHERE’S THE MAP?’: INTEGRATING ETHNOGRAPHY, GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING TO MAP A PASTORAL ZONE**

### **Introduction**

The creation of pastoral zones – secure spaces reserved for grazing – signals a form of adaptation to changing ecological, political, demographic and economic systems. In Burkina Faso, pastoral zones were established in unoccupied areas near farming zones now claimed by autochthonous farmers. This study uses narratives and maps to investigate contemporary land use tensions and conflicts between herders and farmers. Pastoralist studies in West Africa tend to emphasize farmer-herder conflicts (Bassett 1988; Breusers *et al.* 1998; Moritz 2006; Moritz 2010; Turner 2004). In this region, ethnically distinct herders and farmers often inhabit the same area, but they are involved in different land use practices. This case study uses fine-grained ethnographic evidence from a pastoral zone called Sondré-Est (see Figure 2) in southern Burkina Faso (BF) to present a unique case where herders voluntarily resettled near farming communities. This study was carried out as a part of the Local Governance and Adapting to Climate Change in Sub-Saharan Africa (LGACC) project, the International Livestock Research Institute and the World Agroforestry Center lead. This project assessed characteristics of land governance systems to promote the adaptive capacity of agro-pastoral households across sub-Saharan Africa.

In the 1970s, after severe droughts affected the northern regions of Burkina Faso, the government encouraged Mossi<sup>3</sup> farmers and Fulbé herders to migrate from these semi-arid,

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<sup>3</sup> The “Mossi” are sometimes referred to as “Moose”. This study uses the term “Mossi” to describe Moore-speaking peoples who identify as “Mossi” even though historically, they may have come from other ethnic groups, but got absorbed into the Mossi Empire.

densely populated, and degraded areas to wetter, sparsely populated, and more fertile zones in southern regions. The *Aménagement des Vallées des Volta* (AVV)<sup>4</sup> program eradicated onchocerciasis (river blindness) in less densely populated valleys, encouraging resettlement near major river basins (McMillan, Nana and Savadogo 1992). Unlike other cases in Africa, resettlement was voluntary, and the process by which this occurred for Mossi farming families is well-documented (McMillan 1995). However, much less is known about the subsequent resettlement of Fulbé<sup>5</sup> herders, who are the exclusive residents in the pastoral zone. Other ethnic groups inhabit the surrounding villages (see Table 1). This study focuses exclusively on Mossi farmers and Fulbé herders whose relationships are stressed by disputed borders. Both groups agree there is a map of the area showing the actual borders of the pastoral zone. Maps were certainly drawn at the time the zone was gazetted; yet, no physical map of Sondré-Est could be found.

This author re-creates a map of the pastoral zone to examine land use and land cover (LULC) changes over time, locate contentious zones, and contextualize herder-farmer conflicts along boundaries. The fact that no one has a copy of the map or knows where the actual boundaries lie promotes tensions. Geographic Information Systems (GIS) can help create maps in areas where maps are unavailable, or where they are held closely as state or community secrets. Using a political ecology framework, this study integrates GIS analyses with local accounts. It uses a political ecology framework to identify places of inter-group conflict and explain these hot spots in terms of changing LULC.

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<sup>4</sup> English translation: Planned Settlement of the Volta Valleys.

<sup>5</sup> The terms Peul, Fula, Fulani, Felatta or Haalpullar (De Bruijn and Van Dijk 2003: 288) are also used to refer to Fulbé herders. This paper uses the term Fulbé, used by Breusers whose seminal work is key for this study.

## Literature Review

In the Sahel region, the creation of pastoral zones has re-configured farmer-herder relationships. Government interventions promote the enclosure of pastoral zones as they stimulate the creation of grazing blocks where confined herders receive technical support to boost their production. Enclosure refers to the process whereby certain groups or things can cross specific borders to access resources, while others cannot. The enclosure of open rangeland and the allocation of resources to selected individuals or groups (Behnke 1985) restrict the movement of selected goods, people, and ideas (Cunningham and Heyman 2004). This enclosure is due to shifts from communal ownership to privatization (Grandia 2012) or state-ownership of natural resources. Such restrictions involve land cover changes (Boone 2007) and increase vulnerability as people have limited livelihood and land use options (De Bruijn and Van Dijk 1999). The researcher incorporates a historical perspective to political ecology to determine how current border conflicts resulting from enclosure and land use and land cover changes are products of past political, economic and environmental factors (Greenberg and Park 1994).

After the droughts of the 1970s-80s, the State encouraged migrations of farmers and herders from densely populated provinces<sup>6</sup> toward southern and lowly populated regions of the country such as the Zoundwéogo Province. In 1985, the government of Burkina Faso adopted the Agrarian and Land Tenure Reform during the revolutionary regime of President Thomas Sankara. This reform stated that all land is property of the State (Marchal and Quesnel 1997). This reform reduced the power of traditional chiefs in granting land to migrants who no longer asked for their direct permission to settle (Marchal and Quesnel 1997). This was the case for both the AVV and Sondré-Est settlers. The historical context is particularly important when

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<sup>6</sup> Some of these provinces are highlighted in Figure 2.



analyzing the relationships between social positions (e.g. ethnicity, livelihood strategy) and access to natural resources (e.g. land, water) as Mossi autochthons claim access to communal lands within Soudré-Est. This study looks at LULC changes within and outside Soudré-Est from 1975 (just before the creation of the pastoral zone) to 2013. This temporal perspective reveals LULC dynamics over time and space and shows linkages between these local ecological changes, enclosure, and observed border tensions.

Different land use practices increase tensions in surrounding communities that are involved in competing livelihood systems. Mossi social organization and livelihood security, namely extensive agriculture and seasonal labor migrations, strongly relies on customary tenure regimes (Breusers 2001). Mossi land tenure systems promote communal land. The Mossi are known for practicing shifting agriculture with fallow periods, even though AVV administrators required that settlers adhere to intensive agriculture (Furth 1998). Mossi mobility promotes long-term social security. Mossi farmers are involved in a circular migrant labor system in which they migrate toward cities and coastal countries in search of wages (Cordell, Gregory and Piche 1996). Migrants who leave a plot of land can be assured access upon returning. This serves as a household survival strategy. This contrasts with Fulbé tenure and herding practices in enclosed pastoral zones where agricultural land is smaller, clearly divided and attributed to each household for subsistence farming. Thus, herders exploit the same land every year and are not allowed to expand beyond their assigned boundaries. Extending fields would reduce communal grazing land which is central to pastoral livelihoods.

Fulbé tenure in Soudré-Est is ambiguous because the government never established formal land tenure contracts for migrant settlers who are now anxious about land tenure security in destination areas (see Furth 1998). Migrant herders – who have now adopted a sedentary

lifestyle – rely on savanna land within the pastoral zone to graze their livestock. Herder-farmer land use competition happens when agricultural fields and grazing areas use the same land, but with different purposes. In this study, this happens when Mossi farmers clear savanna and forest to make new agricultural fields while herders preserve savanna to secure grazing lands.

Competing livelihood strategies rather than ethnicity are the major cause of conflicts (Ejigu 2009). The absence of a map promotes conflicts, especially along borders where these livelihood practices intersect.

The researcher uses cartography to spatially represent ethnographic narratives (West and Vásquez-León 2008). Maps have the power to help one visualize and analyze social-ecological dynamics using GIS (Bauer 2009). Mapping through GIS also highlights the geography of conflict and hot spots of tension (Brown and Raymond 2014; Klare 2001). This study uses GIS information to re-create the boundaries of the study area. Though maps can be beneficial in clarifying boundaries, maps can also be used as symbols and instruments of power (Bauer 2006). Throughout the world, maps have been more efficient than guns at claiming indigenous territories (Nietschmann 1995). In South America, indigenous groups used Global Positioning Systems (GPS) as a formal base for indigenous groups to claim historical territories (Poole 1995) while in South Africa Geographic information Systems (GIS) techniques was used to re-write the maps of the apartheid regime (Weiner and Harris 2003; Weiner, et al. 1995). Therefore, developing a map in a land conflict zone can be perceived as a political act which can exacerbate some people's sense of disenfranchisement. In order to reconcile that, this study uses participatory techniques which involve both local herders and farmers in estimating the boundaries of Sondré-Est and conflict hot spots from their diverse perspectives. The mapping process, when inclusive, distributes power and offers participants the opportunity to control the

process and resulting maps (Bauer 2009). Indigenous peoples have used participatory methods to rename or claim their ancestral territories (Bauer 2009; Bryan 2011). This study primarily uses mapping for analytical purposes rather than aiming to contradict existing boundaries or satisfy the political interests of one party over another. More precisely, it uses maps to help approximate the Sondré-Est Pastoral Zone boundaries of interest to all parties in order to contextualize and examine LULC changes.

### **Site Description**

The Sondré-Est Pastoral Zone is located at the north-east corner of Zoundwéogo Province. Sondré-Est lies between the 11°50' and 11°57' latitude north and meridians 0°53' and 1°03' of longitude west and are limited in the east by the Nakambé river, and in the south by the Kaïbo-Nord V2 Village (MRA-BF 2006: 5). Sondré-Est is about 30 km from Manga, the capital of Zoundwéogo Province and the Center-South region (see Figure 2). Sondré-Est is a domain of 16,460ha with 15% of land reserved for housing and 85% for pasturing, as well as a herding station of 1,160ha (MRA-BF 2006: 6).

In the 2006 census, the total population for the pastoral zone of Sondré-Est was about 3,100 (1,457 males and 1,643 females). During fieldwork, the residents of Sondré-Est estimated livestock population to be between 10,000 and 11,000 animals. Livestock includes oxen, sheep, goats, chickens, guinea fowls, and donkeys. Table 2 shows the demographic growth and population density in the entirety of Zoundwéogo Province from 1996 to 2006.

Table 2: Demographics of the Zoundwéogo Province

<b>Census year</b>	<b>1996</b>	<b>2006</b>
<b>Total population</b>	127,654	245,947
<b>Population density by km2</b>	54.7	67.1

Data source: INSD 2000&2009.

Sondré-Est is divided into four residential and grazing areas known as ‘sectors’ mainly populated by Fulbé herders.<sup>7</sup> The Fulbé are one of the largest pastoral groups in West Africa. The Mossi are the largest ethnic group in Burkina Faso. During the process of resettling, Fulbé herders were targeted and formally invited to resettle in the area, though it was and is also occupied by other ethnic groups (see Table 1). Some of the first settlers moved because of onchocerciasis (river blindness) in river valleys. The World Health Organization (2015) defines onchocerciasis as a parasitic disease caused by the repeated bites of a fly spreading *Onchocerca volvulus*, a filarial worm. Under the Sondré-Est project, most herders came in from other areas of Burkina Faso listed on Table 1 and Figure 3. In each sector, residents are related through kinship and maintain strong linkages to their villages of origin.

## Methods

This study<sup>8</sup> is a result of 20 months of ethnographic fieldwork conducted in the Sondré-Est Pastoral Zone and its surroundings. The research team collected and analyzed qualitative data (focus groups and semi-structured interviews), along with spatial data (hand-drawn map, GIS and Global Positioning System commonly known as GPS). First, the first author conducted ethnographic fieldwork in Sondré-Est, Kaïbo-Nord V2 and Sondré to collect accounts of major governance challenges in the pastoral zone. Narratives indicated the disputed borders as a key

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<sup>7</sup> In the pastoral zone, there are about four Rimaibé households and one Mossi household. In the past, the Fulbé used the Rimaibé as their slaves. Fulbé-Rimaibé relationships have changed in much of Burkina Faso, especially in Sondré-Est where a Rimaibé is now a community leader. The only Mossi farmer living in the pastoral zone was hired by the Sondré-Est Project to drive the tractors and maintain facilities. At the end of the project, he was authorized to stay in the pastoral zone because he had been living there for a long time. He passed away during fieldwork in 2017, but his family still resides in Sondré-Est.

<sup>8</sup> This study was part of the LGACC project. The LGACC team collected data on land governance systems and access to climate adaptation resources. As an anthropologist, I worked under the “Social Differentiation in Adaptive Capacity” and the “Governance Assessment” work packages to understand land governance and climate adaptation from a fine-grained emic perspective. I use data collected under these two work packages in the study presented here.

issue and vaguely described areas of tension such as water sources. However, the team did not find a detailed large-scale map of Sondré-Est. The mapping sought to spatially locate these areas and other similar locations.

More specifically, this study used GIS administrative boundaries and a hand-drawn map to designate the borders of the pastoral zone. GIS data was obtained from the National Topographic Dataset (IGB-NTD) of the National Geographic Institute (IGB) of Burkina Faso (IGB 2015). The IGB-NTD provides country-wide data on administrative boundaries, hydrology, roads and infrastructure –among other features– at a spatial scale of 1:200,000 (IGB 2015). Hand-drawn maps were produced during a participatory mapping exercise with herders. Next, this study recorded GPS coordinates and integrated photographs of contentious locations into the GIS map. Last, the researcher used the raster West Africa Land Use and Land Cover Time Series dataset of Burkina Faso (BF-WALULCTS) to visualize LULC changes and trends (Tappan *et al.* 2016) in the study area. Remote sensing specialists of West Africa collected and analyzed the BF-WALULCTS dataset as part of a comprehensive satellite data archive to map LULC trends in time and space across West Africa (Tappan *et al.* 2016). In the wider WALULCTS project, Burkina Faso is one of the countries exhibiting the highest proportions of change between 1975 and 2000 (Cotillon 2017). The WALULCTS project seeks to raise the awareness of national and regional decision-makers on land resource changes and trends across West Africa (Cotillon 2017). The study presented here documents the link between changed areas and conflict sites.

Table 3: Description of data

<b>Source</b>	<b>Data used</b>	<b>Spatial resolution</b>	<b>Time frame</b>
<b>BF-WALULCTS</b> (Tappan <i>et al.</i> 2016)	Raster LULC types: Rainfed agriculture, irrigated agriculture, savanna, gallery forest and wetlands/floodplains.	2-kilometer	1975, 2000 (1975 and 2000 correspond to major events in the history of Soudré-Est). 2013 (most recent data available)
<b>IGB-NTD</b> (IGB 2015)	Vector administrative boundaries (provinces, communes and villages), rivers, roads and dams	5-meter	2015
<b>Participatory mapping</b>	Hand-drawn map of Soudré-Est	In Soudré-Est	2016
<b>GPS coordinates and photographs</b>	GPS coordinates and photographs collected at the different borders of Soudré-Est	At northern, southern and western borders of Soudré-Est	2017
<b>Focus groups and interviews</b>	Local narratives of encroachment and conflicts	In Soudré-Est, Kaïbo-Nord V2, and Soudré Village	2016

All the GIS data were incorporated with local narratives. The integration of spatial analysis with ecological fieldwork in this manner offers a powerful complementary lens for understanding local human-environment complex interactions (Jiang 2003). The process allowed this study to determine that zones of dispute are around grazing or farm land and water points along the borders. The following section outlines the specific methods used.

#### *Focus Groups and Semi-Structured Interviews*

This study conducted a total of 46 semi-structured individual interviews and 14 focus groups (266 participants) in Soudré-Est, Kaïbo-Nord V2, and Soudré Village. Former zone leaders and government personnel were also interviewed in Ouagadougou and online.

Table 4: Herders' focus groups in Sondré-Est

<b>Category</b>	<b>Number of individuals</b>	<b>Number of focus groups</b>
Men	126	5
Women	119	5
Young men	4	1
Young women	5	1
<b>Total</b>	<b>254</b>	<b>12</b>

Table 5: Farmers' focus groups

<b>Category (all men)</b>	<b>Number of individuals</b>	<b>Number of focus groups</b>
Kaïbo-Nord V2	6	1
Sondré Village	6	1
<b>Total</b>	<b>12</b>	<b>2</b>

Table 6: Individual interviews

<b>Location</b>	<b>Men</b>	<b>Women</b>
Sondré-Est	32	2
Sondré	1	0
Manga	9	0
<b>Total</b>	<b>42</b>	<b>4</b>

Herders and farmers identified the border issue as a major governance challenge in managing the zone. In all focus groups, herders and farmers argued that specific areas are contentious along the borders, but there was no map of the zone to exactly pinpoint those areas. A former Sondré-Est project official recalled the existence of aerial pictures of the zone and maps created by the French Geographic Institute in partnership with the Geographic Institute of Burkina Faso in the 1970s. AVV partners used imagery and maps to study the hydrology and various types of soils in the AVV area.

#### *Participatory Mapping Session*

In one of the focus groups, nine herders hand-drew Figure 4 – a map of Sondré-Est along with key pastoral resources like dams and rivers as well as their perceived borders of the Zone.

The goal was to obtain finer scale local knowledge data on perceived boundaries of the zone. A hand-drawn map allows participants to directly interact and take full ownership of the mapping process and the final product. The hand-drawn map exercise was not conducted with Mossi farmers because the LGACC project has primarily focused on studying the herders of Soudré-Est, rather than farmers. This emphasis on herders leaves out the social component of the farmers. This study used Figure 3 (below) to create a GIS map of Soudré-Est. Then, Figure 3 was imported into ArcMap 10.3.1. and digitized to draw the approximate boundaries of Soudré-Est. The main author used the IGB administrative boundaries of the Bindé and Béré communes and villages within them as a base map (see Figure 4 below).



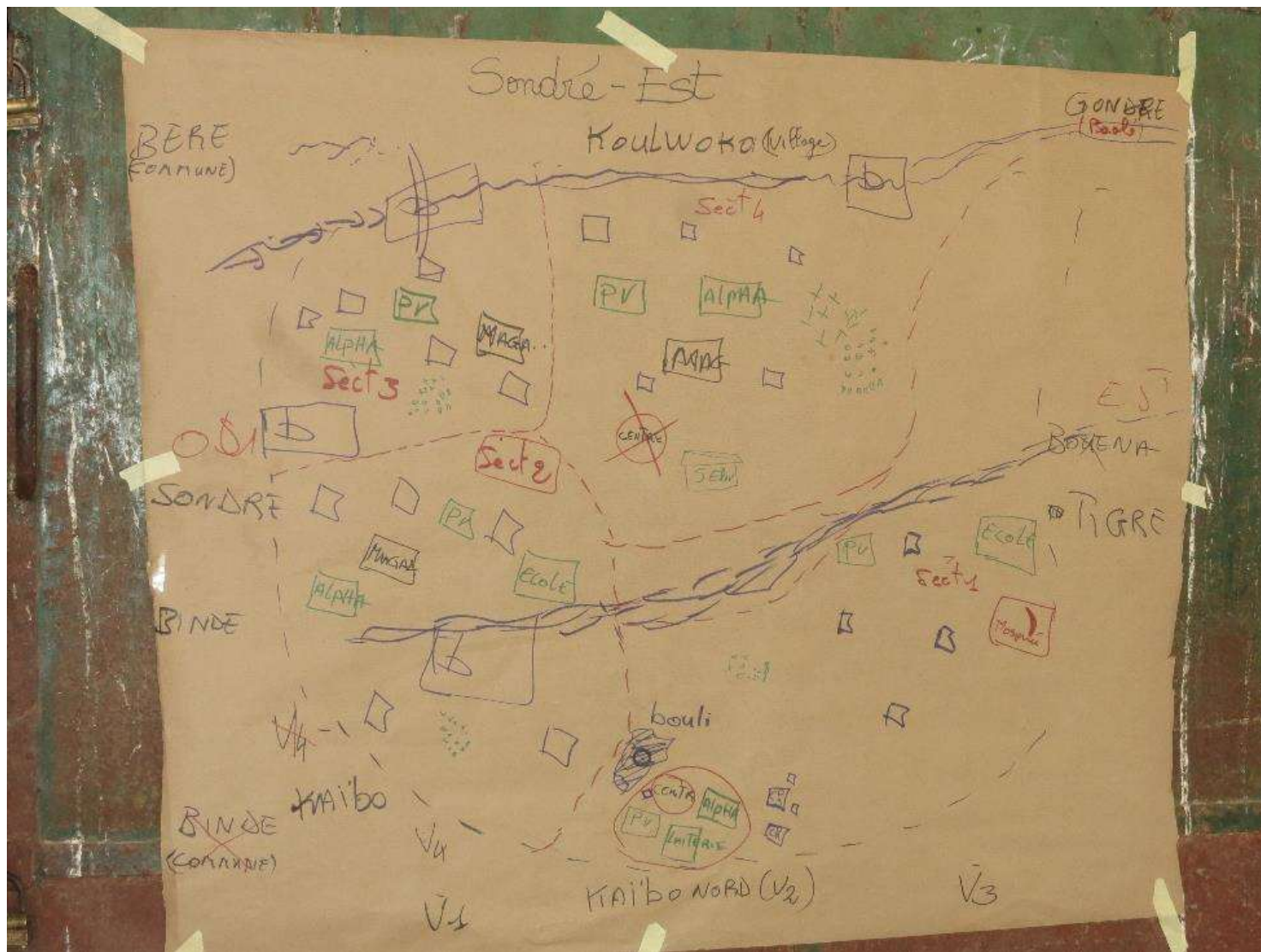


Figure 4: Hand-drawn map of Sondré-Es

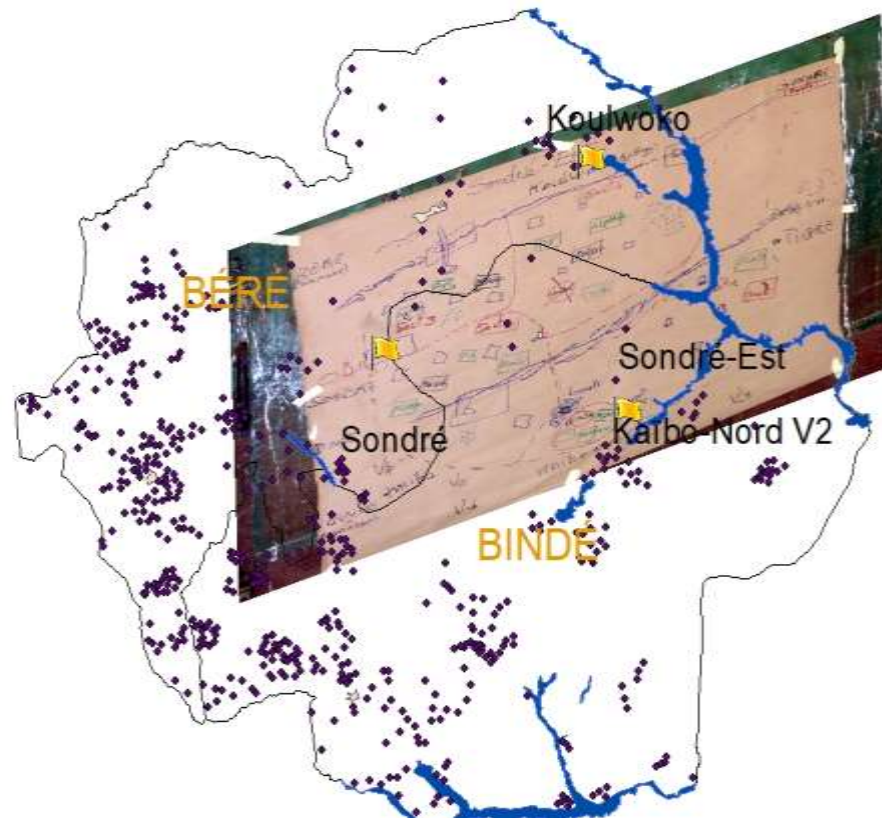


Figure 5: Conversion of Figure 2 into a digital format in ArcMap 10.3.1

### *GPS Coordinates and Photography*

Next, the research assistant and a leader of the pastoral zone drove around the borders of the pastoral zone on a motorcycle to collect geographic coordinates and photographs of contentious areas along the perceived borders of the pastoral zone. The goal of this exercise was to spatially contextualize contentious areas in ArcMap. GPS coordinates were collected with a Garmin eTrex 10 device at the extreme southern, northern and western borders of the zone. The research team used the photographs (Figures 7, 8 and 9) to visualize the LULC context at the border and to identify patterns.

Collected GPS data and photographs also included farmers' perspectives. In Sondré Village, Mossi leaders took the research team to areas they described as the borders with Sondré-Est. GPS data and photographs were taken there (see Figures 5 and 7). In Kaïbo-Nord V2, GPS coordinates were taken at a gully that farmers had mentioned during the focus group as the present border (see Figures 5 and 8). At the border with Koulwoko, data was collected by a gully attached to the Koulwoko dam (see Figures 5 and 9). The eastern border was inaccessible because of the Nakambé river and the poor condition of the roads. Therefore, this study extrapolated from collected GPS data and hand-drawn maps to create borderlines for the eastern borders.

GPS data was downloaded and exported in ArcMap. This information has helped validate the digitized borders of Sondré-Est and identify contentious areas on the map. The red stars (hot spots) displayed on Figure 5 correspond to the most contentious borders of the zone. Vector-based hydrological data from IGB – only available for 2015 – were integrated on the map for illustration purposes. The team integrated this data with local narratives to better understand the social ecological causes behind conflicts.

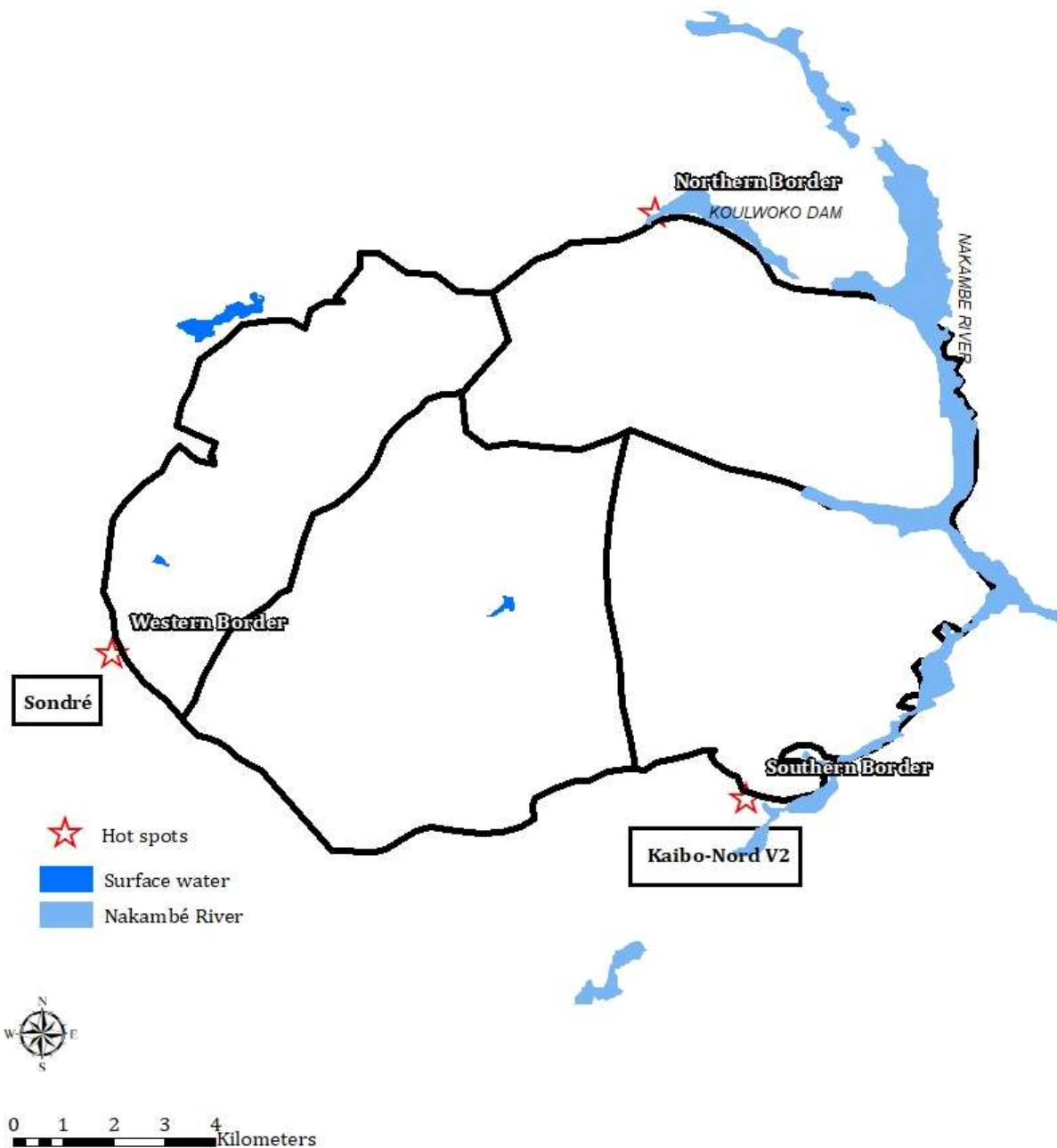


Figure 6: The disputed borders of Sondré-Est.

Data: GPS coordinates and hydrology (IGB 2015).





Figure 7: Western border with Sondré Village



Figure 8: Southern border with Kaïbo-Nord V2



Figure 9: Northern border with Koulwoko

#### *GIS Data*

Raster BF-WALULCTS data for 1975, 2000 and 2013 at a 2-kilometer spatial resolution and vector administrative boundaries of Soudré-Est (produced in Figure 5) were used to display LULC changes within and surrounding the pastoral zone over three periods. This is shown in Figures 6, 7 and 8. The study processed the LULC data in ArcGIS 10.3.1; projected it to WGS 1984 to match the IGB projection; and clipped it to the boundaries of Soudré-Est, with a buffer that includes villages sharing borders with the pastoral zone.



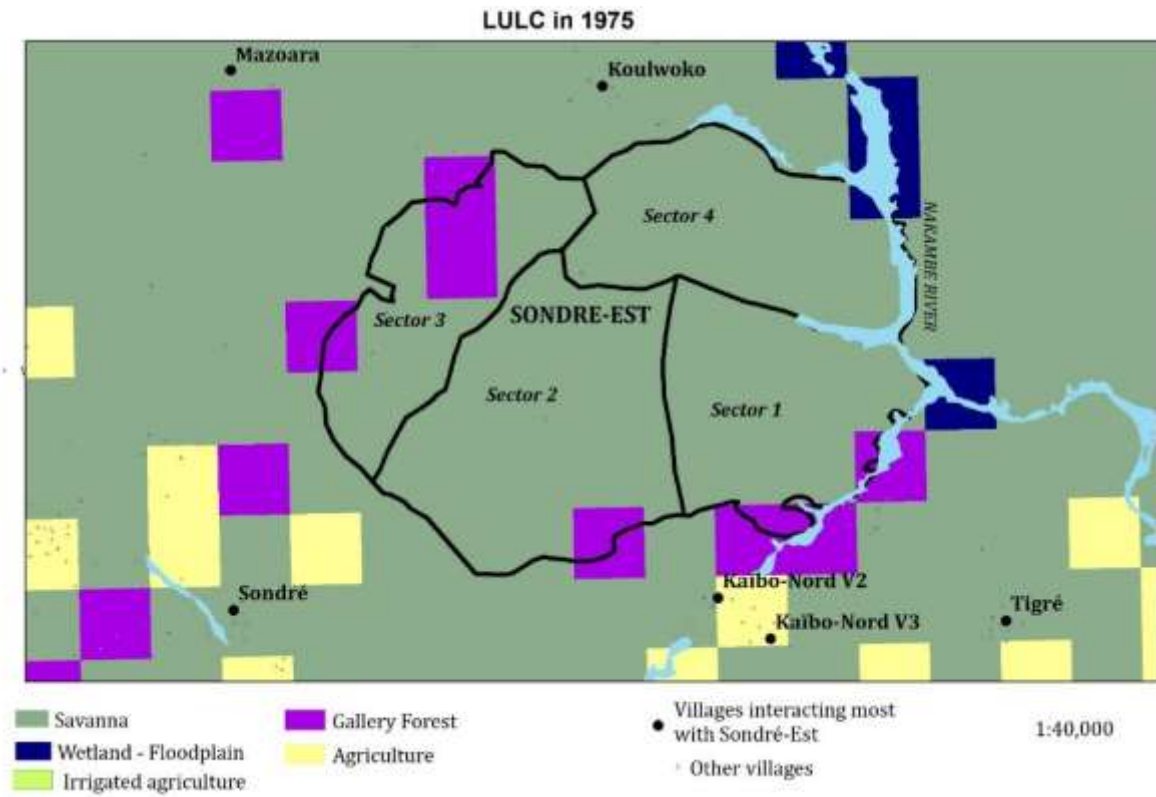


Figure 10: LULC in the Sondré-Est area in 1975  
 Data source: WALULCTS (Tappan *et al.* 2016) and IGB (2015).



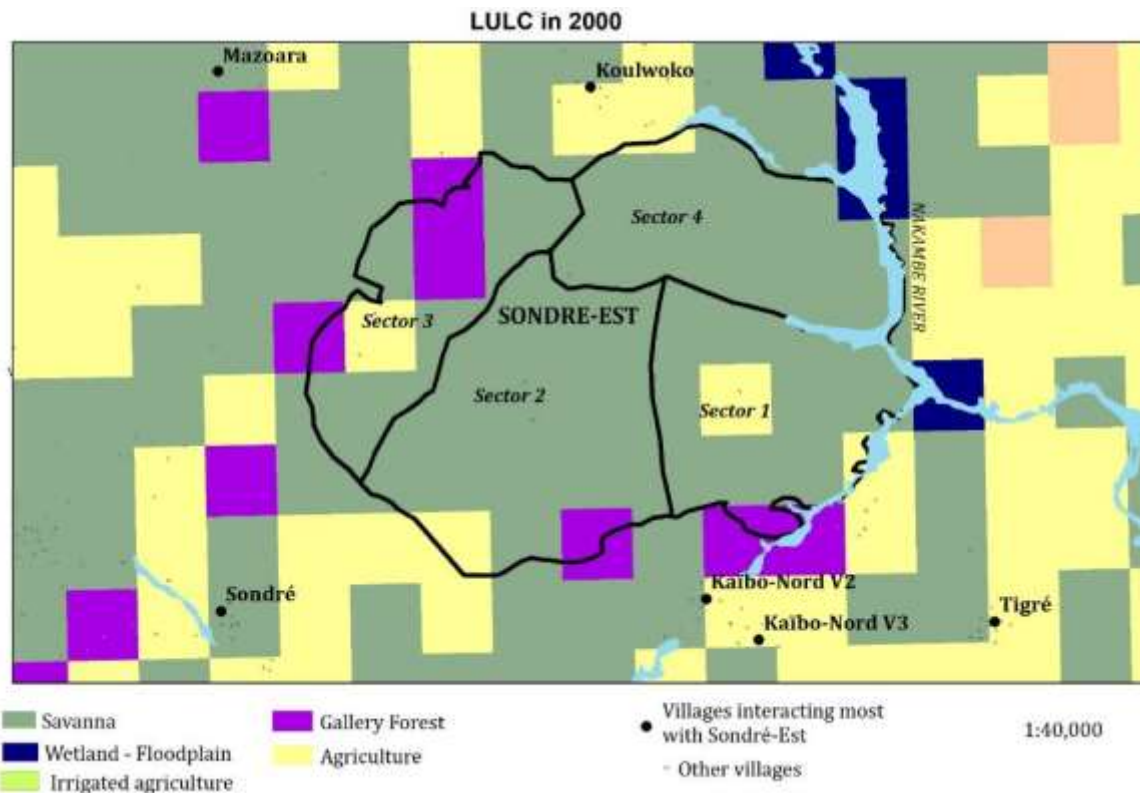


Figure 11: LULC in the Sondré-Est area in 2000  
Data source: WALULCTS (Tappan *et al.* 2016) and IGB (2015).

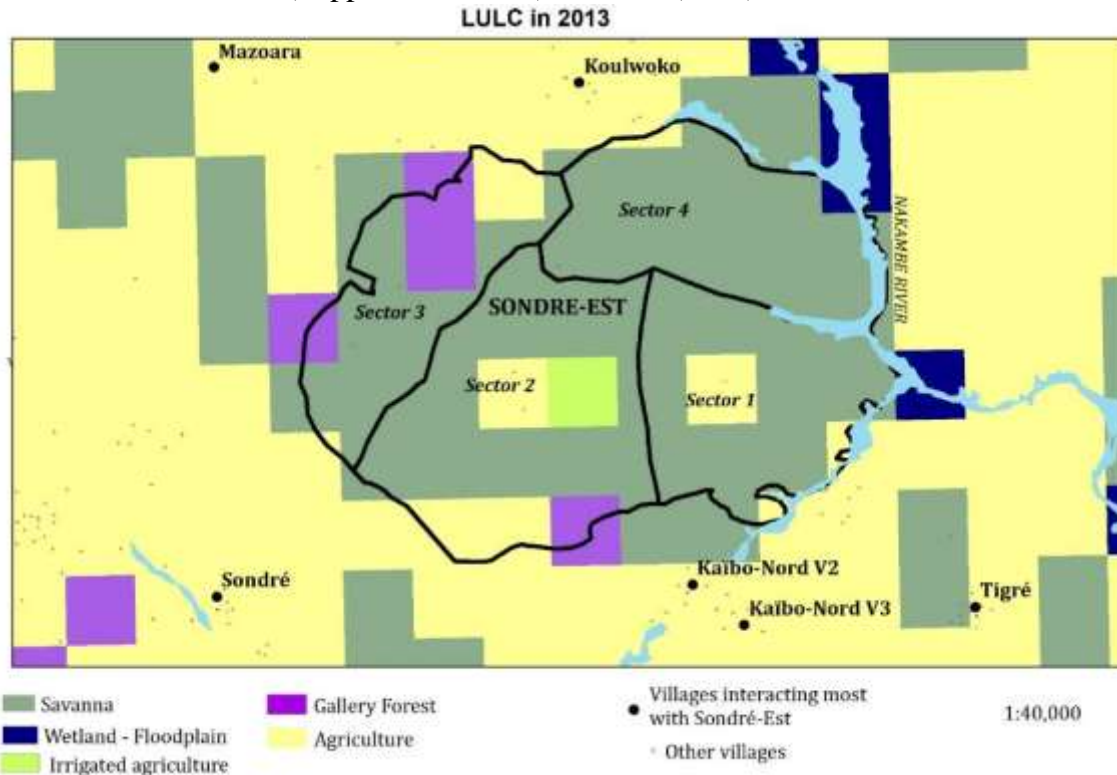


Figure 12: LULC in the Sondré-Est area in 2013  
Data source: WALULCTS (Tappan *et al.* 2016) and IGB (2015).

## **Results**

### *Narratives*

#### **- Fulbé Views**

The herders of Sondré-Est stated they had seen a map of the pastoral zone, but they did not have this map in their possession. According to them, the map stayed with the extension agent of Sondré-Est, but the extension agent was also unable to find and share the map in the midst of brewing border disputes in the area. Community leaders in Sondré-Est identified the disputed borders issue as a major challenge. One leader of the pastoral zone stated that “the border issue is our daily nightmare and its resolution is an emergency” (**DU – Sondré-Est, 09/14/2016**). The Fulbé – who Mossi farmers see as recent migrants – claim ownership of resources in the pastoral zone based on their legal rights accorded by the government when it encouraged them to settle there.

The herders viewed their life in the pastoral zone as beneficial for their livelihood system, but they complained about Mossi encroachment and farming near key water points. One herder explained that: “Three sides of Sondré-Est are surrounded by water. Thus, farmers often impede on areas of the zone that they can cross. This happens partially at the southern and at the western borders” (**KS – Sondré-Est, 02/24/2016**). Another herder added that tensions also happen when farmers garden near major water points. He clarified that:

Farmers garden near the Nakambé River and the dam of Koulwoko; our herds also drink there. The farmers produce up to the borders of the dam. They are too close to where livestock water. When animals water and see crops nearby, they end up grazing on farmers’ fields. Then, farmers capture them (**AS – Sondré-Est, 02/24/2016**).

The Fulbé want the government to clearly delineate the boundaries of the pastoral zone. This would serve as a precursor to an official framework to claim land rights and prevent cases of encroachment on Sondré-Est. The Fulbé described agricultural encroachment as one of the

main drivers of conflict in the area. The western border with the village of Sondré was perceived as the most contentious one, followed by the southern borders with Kaïbo-Nord V2. Tensions, according to herders, stemmed from the fact that farmers' rainfed agricultural land and gardens encroach on what herders perceive as reserved grazing and watering areas within the pastoral zone. There were also tensions with northern and eastern counterparts. However, these tensions were not considered as crucial as those with communities at the western and southern borders. This difference was due to the presence of the natural barriers of the Koulwoko dam and the Nakambé River which separate Sondré-Est from its northern and eastern neighbors.

- Mossi Views

Mossi farmers accuse the Sondré-Est herders of retaining two different maps of the pastoral zone. According to them, herders refused to share so as to take full advantage of these maps depending on the situation at hand. One of the maps apparently shows the borders of the zone in 1977 at the beginning of the Sondré-Est project, when the chief of Sondré verbally gave the land to the government to resettle herders. The other map displayed the borders after the second demarcation in 1984, which is a matter that is highly contested by neighboring farming villages. In Kaïbo-Nord V2, a migrant Mossi stated:

“We would like to see the original maps of the AVV and of Sondré-Est to see what the first agreement was and how things were at first when the zone was first created before we agree on the borders. We want to see the maps to know the truth. If we see the real maps, we cannot disagree. We disagree right now because the zone has two maps showing two different borders. Thus, the pastoralists use each map depending on how useful it is for the situation” (OA – **Kaïbo-Nord V2, 09/17/2016**).

Mossi farmers – who have lived in the area for generations – argued that the pastoral zone has encroached on their villages. They made these claims based on their customary rights to the territory of the pastoral zone, which used to be part of Sondré. They opposed any

demarcation of the pastoral zone as it would decrease their access to resources within the Zone and reduce their ability to pursue shifting agriculture.

The Mossi listed two major land disputes over the pastoral zone. On the one hand, in the village of Sondré, autochthons claimed fertile off-season gardening land between the dam of Sector 3 and the current border with the village of Sondré. The claimed portion was known as Zorgho, which was once a very small village known for its wet and rich land where some gardeners originally from Sondré lived before the second delineation and even before the dam of Sector 3 was created. According to some Sondré Village farmers, when their chief gave the land to create the pastoral zone, he did not intend to give away Zorgho – his constituents were already living there. Other accounts from Mossi farmers stated that a second delineation of the zone – allegedly conducted by officials from the Ministry of Animal Resources along with the residents of the pastoral zone, without the approval of the chief of Sondré – had taken away this productive Sondré agricultural land to expand Sector 3 and 2. Sectors 2 and 3 – which share borders with Sondré and Kaïbo-Nord V2 – are strategically located because this area has more pasture and a key water resources. The dam of Sector 3 was later built in Zorgho.

On the other hand, in Kaïbo-Nord V2, migrant Mossi claim 52ha of rainfed agricultural land now located within the pastoral zone. A Kaïbo-Nord V2 farmer said:

“We were not consulted before our agricultural land was taken away ... V2 is landlocked and villages all around it have grown. We do not have enough space to expand fields in all directions because there are fields everywhere. It is only north of us that we see empty space with hopes to expand, but unfortunately, this is where Sondré -Est is located at ...” (AS – **Kaïbo-Nord V2, 09/17/2016**).

The two disputed areas were equally claimed and valued by herders who dig wells to water their cattle during the dry season. The people of Sondré Village and Kaïbo-Nord V2 claimed that they had not cultivated in these contentious areas since the second demarcation. Farmers argued that

they no longer force their way into the pastoral zone not because they agreed with the border demarcation but rather because:

“We have no other choice. The herders are more powerful and richer than us. They also have stronger connections with government officials compared to us. See how many trucks cross Kaïbo-Nord V2 to go into the pastoral zone! If we dare force our way into the zone, we would get jailed” (**ZI – Kaïbo-Nord V2, 09/17/2016**).

The farmers perceived the creation of the pastoral zone as only benefitting the herders.

The farmers explained that the fact that they cannot access land in Sondré-Est has reduced their farming space. This impedes on their livelihoods. One of them concluded: “If we knew that life here would become so difficult and that we wouldn’t have enough space to farm at some point, we wouldn’t have come” (**OS – Kaïbo-Nord V2, 09/17/2016**).

### *Maps*

The LULC changes that Figure 5 shows corroborated herders’ narratives that there is an expansion of agricultural land along the southern boundary of Sondré-Est that does extend into the pastoral zone. Figure 6, 7 and 8 indicated that agriculture has been expanding around and into Sondré-Est between 1975 and 2013. Encroachment was observed at the southern border with Kaïbo-Nord V2, the western boundary with Sondré and the northern limit with Koulwoko. Encroachment was even more crucial at the border between the village of Sondré and Sector 3 of Sondré-Est up to the border with Sector 2. The decreased savanna on the maps validated herders’ perceptions that “grass is now scarcer” within the study site. Unfortunately, one of the limitations of this study was that the coarse resolution of the LULC data (2km) may exaggerate the changes observed on GIS maps. Yet, it showed general spatial and temporal trends – i.e., agriculture expanding and savanna decreasing over time.

An analysis of Figure 5 and Figures 7 and 8 showed that contentious borders corresponded to areas where agricultural fields encroach in the pastoral zone. Less contentious

borders were demarcated by natural barriers such as water points (Figure 9: East and North of the zone). In contrast, the most problematic borders had insignificant natural barriers or lack them entirely (Figure 7 and 8: South and West). Figure 7 indicated that the border with Sondré, perceived as the most contentious one, was only delineated by a minor dirt path. This dirt path served as a shortcut for the people of the sectors 2 and 3 of Sondré-Est and those of Sondré Village going south, especially to Kaïbo-Nord V2. Figure 8 displayed a gully that separates the pastoral zone from Kaïbo-Nord V2. A small bridge on this gully serves as a main road connecting the pastoral zone with Kaïbo-Nord V2 and urban centers. In contrast, Figure 9 showed the border with Koulwoko, separated by a river that is difficult to cross. Many perceived this border as less contentious.

## **Discussion**

The spatially-explicit maps produced reveal that conflicts occur in very particular places along the border where key resources are located. Studies on farmer-herder conflicts described social processes but typically overlooked geographic patterns. This study therefore argues that border tensions in this pastoral zone result from LULC changes, enclosure, and encroachment in specific areas. Border tensions are a product of enclosure and competing land use practices in strategic locations. While herders preserve savanna to secure pasture lands, farmers clear savanna and forest to create new farms. During the rainy season, Fulbé herders cultivate, but on smaller fields well into the interior of Sondré-Est. In times of rainfall variability, both communities move toward mixed crop-livestock systems where they engage in similar land use practices. In this process, tensions occur where land use practices spatially overlap.

Tensions occur when herds graze and water where farmers create agricultural fields and gardens. There were few tensions or conflicts in the 1970-80s. This is because the area was only

sparsely populated. However, in the 21<sup>st</sup> century, there are more tensions because populations have grown. In this process, agricultural fields and gardens are encroaching on the borders of the pastoral zone. In this case study, Figure 5 shows that this is especially true around strategic land and water resources along borders without clear delineation, whether through natural (river or gully) or man-made (signpost) barriers. Areas with clear paths and easy access facilitate encroachment because they can be easily crossed, whereas, areas with barriers discourage such behavior. Hence, areas with clear paths are more contentious compared to areas with natural barriers.

The Mossi and Fulbé groups want to clarify the borders of Sondré-Est. However, a physical demarcation of borders with signposts – as suggested by the Fulbé – will hinder both the Fulbé seasonal movements and the Mossi shifting cultivation traditions. Herder livelihoods rely on temporary seasonal movements. Seasonal movements involve mobility during the dry season, usually towards wetter southern regions, in search for pasture. Herds usually come back at the onset of the rainy season. In contrast, Mossi sustain their livelihoods through geographical mobility. Geographical mobility involves both Mossi migration into new areas for longer periods of time or the shifting of agricultural fields from one location to another. During this period, previously used fields are left to fallow for a few years. In both cases, migrations and shifting agriculture, Mossi land tenure systems allow farmers to come back and use their fields again once they need it.

Restricted access to land resources – which is implied in landscape fragmentation for the creation of clearly demarcated pastoral zones upon Mossi autochthonous land – would reduce Mossi livelihood options. The paradox is that livestock from the pastoral zone would still have access to foraging patches outside the pastoral zone. This situation, considered as ‘unfair,’ fuels

border tensions in the area. In this process, while Mossi autochthons use their ancestral ties to claim areas in Soudré-Est, Fulbé migrants claim a clear delineation of specific locations at the southern and western borders based on their own legal rights accorded by the government. Though the State officially owns the land of Soudré-Est where it resettled herders, autochthons still claim their customary rights to it.

Perceived encroachment and responses to such perceptions result from household pressures. Outside the pastoral zone, pressures include decreased land availability, which is illustrated by declining cash crop production (e.g. cotton) and decreased off-farm income diversification opportunities among the population. Farmers can either become involved in crop-livestock systems, find seasonal employment as laborers, or expand the area that they farm to mitigate these challenges. Those who do not intend to migrate are left with the option of cattle-fattening or obtaining new farming land. Mossi farmers cannot expand south of their village because it is home to other farmers looking for space. Many perceive expanding north toward the pastoral zone where there is a false notion of ‘empty’ and ‘unused’ land as their only option. Farmers perceive Soudré-Est’s land as ‘empty’ because it is uncultivated. Mossi farmers, as argued by Breusers, sustain their livelihoods through mobility represented by their shifting agriculture, even though this contradicts the original AVV principles that required settlers to adopt intensive agriculture in one specific location. In the study area, the conversion of savanna into agricultural fields and the idea that there is no more space to expand fields southwards reminds of the situation in northern Burkina, the place of origin of AVV migrants.

The enclosure of pastoral zones and observed LULC changes are the product of the unforeseen consequences of development initiatives undertaken three decades ago. In Burkina Faso, pastoral zones were established in unoccupied areas near farming zones. At the time, they



were far away from established villages and resettlement communities. Simultaneously, neighboring Mossi grew and expanded their agricultural fields up to the borders with Soudré-Est. This process is evident in Figure 5, which shows dramatic conversions of savanna into agricultural land surrounding Soudré-Est, and encroachment at specific locations around the borders of the pastoral zone. Mossi land use practices, namely extensive agriculture, are characterized by the expansion of fields into new areas. When the government created the AVV and pastoral zone, Mossi farmers raised few objections because they did not farm in those areas and had no plans of expanding any time soon. As the population increased and farming expanded, their fields nevertheless began to encroach on the area. The Soudré-Est project and the AVV program did not anticipate that in the long run, the empty zones where they resettled herders would become farming areas. These development projects did not foresee that this change would have the currently observed social and ecological consequences.

## **Conclusion**

In the Soudré-Est Pastoral Zone and its surroundings, farmers and herders discuss border tensions and refer to “the map” showing the accurate borders of the pastoral zone. Unfortunately, this map could not be found, and narratives alone do not shed light on underlying mechanisms behind these tensions. This study re-created a map of the pastoral zone to locate contentious areas and understand the causes of tension. These maps have illustrated that the pastoral zone is a physical boundary between two distinct and competing livelihood systems (pastoral and agricultural). These two groups belong to different ethnolinguistic groups that happen to clash. The mapping process suggests that these tensions are not ubiquitous along the borders; they occur at specific points. The unique pastoral resettlement zone reveals that herder-farmer

relations are tense in areas where there are conflicting land use practices. These areas include borders and key water points near these borders.

An analysis of the LULC maps of the Bindé and Béré communes would have no significance for this research without the boundaries of Sondré-Est, which this study has helped re-create. The integration of the LULC maps and boundary of the pastoral zone have enriched the analysis. These maps displayed the contrast in LULC types within and outside the pastoral zone. This contrast describes the different livelihoods systems inside and outside of Sondré-Est. These maps have also demonstrated the extent of the conversion of savanna into agricultural land around the pastoral zone over time. They illustrated agricultural expansion and encroachment along the borders. This spatial information –and narratives– facilitated the precise geographical identification of contentious areas. Major limitations have been the poor participation of Mossi farmers, especially in the participatory mapping process and the coarse resolution of the LULC data. These are limitations that future studies could address.

The study presented here has implications for other regions where farmers and herders live in proximity, but where there are no maps and borders are not clearly demarcated by physical barriers. This is particularly important for areas hosting pastoral zones where the segregated access to resources between residents and non-residents fuels farmer-herder land use tensions. In these areas, creating LULC maps and re-creating boundaries can enhance the analysis of land use conflicts. This study contributes a novel methodology to the field of political ecology by integrating ethnography with cartography.

## **CHAPTER 3 - FARMERS AND HERDERS' ADAPTATION TO CLIMATE CHANGE: BETWEEN AND WITHIN GROUP COMPLEMENTARITY**

### **Introduction**

Adaptation is not new in the Sahel. Rural Sahelian communities have always managed their resources and livelihoods in the face of rough environmental and socio-economic conditions (Mortimore 2010). In the southern regions of Burkina Faso over the past three decades, farmers and herders have adapted their livelihood practices to rainfall variability and demographic growth (Ouédraogo *et al.* 2010; Paré *et al.* 2008). They have changed their production systems to respond to pressure on limited natural resources. For example, these groups have transitioned towards mixed crop-livestock systems (Toulmin 1983). The convergence of production systems, in the wake of farmers' participation in livestock husbandry and herders' involvement in agriculture, has increased conflicts (Bassett 1988). Different land use practices on the same land have increased tensions between farmers and herders. For example, competition can happen when farmers clear land to create their agricultural fields while herders rely on the same land to graze their livestock. This is also true when farmers garden near major water points and thereby reduce livestock access to pasture and water.

Competition and conflict imply a lack of complementarity between livestock husbandry and agriculture. Despite competition, it is essential to examine complementarity. Diallo (2001) defined complementarity as occupational differences that create mutually beneficial relations. West (2015) emphasized the importance of complementarity, but in a different context. West demonstrated the complementarity between private and public responses to food insecurity in the northern Central Plateau region of Burkina Faso. He showed how these different responses

reinforce one another in mitigating local food insecurity. Examples of documented herder-farmer complementarity include farmer's cattle entrustment to herders, the loan of draught animals to farmers, manure and milk exchange for cereals (Diallo 2001). This cooperation could strengthen farmers' and herders' transition to crop-livestock systems and reinforce their capacity to adapt to social and ecological changes.

The researcher uses fine-grained ethnographic evidence on herders and farmers living in the Sondré-Est Pastoral Zone and surrounding villages in the Center-South region of Burkina Faso. In the 1970s-80s, desiccation, demographic pressures and a lack of arable land in central and northern Burkina Faso stimulated intense migrations of people and livestock to southern river valleys (McMillan 1995). These valleys were considered more fertile, but once relatively uninhabited (McMillan 1995). The *Aménagements des Vallées des Volta* (AVV)<sup>9</sup> program eradicated onchocerciasis (river blindness) in these sparsely populated valleys, encouraging resettlement therein. In 1977, Sondré-Est was created on the periphery of AVV farming villages. The AVV area was mainly occupied by the Mossi. The Mossi are the major ethnic and sedentary farming group in Burkina Faso. The Mossi of Sondré Village are autochthons to the area, but more Mossi migrants arrived under the AVV program (see Figures 1 and 2). The government invited traditional Fulbé herders to settle in the pastoral zone. This served as a means to provide traction animals for AVV settlers and to increase cattle exports to neighboring coastal countries. AVV settlers were mainly Mossi migrants, involved in intensive cash cropping (especially cotton). This study allows for comparisons within and between farmer and herder groups (Leung and Cohen 2011). Such comparisons are rare in climate change adaptation research.

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<sup>9</sup> English translation: Planned Settlement of the Volta Valleys

This study analyzes fodder cropping and livestock husbandry as actions that people perform while they enact ethnic and gender identities (Crane, Roncoli and Hoogenboom 2011). More specifically, this study shows how adaptation differs by ethnicity and gender, and how these differences reinforce adaptation. The history and social identities of farmers and herders remain linked to specific production activities, even as they transition toward mixed crop-livestock production systems (Toulmin 1983). Farmers whose ethnic identity relates first to agriculture typically invest more labor and attention in practicing agriculture. At the same time, they primarily entrust livestock to a herder, at least seasonally, in return for wages or an entrustment contract (Bassett 1994). Similarly, herders whose identity is principally linked to herding spend more of their collective labor on livestock husbandry. They tend to use abundant manure in their fields as a means of avoiding weeding and field preparation which requires additional labor (Turner 2004). The convergence of livelihoods toward agro-pastoralism increases farmer-herder competition. However, at the same time, it essentially boosts cooperation as groups begin to share greater common interests which generate production-related relationships (Turner *et al.* 2011). In this process, ethnic and gender differences – which many could perceive as antagonistic – may actually facilitate adaptation.

There is little comparative work on farmer-herder adaptive capacity and most of these focus on communities that are geographically distant from one another (Snorek, Renaud and Kloos 2014; Zampaligré, Dossa and Schlecht 2014; Vásquez-León, West and Finan 2003). The Sondré-Est area is ideal for this research as it features ethnically-diverse herders and farmers who are inhabiting the same areas. These communities adapt to similar climatic stresses, but they are doing so in very diverse ways. African herders and farmers are classic examples of competing livelihoods because they share the same space, but they also sustain their livelihoods

in vastly different ways (Benjaminsen and Ba 2009; Turner 2004; Dafinger and Pelican 2006; Breusers 1999; Bassett 1988). The researcher carried this current study out as a part of the Local Governance and Adapting to Climate Change in Sub-Saharan Africa (LGACC) project. The International Livestock Research Institute (ILRI) and the World Agroforestry Centre (ICRAF) lead the LGACC project. LGACC investigates innovative adaptation strategies in agro-pastoral communities. This aligns with Burkina Faso's National Adaptation Plan (NAP). The NAP itself seeks to reduce herders' vulnerability to rainfall variability, especially through fodder production (MECV-BF 2017).

## **Literature Review**

The terms “farmer” and “herder” have been occupational categories historically tangled with ethnic identities (Toulmin 1983). These ethnic differences bind and divide groups who interact daily. This presents opportunities to develop reciprocity and obligation ties (Turner 2004). The Mossi have traditionally been farmers who grow subsistence millet, sorghum and maize (Marchal 1983; Izard 1970; Skinner 1964). Historically, they have owned livestock but occasionally chose to entrust their cattle to their Fulbé neighbors (Breusers, Nederlof and Van Rheenen 1998). The Fulbé are expert cattle herdsman. They are culturally, linguistically and politically related and live in the Sahel region of West Africa, the Sudan Zone and regions in Ethiopia and Eritrea (De Bruijn and Van Dijk 2003). Sahelian Fulbé practice transhumant pastoralism which involves moving their cattle toward wetter regions in the dry season. They have not traditionally grown crops because of their mobility, challenging environment and pure focus on cattle raising (De St Croix 1945). Cattle define Fulbé identity, even though they are increasingly raising more small ruminants such as goats and sheep. In Fulbé communities, cattle compose cultural capital that can be converted into economic capital while small ruminants

(goats and sheep) are financial capital (Adriansen 2006). Small ruminants are sold to purchase food and more cattle.

Most studies on farmer-herder dynamics that have examined the relationships between Mossi farmers and Fulbé herders have focused on competition and conflict (Benjaminsen and Ba 2009; Turner 2004; Tonah 2002; Dafinger and Pelican 2006; Breusers 1999; Bassett 1988). These studies argue that competition over the use of natural resources following the droughts of the 1970-80s, population growth, and cash cropping have accelerated the convergence of these groups toward agro-pastoralism and that this transition has polarized their relationship (Turner *et al.* 2011; Toulmin 1983). Other scholars emphasize that symbiosis when using natural resources existed at a time when each of the two groups was involved in one sector of activity: either agriculture or livestock rearing (Breusers 1999). These studies are now quite dated, and typically occurred during and after droughts –most do not consider the longer-term process of climate change. However, there has been significant non-governmental organization (NGO) and state investment in adaptation. These actors have focused efforts on different sectors and varying ethnic groups. Unlike these previous studies, this study took these more recent dynamics into consideration. More specifically, this study examined how these distinct adaptations complement each other, rather than always being competitive and mutually exclusive (Moritz 2006; Cabot 2017).

Predicting the effects of climate change on farmer-herder relations, a recent study stressed that rainfall variability will increase the geographical and occupational overlap between farmers' and herders' activities; thus, increasing conflicts (Cabot 2017). Yet, Cabot (2017) adds that while geographical proximity can increase conflicts, it also offers an opportunity for stronger and longstanding collaboration (Turner *et al.* 2011). In the 1970-80s, host farming communities

welcomed migrant pastoralists. Plus, seasonal transhumance has stimulated complex relationships between herders and farmers. These relations involve cattle entrustment and gift and economic exchanges (De Bruijn and Van Dijk 2003; Moritz 2006; Bassett 1994). The Fulbé even adopted traits of local culture because of their longstanding relationships with local communities and vice versa (Cabot 2017). All these cooperative relations consolidated social networks (Bassett and Turner 2006).

This study examines the combination of livelihood resources and formal and informal institutional processes that enable households to pursue specific adaptation strategies. People and households diversify assets, incomes, and activities for diverse reasons. Combined global and local ‘push’ and ‘pull’ factors generate economic disparities them. On the one hand, ‘push’ factors are strong incentives for diversification based on risk reduction (Barrett *et al.* 2001). Examples include frequent droughts along with land and labor constraints. On the other hand, ‘pull’ factors are incentives that draw people in a particular direction such as the strategic complementarities between activities (Barrett *et al.* 2001). This includes crop-livestock integration and the proximity to a market and access to subsidies. These factors influence adaptive capacity. Adaptive capacity refers to one’s ability to alter and reorganize practices and processes to reduce current threats and overcome future risks (Smit and Wandel 2006).

This research focuses on fodder cropping and livestock husbandry as key adaptation strategies in the Sahel. Fulbé fodder cropping involves cultivating grass and dual-purpose crops. Grass species include Columbus grass (*Sorghum almum*) and Verano (*Stylosantes hamata*). Dual-purpose crops include cowpea (*Vigna unguiculata*) and velvet bean (*Mucuna pruriens*), with the principal purpose to feed livestock. Humans can also eat the grains or pulses. Mossi livestock husbandry includes day-to-day livestock raising, including cattle, small ruminants, pigs



and chickens. Cattle is intensively stall-fed with agro-industrial by-products (cottonseed cake, bran) and crop residues such as stalks, stems, leaves, and seed pods (Dossa *et al.* 2015). Such a limited scope on just these two strategies may affect the generalizability of findings. However, this current study focuses on these two specific strategies rather than a larger set of general climate adaptations because they are part of the NAP priorities in Burkina Faso. The NAP identifies promotion of fodder production among priority projects to develop livestock husbandry, highlighted as a vulnerable sector.

Restrictive institutions (typically based on gender differences), which reinforce structural inequities, hinder adaptive capacity (Jones and Boyd 2011). In Africa, patriarchy shapes men and women's vulnerability (Nyantakyi-Frimpong and Bezner-Kerr 2015). Patriarchy is a system of social structures and practices which shape unequal power relations between men and women (Walby 1989). Men are perceived as best fit for labor-intensive work, leadership, and public roles in general. In contrast, conceptions of women's work range from cooking and reproduction to care, petty commerce and, more importantly, their participation in cultivation and herding. Women's work is typically labelled as 'housework' and not productive labor (Mies 1986). Women's lack of assets and poor access and control of resources – such as land – influences their vulnerability and involvement in adaptation strategies. Though patriarchy gives different roles to men and women, this study argues that gender roles are complementary and overlapping in the household.

As a product of social interactions, gender issues, relations, and duties differ among livelihood and cultural systems (Rubin 1975). For instance, Mossi women are economically and socially constrained (Kevane and Wydick 2001) while Fulbé women possess a larger economic independence (Van Haaften, and Van De Vijver 1996). Power is contested between men and

women in pastoralist households because of the changing status of women in pastoralist the household economy (Brockington 2001). In farming and herding households, responses to the effects of climate change (such as male migration) have allowed women to undertake traditionally male-dominated activities (Djoudi and Brockhaus 2011; Hampshire 2006). Male labor migration has modified the size and structure of households, prompting changes in the division of labor within household units (Hampshire 2006). Intra-household gender roles do not always match ideal norms, but they are often improvised to help sustain livelihoods. Therefore, it is essential to go beyond men-women dichotomies in order to explore complementary roles within households (Lindsay 2007).

### **Study Site**

Located at the north-east corner of the Zoundwéogo Province in the Center-South region of Burkina Faso, the study site includes the pastoral zone of Soudré-Est and Kaïbo-Nord V2 and Soudré, two of its surroundings villages (see Figure 2). The area receives about 880-900mm annual rainfall with a five-month rainy season from May to October (Nébié 2005:192). In the pastoral zone, the main LULC is savanna, while agricultural land dominates Kaïbo-Nord V2 and Soudré. Soudré-Est Pastoral Zone covers an area of 16,460ha. Pastoralism (animals include oxen, sheep, goats, chicken and guinea fowls) is the major activity in Soudré-Est. Agriculture (crops include millet and sorghum and smaller quantities of groundnuts, cowpea, peas, sesame, and cotton) is practiced in the surrounding farming communities. Secondary activities include trade, mining and the service sector.

Most of Soudré-Est's population are Fulbé – one of the largest pastoral groups in West Africa. Fulbé herders usually have satellite herds that are transhumant and travel seasonally between Soudré-Est and neighboring coastal countries (Ghana) and southernmost provinces

(Nahouri and Sissili). However, in Soudré-Est, not all herders are transhumant. Non-transhumant herders usually have smaller herds. Cattle that remain in the pastoral zone throughout the year rely on natural grass and cultivated fodder inside Soudré-Est and in surrounding Mossi villages. The Mossi of the village of Soudré and Bissa communities who moved are the autochthons of the area, but the AVV program and seasonal mobility mechanisms have engendered migration of more Mossi, Yadsé and Fulbé into the area. Farmers have not been invited or allowed to settle in the zone because of the focus on livestock husbandry. In the last 20 years, herders and farmers in the area have been converging toward mixed crop-livestock systems. This transition served as a means of mitigating their increased vulnerability to ecological, social, economic and political changes in the country. Though both groups are involved in similar activities, adaptation strategies differ. For example, the way Fulbé communities practice fodder cropping differs from the way their neighbor farmers cultivate. The researcher uses fieldwork data to compare adaptation practices in these different communities.

## **Methods**

The first author collected data over the course of 20 months from 2016 to 2017. She was the primary researcher and lived in nearby Manga from which she conducted multiple fieldwork visits to Soudré-Est during the data collection period. Though the LGACC team mainly focused on Soudré-Est, the first author of this study also conducted fieldwork in the two surrounding Mossi villages of Soudré and Kaïbo-Nord V2<sup>10</sup>. The main author worked with a paid local assistant. The assistant helped schedule meetings, recruit participants and translate conversations from Mooré to French. The time spent in Soudré-Est allowed the lead author to conduct multiple focus groups and interviews with men and women herders. However, in the Mossi villages, there

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<sup>10</sup> The first author interviewed an agro-pastoralist leader, identified as a key informant, in Kaibo-Centre.

was only a single focus group, though there were multiple informal discussions with male community leaders<sup>11</sup>. The study of Mossi adaptation has been widely informed by these discussions and, more importantly, by the vast literature on Mossi households' own adaptation in southern Burkina Faso (Kevane and Gray 1999; Howorth and O'Keefe 1999; Kevane and Wydick 2001; Paré *et al.* 2008; Pérez, *et al.* 2015).

### *Focus Groups*

In Sondré-Est, a total of 130 men and 124 women participated in 12 focus groups in the study. They documented fodder cropping techniques and access to resources needed to practice those techniques. Fulbé focus groups occurred with representatives from different sectors within the pastoral zone. In Kaïbo-Nord V2 and Sondré Village, there were a total of 12 male leaders who participated in the study. Fieldwork was intermittent because Sondré-Est is remote and difficult to access from Manga, especially during the rainy season. The researchers in this study were part of a larger interdisciplinary project that was conducting other activities. The main researcher traveled between Manga and Sondré-Est by motorcycle. These past years, security issues were recorded in the area where there are now active indigenous police (known as *Koglweogo*) presence. These security issues prevented the researcher from living in Sondré-Est and neighboring villages.

This research selected participants purposively. At each site, the study asked community leaders (men and women) to recruit participants based on gender and age (at least 30 years old to have an in-depth historical perspective regarding adaptation in the area). This recruitment method could have biased sampling and limited the participation of people not included in the leaders' networks. This could also explain the exclusion of women from focus groups in Mossi

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<sup>11</sup> This study was conducted as part of the LGACC project which has primarily focused on studying the herders of Sondré-Est.

villages, where leaders were exclusively male. All the interviews and focus groups were conducted in teams of at least two researchers to maximize the quality of the information gathered. Questions were administered in Mooré and Fulfuldé, the languages spoken respectively by the Mossi and Fulbé in the area. Notes were written on paper during discussions, then later typed, transcribed and coded.

#### *Individual Semi-Structured Interviews*

In Sondré-Est, this first author individually interviewed a total of 42 men and 4 women herders. Participant selection was based on a network sampling technique where, at the end of each focus group, participants provided names and contact information of people involved/uninvolved in fodder cropping. Follow-up in depth individual interviews were only conducted with people who previous participants referred. The strength of this methodology lays in the fact that it increased trust and guaranteed participation. Participants were more confident in answering questions when they were referred by someone from their community who also participated in the study. However, the limitation of this methodology is that all participants belonged to the same network, omitting people outside this network. In addition, this sampling method reflected Fulbé cultural perceptions of gender roles in cultivation. The team only received referrals to men who are primary actors in fodder cropping at household level.

Since the research assistant – the main intermediary between the research team and the community – was a male, Muslim norms of female behavior and deference prevented the team from speaking to women individually. At the same time, the main researcher, who is a female Burkinabè, belonged to another ethnic group with a different dialect and did not speak Fulfuldé well enough to speak with Fulbé women. Therefore, men answered questions on women's roles

in household fodder production and the team also managed to interview four women leaders to verify these statements.

In Kaïbo-Nord V2 and Soudré, there were informal discussions with Mossi farmers, but researchers conducted no formal individual interviews there because of the focus of the LGACC project on Soudré-Est. However, the team interviewed a Mossi agro-pastoralist leader and resourceful person in livestock husbandry in Kaïbo-Centre. All interview questions were administered in Mooré, and notes were taken on paper during the process, then typed, transcribed and coded.

## **Findings**

### *Differences*

#### **- Fulbé Herders' Adaptation**

Fulbé herders were the main cultivators of fodder, but Fulbé communities do not traditionally cultivate fodder. In the past, animals only grazed on common grazing areas in the savanna and gallery forest and relied on farmers' crop residues to supplement their diet. One herder stated that: "When I was younger, we weren't cultivating fodder. Now that forests have dried out and that we have the means to adapt to this situation, we can cultivate fodder" (**GI – Soudré-Est, 05/13/2016**). In recent times, many Fulbé herders have adopted fodder cropping as their specialty. In Soudré-Est, the cultivation of dual-purpose crops was more widespread than grass cultivation because of the lack of labor to cultivate both cereals and fodder during the rainy season. The Fulbé did not use compost and their fields are relatively small, subsistence-oriented activities.

The Fulbé only gave cultivated fodder to oxen and cows toward the end of the dry season because they eat more and are more valuable culturally and financially. Among oxen and cows,

the herders allocated priority to weaker and sick animals to promote health, as well as to females to stimulate milk production. The Fulbé frequently sold small ruminants to fund smaller expenses, but they only sold cattle as a last resort or to fund major expenses such as their pilgrimage to Mecca. This is largely because Fulbé identity and social prestige are closely intertwined with their cattle ownership. They raised cows for milk, sale and for paying bride-wealth or dowries. Feeding cows guaranteed the Fulbé's own subsistence. Small ruminants were left out to graze on natural grass near homesteads and their diet was supplemented with industrial feed. Fulbé cattle freely roamed in the pastoral zone, sometimes even without a herder. However, in the rainy season, when water levels were high and fields were cultivated, the Fulbé kept their animals under round-the-clock surveillance.

Fodder cultivation involved resources such as land, seeds, farm equipment, fences, manure, labor and storage facilities. The regulatory laws of the Soudré-Est Pastoral Zone stated that each Fulbé household officially has 1.5 ha reserved for fodder cropping and 2.5 ha for cereal cultivation. It remained unclear if residents still followed these regulations as population increased in the pastoral zone. Cultivating fodder depended on the availability of seeds and the use of a plow, a hoe, and/or a farming cart and donkey. The lack of labor and seeds was a major reason why herders did not grow fodder. The herders of Soudré-Est often received subsidized seeds and equipment from NGOs and government organizations. They perceived subsidized seeds and equipment as being of higher quality, but not always cheaper. When subsidized seeds and equipment were insufficient, pastoralists bought them from seed producer associations and companies. During planting and harvesting seasons, the Fulbé fenced agricultural fields with dried thorny branches to block livestock access to young cultivable plants, which are often similar to grass.

Cultivated grass, which local populations consider nutritious and valuable, was stored in *fénils*, stalls or trees. A non-governmental organization known as *Plate-Forme d'Actions à la Sécurisation des Ménages Pastoraux*<sup>12</sup> (PASMEP) introduced *fénils* in 2013 in Sondré-Est. PASMEP provided financial and technical aid to cattle breeders (mainly traditional herders such as the Fulbé) to help them adapt to climate change. A *fénil* is a modern fodder storage room of 48 m<sup>2</sup> constructed from mud brick with at least four large or eight medium-sized windows. The roof is made of at least 20 tin sheets. As an indoor storage space, the *fénil* improves fodder conservation as fodder is stored (and sometimes locked) in an enclosed environment for protection from natural phenomena (sun, wind, humidity) and theft. *Fénils* last up to 10 years. Surrounding communities did not use this conservation strategy.

Building a *fénil* costed at least 175,000 CFA.<sup>13</sup> PASMEP covered up to 50% (87,500 CFA) of herders' expenses when building *fénils*. One needed to be a group member to benefit from such subsidies. The *fénil* belonged to an individual's household, and permission from the owner is required for access. One herder stated: "...a few decades back, if us Fulbé were told that we would keep fodder in houses that are more beautiful than our own huts, we would laugh out loud and say it's a lie. But this is actually the case today" (ZH – Sondré-Est, 05/12/2016). The fodder that Fulbé herders cultivated was so far used only for household livestock subsistence. It was also shared sometimes with neighbors and acquaintances in need – no one sold it, so it was not yet a commodity. Some herders stated that it could become a lucrative business in coming years because of erratic rainfall and increasing grass scarcity.

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<sup>12</sup> Action Platform for Securing Pastoral Households

<sup>13</sup> 1 dollar = 532.44 CFA as of March 29<sup>th</sup>, 2018 at <http://www.xe.com/currencyconverter/convert/?Amount=1.925.000&From=USD&To=XOF>



- Mossi Farmers' Adaptations

In contrast, Mossi fields were diverse, large, and intensive. The Mossi raised stall-fed cows for animal traction, compost, and sale. They also raised small ruminants, pigs,<sup>14</sup> chickens and donkeys. Mossi used livestock as a means of accumulating wealth. During the day, cows were tied at home or close-herded by children. Farmers kept their animals in a corral at night. The Mossi had time and labor to focus on this activity during the dry season. Table 6 shows the cost for livestock husbandry during a fattening cycle of 90 days. This table does not include additional expenses for water, crop residues (when household stocks are depleted), wheelbarrows, rakes and shovels. These costs should be considered in the total estimate.

Table 7: Costs for raising a cow in 90 days

Item	Cost in CFA	Details
Stall	25 000	Lasts two years
Agro-industrial feed	42 500- 50 000	5 bags of 50 kg per cow. A bag costs 8500F/10 000 CFA
Vaccination and deworming	2500-3000	
Fence	30 000	For 25 meters and can take up to 4 cows
Cart	150 000-175 000	Can last five years
Stall-feed	8 000	Includes two
Labor	12 500	This is an estimate if work was done by hired laborers. But work is usually done by their own children. Extension agents encourage them to pay their children for their labor, though it is unclear if this is done in reality

In the study area, it costed about 303,500 CFA to raise one cow in 90 days. This cost included long-term resources such as stalls, fences and carts, which also apply to multiple cows and other fattening cycles. When these resources were acquired, the most important expenses were livestock feed, vaccination and deworming, and labor, which cost about 65,000 CFA. In return,

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<sup>14</sup> Fulbé herders do not raise pigs because they are Muslim.

per cycle, one cow generated about 180 kg of manure, though livestock producers did not sell manure, but rather mixed it with household farm residues and converted it to compost before using it in the fields to increase fertility. Overall, Mossi farmers considered livestock husbandry a lucrative business. One of them stated:

Raising livestock at home is more profitable for us compared to herders who move with cattle. We buy cows at 300,000 CFA and sell them back at 500,000 – 600,000 CFA after fattening them. We just tie them somewhere in a corner and feed them so that they can reach 250-500 kg (**FB – Kaïbo-Centre, 02/09/2016**).

Farmers who were members of the *Federation des Eleveurs du Burkina Faso*<sup>15</sup> (FEB) benefited from feed subsidies through partnering organizations. Farmers complained that too many farmers were now involved in livestock husbandry and it was more difficult for them to benefit from subsidies. He explained that too many people rely on subsidies to obtain livestock feed. In most cases, Fulbé herders received priority. One farmer stated that “we wish we had the same resources and networks that the herders of Sondré-Est have” (**OS –Kaïbo Nord V2, 09/17/2016**).

#### *Complementarity*

##### **- Fulbé Herders**

Herders relied on farmers for labor, equipment and subsistence crops. At the end of the rainy season, herders relied on paid Mossi laborers to prepare fields for seeding. At the end of the season, they also needed these laborers for harvesting fodder, especially in households where children were too young or enrolled in school. Laborers once came from surrounding farming villages. Herders would pay them, give them a portion of the harvest, or even allow them to borrow light farm equipment (hoe, sickle) or traction cows for their own fields. The situation has

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<sup>15</sup> National Federation of herders in Burkina Faso.

changed. Herders explained that the availability of laborers has decreased because of rural exodus, as well as other mining and gardening opportunities in the region. The herders also rented or borrowed farm equipment such as tractors<sup>16</sup> from farmers in the area. The rent of the tractor usually included the laborers' salary. Many Fulbé households in Soudré-Est produced small quantities of cereals because of their focus on fodder cropping and the small size of their fields. Thus, the cereals were insufficient to feed their household the entire year. Many herding households therefore still relied on farmers to purchase staple crops.

- Mossi Farmers

Even though farmers stated: "...we do not need the Fulbé" (**OL – Soudré, 09/18/2016**) to sustain their livelihoods, observations have shown cooperation and mutual benefits between both groups. This varied depending on the season. First, during the dry season, after farmers finished harvesting cotton and saving crop residues to fatten their own cattle, they encouraged herders to bring their cattle to graze on their fields, which need manure. Mossi usually had small numbers of cattle that were insufficient to provide manure for their fields. One farmer explained that: "we bring water to cattle to motivate them to stay on our fields. Also, we allow cattle owners to sleep in the temporary huts we build near our fields" (**ZA – Soudré, 09/18/2016**). In addition, at the onset of the rainy season, farmers approached their friends in the pastoral zone to acquire subsidized fodder seeds only available for the herders of Soudré-Est. However, they claimed that the amount of seeds that they received was insignificant. This did not allow them to start fodder cropping. At all times, Mossi farmers who were involved in livestock husbandry often requested

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<sup>16</sup> The Soudré-Est Project purchased tractors for fodder production. However, these tractors broke down and have not been repaired after the project ended. They are parked at the commercial Center of the pastoral zone and now serve as occasional 'seats' for herders attending meetings at the Zone's Center.

advice from the Fulbé for livestock management. They specifically sought advice regarding health and feeding tips.

#### *Within-Group Differences*

##### **- Fulbé Women Adaptation**

Fodder cropping had been particularly beneficial to women, though men were the main actors in cultivation. One of the major income-generating activities of Fulbé women was the commercialization of dairy products. Milk production and commercialization flourished with fodder availability. In households that cultivated fodder, milk production was quite stable throughout the year. Women commercializing milk helped stabilize households. Women fed, milked and provided medication and fodder to household livestock, which were herded together. In contrast to the Mossi, Fulbé men and women could own and herd cattle. Children inherited cattle from their parents, but especially their mothers and maternal relatives. In the dry season, when men moved with part of the household cattle, Fulbé women took on leadership responsibilities in the household, including feeding decisions.

At the household level, while men still focused primarily on preparing the fields, planting and taking care of crops daily, women participated in crop harvesting and transportation from the fields to the storage location. In most cases, Fulbé women participated in harvesting which started when children were off at school. An older man explained that “Fulbé women did not cultivate in the past. But now, things have changed” (GI – **Sondré-Est, 05/12/2016**). An old woman adds that “it is usually older women who cultivate. Young women define working the soil as ‘dirty.’ Young women who just got married for one to two years want to look clean and beautiful. This perception is not cultural. It is just what women think. When you are young you are less worried about feeding a family” (AK – **Sondré-Est, 05/23/2016**).

Cultivation by women in the name of a female group was better accepted compared to women individually involved in cultivation at the household level. Fulbé women individually involved in cultivation at the household level decreased their husband's prestige in the eyes of the community. The observed benefits of fodder cultivation in annual milk production had pushed some women to create a female group known as the *Muyan*, which is composed of women exclusively dedicated to fodder cultivation. At specific stages of fodder production (plowing, sickling and building of conservation areas) they requested help from their husbands, male children, relatives and/or friends. When aid from men within their networks was insufficient, they hired laborers. Individually, women would not have enough financial resources and labor power to cultivate fodder.

Non-governmental organizations, such as PASMEP, which promoted the resilience of pastoral households in general, and that of women in particular, supported these women organizations. PASMEP subsidized *fénil* construction and farm equipment. Upon purchase, the equipment and/or *fénil* belonged to the individual woman who paid for it, and her household members could also use it with her permission. This increased women's respect in the household and community, as their husbands and co-wives requested space in their *fénil* to store fodder, or they borrowed fodder from women owners to feed livestock.

#### - Mossi Women Adaptation

In farming households, livestock husbandry – which is a secondary activity and an adaptation strategy – was largely a male activity. Male household heads usually owned livestock and their derived products, including eggs, as well as other assets, such as land. Mossi women did not sell livestock or dairy products, but they fed livestock and cleaned the house, including stalls. In some instances, Mossi women owned small ruminants and poultry through project

support or when they had accumulated enough financial resources to invest in livestock. These women used livestock as a financial asset to fund their children education and healthcare.

During the rainy season, Mossi women devoted themselves to agricultural activities. They borrowed land from their husbands or male relatives. Women produced cereals for household subsistence and urban markets, especially when men migrated toward cities and coastal countries in search of wages (Cordell, Gregory and Piche 1996; Bleiberg *et al.* 1980). All household members above seven years old participated in cultivation. The elderly rarely participated in collective farming, but they looked after children. During the dry season, women participated in income-generating activities such as handicrafts, weaving, pottery and trade. Trade often involved commercializing foodstuffs such as doughnuts made of millet, sorghum and beans.

## **Discussion**

### *Exchanging resources to strengthen adaptation*

The relationship between farmers and herders is not always characterized by conflict. Though studies (including the first paper in this dissertation) highlight farmer-herder conflicts due to the increasing overlap of their activities, this study emphasizes cooperation. First of all, cooperation occurs between farmers and herders when they borrow resources from each other to reinforce their adaptation to social and ecological changes as both groups converge to agro-pastoralism. Second, the fact that they use different ways to adapt reduces competition and thus, conflicts.

Farmers and herders can no longer rely exclusively on either agriculture or pastoralism because of rainfall variability and decreased land and grass availability. Hence, they converge towards agro-pastoralism. In this process, they exchange resources in their daily interactions in

order to reinforce adaptation. This relationship develops reciprocity. For instance, the Mossi detain agricultural knowledge and resources, but they aim to become efficient livestock producers. The Mossi can buy livestock at competitive prices and benefit from livestock feeding and health management advice from the Fulbé because of their proximity with the pastoral zone. Similarly, the Fulbé possess pastoralist knowledge, but the creation of pastoral zones and institutional support have influenced their sedentarization and specialization in fodder cropping. The Fulbé borrow farm equipment and labor from neighboring Mossi farmers in order to cultivate their small fields more efficiently.

Herders and farmers have integrated farming and livestock husbandry into their livelihoods, but doing it differently and possessing different adaptation goals does not sustain or increase farmer-herder conflicts. On the one hand, the convergence of both groups in livestock husbandry is visible in the market place where farmers and herders alike sell livestock. In the study area, the Fulbé still sell more livestock more often than the Mossi. Competition between farmer and herder livestock sales in the market happens at different times of the year because Mossi only sell fattened livestock during specific periods. Cattle raising in Fulbé communities is tied to their cultural identity, while cattle raising among farmers is more of an income diversification strategy and has relatively little to do with their cultural identities. The Mossi themselves recognize that livestock husbandry is more profitable than Fulbé herding. These differences are reflected in the two groups' livestock management styles. For instance, Mossi farmers buy, tie and intensively feed cattle at home to sell them at higher prices on the market. In contrast, the Fulbé herd cattle, allowing their animals freedom to roam the bush for pasture in the pastoral zone. In Fulbé communities, what matters is cattle ownership and the relationship with cattle; using cattle for economic and financial purposes is only secondary. They only sell cattle to

fund major events. This happens when they own a certain number of cattle so that they can sell some without a significant impact on their social status.

On the other hand, herders grow fodder mainly for livestock. Even when they cultivate dual-purpose cereals, their primary goal is to feed livestock, whereas farmers cultivate cereals for personal subsistence and for sale on the market. In other words, even though herders cultivate to a certain extent, they still rely on farmers to obtain grains for household subsistence. So far, there are no recorded cases of Fulbé herders selling cereals or fodder like there are in Mossi communities. In Fulbé communities, cultivated crops are only for household livestock and members' consumption. Fulbé cattle graze primarily on natural and cultivated fodder, or on crop residues on Mossi farming fields. The ownership of livestock by Mossi farmers might have reduced, but it does not completely dismiss the ability of Fulbé cattle to graze on farmers' crop residues. Mossi farmers continue to invite herders to graze on their fields because they do not own large herds that can fertilize their vast agricultural possessions and meet their needs. It is mainly during the dry season that the Fulbé complement their cattle's diet with agro-industrial feed. In contrast, Mossi cattle feed on crop residues and agro-industrial feed at all times. The Mossi do not cultivate fodder, and the Fulbé do not sell fodder. Mossi and Fulbé livestock have dissimilar and diverse feeding strategies that reduce herder-farmer livestock competition on common grazing areas. This mitigates vulnerability because livestock from these two groups do not rely on a single source of food.

Even though there is increasing overlap between herders and farmers' activities, there are important subtleties to these that often go overlooked. This divide is also present in the National Adaptation Plan (NAP), which separates priority actions in agriculture and livestock. Hence, external organizations differentially target farmers and herders in the area with targeted



interventions based on their primary production system. For instance, PASMEP only works with farmers in the pastoral zone and provides them with resources to successfully cultivate fodder. Even though farmers and herders are differentially targeted, they figure out ways to benefit indirectly through complementary relationships with specific herders or farmers. Exchange of labor, resources (e.g. subsidized seeds and equipment), technology and knowledge (e.g. training and consultations) among herders and farmers shows the importance of going beyond conflicts to recognize cooperation among them, even as they converge to agro-pastoralism.

The type of relationship that farmers and herders share varies depending on the season. The rainy season is a tense period because this is when livestock can damage crops on their way in and out of the pastoral zone. Yet, this is when herders count most on farmers for labor and equipment to engage in fodder cropping. In contrast, farmers rely most on herders during the dry season, not only for manure, but also for selling cereals and surplus crop residues. Plus, farmers indirectly gain from interventions which target the pastoral zone and vice-versa, though gains are not evident at first sight. The fact that farmers do not necessarily see these gains in their everyday lives promotes tensions with herders.

### *Gender synergies*

Contrary to beliefs that a gender division of roles has always existed in rural households, this study shows that these gender roles are not rigid in primary livelihood systems as they are in newly introduced adaptation strategies. For instance, in Fulbé households, it is culturally accepted that women can herd and care for cattle, but agricultural fields are perceived as men's spaces. Even so, women are increasingly intervening in harvesting and conservation, regularly taking on men's activities in their absence. Similarly, in surrounding Mossi villages, men and women fully participate in all agricultural activities, though Mossi men primarily own land and

household assets such as livestock. Contrary to Fulbé women, who are livestock owners owing to inheritance and bride wealth, Mossi women rarely own cattle in their households. They nevertheless play a prominent role in livestock care-giving. The flexibility of primary livelihoods systems has allowed women to sustain livelihoods even when men were absent. Yet, external policies and development organizations have promoted the gender divide in access and involvement in newly introduced adaptation strategies.

Development projects draw on – and reinforce by the same token – existing patriarchal systems to put men forward as the earner of the main source of household income and the primary actors in household adaptation. Thus, fodder cropping is gendered in Soudré-Est while livestock-ownership is gendered in Mossi communities because of men and women's differentiated access and control of adaptation resources. In the pastoral zone, for a long time, male groups have been the primary recipients of equipment and subsidies for fodder cropping. A few development partners, such as PASMEP in Soudré-Est, are now targeting women as key actors in climate adaptation. These partners have realized that women's involvement in adaptation is stronger when they belonged to groups. Groups receive better institutional support as they are known to have stronger and wider impacts compared to individual participants. Plus, culturally, women who are group members are more socially accepted when engaging in 'male' tasks. As external institutions promote gender equality and modernization at a group level, women performing tasks perceived as 'male' as a group are less stigmatized and individual husbands do not receive blame for failing to fulfill their roles. This notion of 'male' tasks does not only build on local patriarchal prescriptions, but also results from Euro-American dichotomies which dictate what men and women ought to do. These dichotomies are promulgated and reinforced by foreign development projects.

## Conclusion

Mossi and Fulbé are moving toward agro-pastoralism apace, but in different ways. Attending to differences within and between groups is key to understanding adaptation. The study presented here offered a rare glimpse into this because the herders and farmers studied here interact in close proximity. Previous studies have emphasized farmer-herder conflicts. The first author highlighted contemporary instances of symbiosis, even when farmers and herders both converge toward mixed crop-livestock systems. She demonstrated how Mossi farmers and Fulbé herders practice similar adaptation strategies differently to sustain their livelihoods. While Fulbé fodder cropping aims to feed cattle that define Fulbé cultural identity, Mossi livestock husbandry focuses on capital accumulation. The Mossi raise cattle that are stall-fed for animal traction, compost, and sale, while simultaneously practicing intensive agriculture of diverse crops on large fields. In contrast, the Fulbé only grow grass and specific dual-purpose crops for subsistence on much smaller fields than their neighbors.

These two communities have found ways to reinforce their livelihoods by exchanging labor, technical and material resources. Within households, patriarchal norms allow men and women to participate fully in the main production systems. However, women play supporting roles in relatively newer and secondary production systems. While Mossi women and men equally participate in cultivation, men are the main actors in livestock husbandry and the owners of livestock. Similarly, Fulbé men and women both own livestock and it is culturally accepted that both genders participate in herding, but men are the primary actors in fodder cropping. In Fulbé fodder cropping and Mossi livestock husbandry, women play secondary, but essential roles. In some instances, women play primary roles when men are absent or when they produce as a group. It is crucial that adaptation policies and development initiatives consider the

complementary elements between farmers and herders at a larger scale, but also between men and women in household adaptation. This is particularly important for designing efficient and integrated household and community adaptation programs.

## **CHAPTER 4 - GENDER PARITY IN LAND MANAGEMENT: THE DISCONNECT BETWEEN TOP-DOWN STATE POLICIES AND LOCAL SOCIAL VALUES**

### **Introduction**

Over the past three decades, in the southern regions of Burkina Faso, farmers and herders have adapted their livelihood practices to rainfall variability and demographic pressure on scarcer natural resources (see Chapter 3). Responses to the effects of these threats have increased women's leadership in household decision-making, especially following men's labor migration (Cordell, Gregory and Piche 1996) but not much in community land management. Participation in rural land resource management is gendered (Fortmann and Rocheleau 1997, Porro and Stone 2005) even though studies have demonstrated women's aptitudes for contributing to sustainable resource management (Agarwal 2001, 2009). This chapter examines the exclusion of women from leadership positions in land resource management within their community even though top-down state policies encourage gender parity in management. It argues that this inequality stems from interrelated cultural and social structures, such as the patriarchal structure of society, which create the necessary conditions for men to dominate women (Walby 1989). Quotas and parity policies coming from international donors do not guarantee that men and women have equal access to decision-making processes regarding natural resources management.

This study emphasizes the conflict between a more kin-based system of right to land versus the state based/international donor framework that dominates the current shift in land management in the context of climate change. Ethnographic evidence from Sondré-Est, a vast pastoral zone territory of 16,460 ha. in the Center-South region of Burkina Faso, reveals that despite their interest, women find themselves marginalized from land management initiatives at

the community level. This exclusion derives from a variety of factors tied to social, religious, and cultural influences. The management of natural resources and pastoral infrastructure in Soudré-Est has been heavily gendered, typically privileging work associated with men. This is ironic given the fact that women are increasingly performing tasks perceived as only for men, including cultivation.

The Burkina Faso government and the Soudré-Est Project –a sub-project of the Planned Settlement of the Volta Valleys (AVV) program– created the pastoral zone in the center-south region of the country in the 1970s in order to promote pastoralism and population resettlement. In the 1970s, major droughts, demographic pressures and a lack of arable land in Central and Northern Burkina Faso (formerly the Upper Volta) stimulated intensive migrations of people and livestock into more fertile southern river valleys, which were largely uninhabited because of the presence of the filarial worm *Onchocerca volvulus* near rivers and streams. This parasite transmits a disease known as onchocerciasis or river blindness. The AVV program eradicated onchocerciasis to encourage resettlement. As part of the state initiative to promote resettlement into the southern river valley, officials created the local umbrella management committee known as *Comité de Gestion* (COGES), whose purpose was to both manage and protect the pastoral resources in the resettlement zone. (add something here in general about gender quotas in state committees, women as members).

### **Regulating Land and Regulating Gender: Women and Land Resource Management in the Global South and in Burkina Faso**

Since the 1980s, the earlier emphasis on women as victims of environmental crises in academic scholarship and policy reform research and recommendations has shifted to viewing women as efficient environment managers (Braidotti *et al.* 1994). In various regions of the Global South, some researchers have studied important women's contributions to community

forestry management in India and Nepal (Agarwal 2001) and in the Green Belt movement in Africa (Maathai 2003). High numbers of women in decision-making structures for local forest management have correlated with greater forest regeneration in India, for example (Agarwal 2001). Cases from Latin America and East Africa demonstrate that complementary gender groups perform consistently better than non-complementary gender groups in all management functions of the forest (Mwangi *et al.* forthcoming, Sun *et al.* 2010). Yet, local social systems often exclude women even in instances when project guidelines deem their participation mandatory. Fortunately, NAPs are slowly integrating women as key stakeholders or participants (Ministère de l'Environnement et des Ressources Halieutiques du Burkina Faso 2015).

This study uses a feminist political ecology lens. Political ecology examines the relationships between social positions (e.g. ethnicity) and access to natural resources (e.g. land tenure) and the impact of these interactions on the environment at multiple spatial and temporal scales (Blaikie and Brookfield 1987). Feminist political ecology is a feminist perspective on political ecology that treats “gender as a critical variable in shaping resource access and control, interacting with class, caste, race, culture, and ethnicity to shape access processes of ecologically viable livelihoods, and the prospects of any community for sustainable development” (Rocheleau, Thomas-Slayter and Wangari 1996: 4). Gender is a “socially imposed division of the sexes. It is a product of the social relations of sexuality” (Rubin 1975:179). This definition of gender implies that who studies women also must study men since they exist in relation to each other. A gender analysis of pastoral resource management is pressing in time of climate change because different gender groups will differently experience the effects of climate change, with women bearing the most disastrous consequences (IPCC 2007; UNFPA and WEDO 2009).

In West Africa, scholars have overlooked Fulbé women's participation in resource management at the community level. Most studies on Fulbé herders have focused on intra-household dynamics because of the barrier to meeting and speaking with Fulbé women, who are typically 'invisible' in the public space. This research uses focus groups to overcome the barrier of speaking with Fulbé women who are less likely to participate in individual interviews. Previous studies are not entirely clear on whether or not women themselves perceive gender-based exclusion in development projects and desire a shift in the status quo, even when the projects include new incentives for women to participate. Research in the Brazilian Amazon, for example, found that women's inaction on this front was due to how the foundations of male domination are still present in these communities, so that women perceived certain activities such as timber exploitation as male activities. One seemingly minor example of this gendered roadblock is in the performance of gender through clothing (Porro and Stone 2005). The necessary safety gear for timber exploitation, including hard hats and protective clothing, was heavily coded as menswear in the Amazon, and women were so reluctant to don it that they opted out of the labor itself. This is applicable to rural areas in Africa where international development organizations' promotion of gender equality conflicts with how men and women perceive locally constructed concepts of gender and gender relations. One consequence is that women stay away from these development activities, while men manage resources and benefit from economic returns. The study presented here explores the disconnect between top-down policies pushing for more gender parity in resource management and patriarchal values and customs in rural communities. This research highlights how the historic avenues surrounding women's rights to land are changing in the current context of increasing state control over land



management. Plus, how do subsequent shifts in land management and climate change increase women's gender-based vulnerabilities?

Women are largely responsible for gathering water and firewood. Land management directly affects firewood and water (deforestation, water contamination, damming and diverting of water ways, digging wells, etc.). Women's lack of assets and poor access to and control of land reduce their access to these key resources. Furthermore, the threats of climate change, namely rainfall variability, increase their vulnerability (Fortmann and Rocheleau 1997; Tompkins and Adger 2004; Pérez *et al.* 2015). Women –as key land resources managers– need access to land as a prerequisite in their access and management of water and forest resources.

This author reviews the shift to women's formal rights to land during and after the political revolution of the late 1980s in Burkina Faso. It also exhibits how the State repositioned itself under Thomas Sankara's presidency as a regime conscientiously concerned with women's rights. This was perpetuated under Blaise Compaoré's tenure, and it was his administration that privatized land and instituted gender parity policies in land laws.

### **Political shifts in land management**

The government of Burkina Faso has adopted two major policies that influenced women's access to land and then their position in management. These are the Agrarian and Land tenure Reform (RAF) during the presidency of Thomas Sankara in 1984 and the *Gestion des Terroirs Villageois* (GTV) approach in the 1990s under Blaise Compaoré's regime (Marchal and Quesnel 1997; Matlon 1994 and Caulcy 2003). On the one hand, the RAF states that all land was property of the State and allocated more control of land to government officers over traditional leaders (Marchal and Quesnel 1997; Faure 1995). The presidency of Sankara (1983-1987), which was characterized by a Marxist Leninist political ideology, the State nationalized land, increased

spending on agriculture, and focused on economic self-sufficiency (Furth 1998). Sankara's tenure challenged the power of traditional leaders, advanced women's rights, and mobilized the masses to save the environment in times of political and environmental crises (Batterbury and Warren 2001). The increasing involvement of the State in rural land control has opened more opportunities for women to access land (Kevane and Gray 1999). On the other hand, the GTV approach involves national officer's transfer of control over resource management to local management committees (Batterbury 1998). Land management decisions under this approach are decentralized and no longer made exclusively by men.

The GTV committees include all groups present in the village, including customary village leaders and under-represented groups such as women, girls, young men, herders and migrants (Kevane and Gray 1999). In the study site, the government is testing COGES as a pilot project and as part of the country's GTV approach to development. Many describe COGES as an 'improved' version of the *Comité Villageois de Développement* (CVD). CVD is an administrative and centralized institution created by the government but led by local leaders under the supervision of the prefect (state representative)<sup>17</sup>. COGES moves beyond state management, introducing more independent and decentralized management of the zone by local leaders. Integrating women complies with the principles of the GTV approach. Yet, women are still under-represented COGES and there is no direct supervision from government officials to guarantee women participation on the ground.

The integration of women in resource access and decision-making processes was one of Sankara's major concerns. According to him, development is not possible without the freedom of women. Women's rights in the country were a result of a communist ideology. One of the

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<sup>17</sup> Officially, CVD remains, but it has been largely supplanted by COGES in pilot communities such as Sondré-Est.

tenets of this ideology states all are equal under the State. In his speech commemorating Women's Day on March 8, 1987, Sankara said it was the advent of private property that led to slavery and patriarchy. Private property allowed man to also become the owner of slaves, land and women (Sankara 1990). He saw accordingly the revolution he led as a process that would bring men and women to rethink social relations and eliminate the exploitative system sustaining gender inequalities.

Compaoré's regime overturned Sankara's Marxist policies and opened back to foreign aid. State policies were increasingly influenced by international policies like neoliberal structural adjustment programs (see Ferguson 2007). In 1991, Compaoré's government revised the 1984 RAF to encourage private land ownership. The newer RAF stated that farmers could obtain land titles following a simple administrative procedure (Faure 1995). Land ownership became based on purchasing power rather than gender. Even though women still lag behind men in terms of income and land ownership, the fact that ownership no longer officially depends on gender create hope and open access to land for women involved in income-generating activities.

In recent decades, national and international development projects have promoted the emancipation of women, especially as it regards access to land – an aspect that is vital to their livelihoods. International development institutions facilitate women's access to land when they request a specific gender quota or fund women's projects as a means of improving the management of natural resources, such as reforestation projects (Batterbury 1993).

Even though top-down approaches promote women's access to land, men and women still differently access land resources. The ethnographic data in Soudré-Est actually shows the short-comings of these policies in practice, as well as other local complications and entanglements that lead to women's lack of participation in decision making in COGES. In

Burkina Faso, the conflict between a more kin-based system of right to land versus the state based/international donor framework dominates the current shift in land management. This divergence and poor state supervision and follow-up after the launch of rural projects could explain why women are still missing or under-represented in rural management committees. This study argues that quotas and state policies seem to promote women's equal access, but there's actually very little political will or desire behind these initiatives. Thus, it is not only that one approach values women's participation and the other does not, it is that neither are actually really invested in changing social practice. This study retraces traditional and religious regulations that create and sustain patriarchy and hinder women's land access and their involvement in land resource management in Burkina Faso.

## **Methods**

This study collected data in the Soudré-Est Pastoral zone and its surroundings for 20 months. This study was part of the Local Governance and Adapting to Climate Change in Sub-Saharan Africa (LGACC) project. The International Livestock Research Institute and the World Agroforestry Center (ICRAF) led this project. The LGACC project examined the governance of pastoral resources in the pastoral zone as one of its objectives. The research team conducted a total of 43 semi-structured individual interviews (44 participants, including 40 men and 4 women participants), and 11 focus groups (220 participants, including 106 men and 114 women). The

study administered questions in the Mooré<sup>18</sup>, Fulfuldé<sup>19</sup> and French<sup>20</sup> languages. The researcher only conducted interviews in French with governmental and non-governmental officials.

The herders often consulted each other in Fulfuldé before answering back in Mooré. The herders appreciated discussing topics in their native language, but researchers identified no major differences in male responses during these meetings compared to those conducted in Mooré. The major difference was greater female participation, because women felt more comfortable speaking Fulfuldé. The field researcher only spoke French and Mooré; she did not understand Fulfuldé. One of the limitations of holding discussions in Fulfuldé may be the loss of details and key information during Fulfuldé to French interpretation/translation.

Different participation patterns of men and women in this study highlighted the absence of women from public debates involving men and regarding community resource management. Community leaders helped the research team in explaining the LGACC research project and in recruiting participants. In Fulbé communities, leaders have strong influence on their constituents. Thus, the team relied on them to stimulate greater participation. Even though the team emphasized gender equality as selection criteria, more men came to meetings than women. Women generally attended meetings that only targeted women. Overall, women participated most in focus group discussions when they were interviewed in groups rather than individually.

During individual interviews, they often called upon their husbands to answer questions for them. In contrast, women did not attend focus groups also attended by men to talk about the

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<sup>18</sup> Mossi native dialect.

<sup>19</sup> Fulbé native dialect.

<sup>20</sup> Official language of Burkina Faso.

zone's governance issues, especially COGES. Men gave excuses for the absence of women and provided explanations such as a lack of means of transportation and weather conditions (data was partly collected during the rainy season). These reasons alongside the involvement of men in the recruitment process of participants and the widespread perception that Fulbé women are 'shy' in the public sphere could have justified women's absence. However, this study delves deeper into systemic social, religious and cultural mechanisms to understand this absence.

### **Case study: Gendered management of resources in the Soudré-Est Pastoral Zone**

Created in 1983 as the extension of the Dutch-Burkinabe cooperation, the pastoral zone of Soudré-Est is located in the North-East of the Zoundwéogo province (See Figure 1). Its vegetation includes both savannah and gallery forest. The Zone is divided into four residential areas or 'sectors' with no clearly marked boundaries. Pastoralism is the major activity in Soudré-Est, with seasonal movements of cattle in and out of the pastoral zone during the dry season in a literal quest for greener pastures. Key resources in the pastoral zone include pastures, forest products and infrastructure such as dams, pumps and vaccination parks. Secondary activities include agriculture and the commercialization of livestock and dairy products at nearby markets.

Overall, the zone is ethnically homogenous because the State only invited Fulbé herders (the major ethnic herder group in the country) to come and settle in the area. These people settled in the different sectors based on their affinities. The autochthons of Soudré-Est's surrounding areas are the Mossi and Bissa (see Table 1). The territory was under the chief of Soudré's dominion, who donated it to the government to create the pastoral zone. The Zone is called Soudré-Est because of its location at the East of the Mossi village of Soudré. The AVV resettlement program and transhumance mechanisms have since brought in more Mossi, Yadsé

and Fulbé communities who live in Kaibo-Nord V2. These communities were not invited or allowed to settle in the zone because of the formal purpose of the zone as a herding area.

The borders of Sondré-Est are increasingly challenged and encroached (see Chapter 2). On the one hand, Mossi agriculturalists claim the pastoral zone's land, water and forest resources based on customary land tenure rights. On the other hand, other non-residents, and more precisely Fulbé herders from riparian villages, are making inroads into the zone with no clear entitlement claim other than their intent to take advantage of pastures. These non-resident herders share ethnic or kin ties with the zone's current residents, whose Fulbé culture prescribes that a Fulbé cannot refuse access to water and pasture to another Fulbé. This cultural element practically opens the zone up to any Fulbé interested in joining the current inhabitants. Therefore, the State introduced a local management committee known as *Comité de Gestion* (COGES) into Sondré-Est to help Fulbé herders efficiently manage their resources, especially in the times of rainfall variability and declining natural resources. COGES enforces the residents' rights over Sondré-Est and secure the space that is emerging as a realm of opportunity for them and their posterity.

Created in October 2015 as the only operational zone-wide management committee, COGES regulates the use of resources in the pastoral zone. In the pastoral zone, access to and allocation of resources depends on a user's residency status. Natural resources and infrastructure within the pastoral zone are solely reserved for herder residents. Exploitation of resources by both residents and outsiders requires fees paid to COGES. Men, who own far more cattle than women, use most of the pastoral resources (dams and vaccination parks) while women mainly use water pumps and forest products for household consumption. Residents pay annual membership per person, rather than per household. COGES leaders directly collect non-resident

fees at water points and vaccinations parks before the use of resources. Each sector has a COGES committee supporting individual residents and groups in managing resources at the sector level. The central COGES, which Figure 9 displays, has been settled out of the four COGES of the four sectors. COGES has a total of 24 leaders (6 per sector) who are democratically elected for a period of three years and can only serve two terms in a lifetime. They are assigned to work for the common interest of all community members.

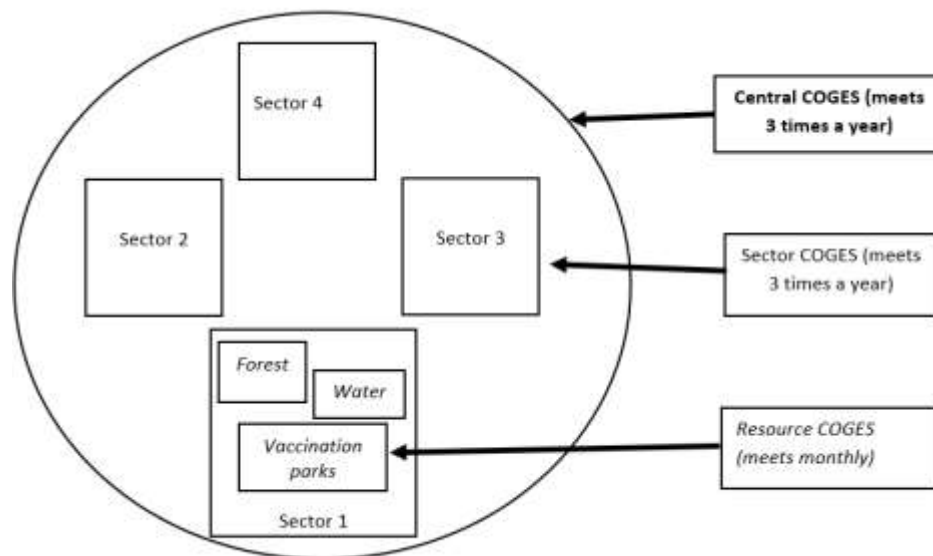


Figure 13: Schematic of COGES' decentralized structure.

Through COGES, the herders argue they have improved the management of local natural resources. First, when a resource is owned by a specific sector, money gained from its exploitation goes into the budget of that sector. When the budget of the central COGES is insufficient to cover infrastructure repairs, the extension agent generates a repair quote and forwards the matter to the ministry in charge of animal resources. Second, when riparian agriculturalists and foreign herders now enter the zone, they know they should first speak to COGES leaders to acquire permission to collect wood or use water points inside Sondré-Est. This system has decreased conflicts with outsiders, but inside the pastoral zone, there are unequal



power relations between men and women regarding how the population manages livelihood resources. However, even though women are against this gender discrimination and want to be part of land management, there were no observed tensions between men and women on this matter. During one of our focus groups with Fulbé women in Sondré-Est, one of them explained that “men think that being in the COGES committee is not a woman activity”–**FG, Sector 1, 05/23/ 2016**. Another woman added that “Protecting resources is crucial but we can’t do anything about it apart from paying COGES’ membership fees. We are not integrated into COGES management. If we were integrated into COGES we could help men tackle this issue.” **FG, Sector 1, 05/23/ 2016**. However, women of Sondré-Est have so far not taken any concrete action to change the status quo.

Historically, men have been more involved in resource governance than women, and mostly men attend COGES meetings. Overall, adult men –who are almost always the heads of households – and older residents are more familiar with COGES because they are entitled to care and make decisions for women and youth who depend on them. Men and women leaders who participate in COGES or other zone-related management committees possess more information about COGES than commoners. Women who are group members, especially leaders, know COGES better than those who are not in groups or those who simply everyday members of a group. Most female participants have heard of an institution that was recently created to manage resources in the pastoral zone, but few are even familiar with the name ‘COGES’ or know its basic functions.

The government required the election of at least two women per sector COGES and encouraged their participation in the Central COGES. However, in reality, only two women (one in Sector 1 and the other one in Sector 4) are members of their sectors’ COGES committees.

They hold positions (e.g. communication officer) that are less coveted by men. Since the launching of the COGES project in 2015, state representatives have not attended COGES meetings to find out if gender parity is respected on the ground. This failure on the part of state representatives to attend a COGES meeting is a great example of the lack of top-down political will that the author suggests in this chapter.

The two women who are part of the COGES bureau in their sectors have distinctive and unusual backgrounds. This has allowed them to occupy leadership positions, unlike other women in their communities. One of them is a young and literate Mossi woman who married the former CVD president of the zone, while the other woman is older and influential in her community by virtue of local connections. Differences of ethnicity and age could explain why these women are more outspoken and have had greater chances to integrate into their Sectors' COGES compared to mid-age and younger Fulbé women. Though these two women are well-respected in their respective sectors and eligible, male leaders did not allow them to sit in the central COGES committee, where decision-making regarding the zone is centralized<sup>21</sup>. State policies promote women access to land and their participation in the management of land resources, but these top-down policies clash with the locally and culturally accepted concepts of gender. These local concepts do not perceive the public sphere as a space for women. The perception of what women's space ought to be and the dismissal of women as resource managers results from cultural and religious prescriptions that reinforce the domination of women at the hands of men. The next sections explore this contrast.

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<sup>21</sup> One of the women (the oldest one) was sick on election day. The other one attended but men refused her candidacy.

## **Customary and religious norms**

In Burkina Faso, cultural norms dictate that only traditional leaders and ‘chefs de terre’ (land chiefs) are entitled to make land tenure decisions. According to these norms, land belongs to clans or village communities that men lead. Natural resources management – linked to land tenure rights – is therefore also gendered. In most of Burkina Faso’s ethnic groups, women do not inherit land, but rather they borrow it from male relatives and husbands are informed (Stamm *et al.* 2003). Kevane and Gray (1999) highlight a Mossi proverb from Burkina Faso stating that women create their fields at night. This means that household bargaining is conducted in the private space of households at night between husband and wife (and co-wives to some extent). In this way, dealings in the private space influence women’s access to land and labor. Women must bargain with men who are the only people entitled to own (and therefore deal in and operate) land (Kevane and Gray 1999). Here, women’s rights to farm a plot of land is determined by marital or kinship status with men as mothers, sisters, wives, or daughters. As land becomes scarce, women’s rights to use it weakens as men are given priority (Kevane and Gray 1999).

In Burkina Faso, where the majority of the population is Muslim, the mixture of all these patriarchal norms with Islamic beliefs has shaped women’s positions in society. Fulbé herders who are mainly Muslim are bound to Islamic doctrines and practices (VerEcke 1989). There are contrasting views between traditionalists and reformists on women’s status in Islamic societies because of the different interpretations of the Quranic injunctions (Kusha 1990). The traditionalists –composed of men who define the status of women – promote patriarchy as seen in customary laws. This view prescribes that women be submissive to their husbands and that their esteem results from their womanliness, symbolized by their domestic competence, servitude and obedience (VerEcke 1989). This together compose their primary role in the Fulbé

community. In this view, women share their husband's status and honor which increases through age, honesty, knowledge, cattle ownership and generosity. In contrast, reformists –consisting of educated contemporary Muslim women– argue for the liberation of women (Kusha 1990). While the traditionalist view fits the context in the study area, top-down state policies that promote gender parity reflect the reformist views.

In Sondré-Est, women understandably have issues voicing their needs in public settings. Rural literacy levels (Burge and Haughey 2002) favor men over women and reduce women's power and participation in community management and decision-making processes. Owing to their status and literacy, men are the interlocutors with external organizations and play the role of gatekeepers for women. Most external organizations promoting agricultural and pastoral services and natural resource automatically management assistance target men. They mainly target women for health, education, nutrition and family planning issues. Even when they do so, men still play the role of intermediaries. Some have interpreted male mediation as harmless by assuming that helping men is the same as helping women because all resources are shared between men and women in the household (Pérez *et al.* 2015). However, households have diverse and even contradictory goals based on their members and one cannot assume that individual choices are mindful of the entire household's goals (Goldstein and Udry 2004). Women's restricted access to these organizations and to the political sphere implies their specific needs are less likely to be heard; there are resulting consequences to their adaptive capacity (Brooks *et al.* 2005).

### **Conclusion: Top-down policies versus cultural and religious prescriptions**

Responses to the effects of climate change have caused changes to the existing social order. Responses such as the migration of men have increased women's workload and leadership

in household decision-making and their ability to command leverage. However, this has not yet translated to how women are represented in community resource management leadership and decision-making. Women are typically perceived as viable and efficient decision-makers at the household level, but not at the community level. In Fulbé communities, this is owed to ethnic and religious prescriptions. Islam is a highly gendered religion with clear prescriptions about gender roles. To be viewed and respected as a good mother, wife and daughter revolves around women's performance within their household, but it has nothing to do with women's formal leadership roles in the public sphere. In this community, there is a clash between the public sphere where men are more 'visible', and the private sphere, which is viewed as women's space. This could explain the dismissal of women from participation in community land management debates.

This study has shown a disconnect between state policies and customary values. Even though the State and international organizations promote laws and policies that aim for gender parity, the last word on whether these laws come into effect on the ground belongs to local community decision makers. The case study of COGES shows that rights-based frameworks are insufficient to promote gender parity because they typically do not translate to local practice, especially in rural areas where customary laws and values regulate gender relations above and beyond any formal laws and policies. In this process, top-down State laws instrumentalize women and local organizations focus on them to fulfill gender quotas to comply with donors' requirements. Government officials are more preoccupied with checking boxes to fill in administrative paperwork than actual project implementation and meetings in targeted communities. The result is that few do much work to confront reality on the ground. There is no binary resistance to what the State says about gender parity in resource management. Local

organizations create a bureaucratic fiction in which they argue that they will do what the State requires to benefit from opportunities.

This study questions the State's interest in promoting gender equity. It is apparent that the State uses gender parity as a mechanism to fulfill donor requirements. Since this parity does not translate in practice, customary laws may be considered to be stronger than top-down State laws. The importance of this study lays in the fact that it questions the State's ability to regulate its constituents at the local level. The existence of quotas and parity policies does not ensure that men and women have equal access to decision-making processes. On paper, both the State and local communities create a local fiction. The author has experienced this fiction based on fieldwork and the case studied here. These parties say what they will do, but in reality, they do not do it because of their cultural and religious values regarding men and women's roles in society. The result is that women rely more on internal village groups, such as women's associations, to cope with, manage or adapt to stress in their daily lives. These local and female support groups open women's access to food, labor and cash and sooth productive and reproductive responsibilities, at the same time allocating them recognition as leaders in their communities.

## **CHAPTER 5 – GENERAL CONCLUSION**

### **Findings Summary**

Anthropologists have played key roles in both farmer-herder studies and climate change research. This dissertation examined present-day farmer-herder relations during climate change in three different but connected papers. Recent studies predict that the disruption of the agricultural and pastoral calendars will increase the overlap of farmer-herder activities and the frequency and intensity of their conflicts. Most ethnographic studies have either documented farmer-herder conflicts or ‘symbiosis’ in the Sahel and made comparisons among distant communities. This study added to this knowledge by examining both conflictual land use relations and cooperative adaptation relations among and within farmer-herder households living next to each other. This anthropological study will help policy makers and development and research institutions to:

- 1) Identify conflict hot spots to better understand and address land-use conflicts.
- 2) Document cooperative relationships to better reinforce them.
- 3) Understand within-group differences.

This dissertation uses political ecology to examine the relationship between social positions (e.g. ethnicity, main livelihood system and gender) and people’s access to resources and the impact of this relationship on the environment at multiple spatial and temporal scales. The main author created maps to look at LULC changes and map conflict hot spots in and outside the pastoral zone of Soudré-Est from 1975 to 2013. Using a political ecology framework to understand patterns on these maps, the first author found that LULC changes differ inside and outside Soudré-Est and that these changes followed historic political, ecological and social

events (e.g. major droughts, land tenure reforms, the creation of AVV villages and Sondré-Est) and were subsequent to external influences (e.g. AVV development program, subsidies) in the history of the area. From 1975 to 2013, results show that the conversion of savanna into agricultural land has dramatically increased in surrounding farming villages compared to very few changes in the pastoral zone. These LULC changes result from different livelihood strategies observed inside and outside Sondré-Est. In this process, differentiated access to resources inside Sondré-Est explain conflicts. While some social groups have wide or moderate access to adaptation resources, other groups have poorer access.

In the study site, access to resources depends on geographical location, more precisely one's place of residence (inside or outside the borders of the pastoral zone), residence status (migrants versus autochthons) and gender (men have better access to land resources and external subsidies than women). Residence status is closely intertwined with main livelihood strategy as the residents of Sondré-Est are primarily herders while their neighbors are farmers. Residence status and livelihood characteristics, which in return depend on ethnicity, regulate who has access to grasslands and development interventions in and out of Sondré-Est. The pastoral zone can be identified as an ethnic boundary within which people practice similar livelihood strategies and share resources equally. In times of climate change, as resources within this boundary are threatened, COGES –a local management committee– maintains the borders of the pastoral zone to defend the interest of the Fulbé while restricting other ethnic groups – especially the Mossi who claim tenure of the pastoral zone– from accessing resources. Conflict hot spots correspond to places where livelihood systems overlap (e.g. agricultural land encroaches on grazing areas along the borders of Sondré-Est or on key water points).



The integration of spatial analysis with local accounts offers an important contribution to multidisciplinary research and a significant methodological contribution to political ecology. The 2-km coarse resolution of the BF-WALULCTS dataset might exaggerate LULC changes displayed on the maps. Nonetheless, these maps highlight the overall temporal and spatial changes in the area, namely the savanna conversion into agricultural land over the course of time. The understanding of these trends will raise awareness on the changing LULC trends in the southern regions of the country, especially in the midst of land use tensions. This study has implications for other areas of Burkina Faso and in Africa in general, anywhere farmers and herders fight for land in the absence of reliable maps or clear delineation.

This dissertation research is part of a larger interdisciplinary team project. As an anthropologist, the main author has documented climate adaptation from a fine-grained emic perspective. The first author moved beyond documenting farmer-herder conflicts toward also exploring contemporary cooperation between and within these groups. As such, this research is an important contribution to the literature on farmer-herder in times of climate adaptation in the Sahel. The first author has emphasized that the peaceful cooperation among people from diverse ethnic and gender is crucial for climate adaptation. Fieldwork in Sondré-Est has shown that, amidst land use tensions, farmers and herders – and men and women within these communities – develop ways to cooperate. Simply put: they are aware that as they live near/with each other, they “must learn to live together.”

Herders and farmers in the area have been exchanging resources (e.g. farming or herding techniques, equipment) regardless of borders and ethnicity in order to efficiently converge to agro-pastoralism. Though resource exchange does not completely eliminate conflicts, it increases collaboration and interdependence among farmers and herders at community level and men and

women at household level. In this process, men are the main actors because of their better access to adaptation resources. This dissertation also examined the role of women in household adaptation. It found that men and women play complementary roles in household survival, but women are poorly represented in community resource management because of their poor access to land. The first author, by examining resource access and the different involvement of social groups in management, will help improve development interventions aiming to provide for and build the capacity of disadvantaged groups in the times of climate adaptation.

The poor participation of Mossi farmers and women in individual interviews is perhaps the most significant limitation of this dissertation research. The study presented here is part of the LGACC project, which focuses on studying the herders of Soudré-Est. The team conducted informal discussions with the farmers of Kaïbo-Nord V2 and Soudré, but there were no formal individual interviews there because of the focus of the LGACC project on Soudré-Est. Among the Fulbé, Muslim norms of female behavior and deference prevented the team from speaking to women individually. This happened because the research assistant at hand was a male and the main researcher –who is a female– belonged to another ethnic group and spoke a different dialect without enough competency in Fulfuldé to speak with Fulani women. Another factor was that the participant recruitment strategy in this study relied heavily on the Zone's leaders to motivate participation. While this strategy increased trust and guaranteed participation, all participants belonged to the same network, thereby omitting people outside this network – this reveals another limitation of the sample. This study has highlighted these major limitations so that future anthropological and ecological studies are on better footing to address them as work continues to delve deeper into farmer-herder adaptation in the study region.

This research contributes to the literature on climate adaptation in the southern regions of Burkina Faso which have been poorly documented. This study shed light on Sondré-Est, which is a remote pastoral zone, facing the challenges of climate change but omitted by research institutions. This is translated in the low number of previous studies on the area. While Sondré-Est was a prosperous economic zone under the AVV program and the Sondré-Est project, it has lost most of its glory throughout the years. At the same time, development projects and research institutes became less interested in the area because security concerns in the region and the poor conditions of the roads, especially in the rainy season, hinder access to the Zone. The main author has found ways to mitigate these barriers and spent 20 months collecting data in the area. This will also better inform national adaptation policies and research institutes such as ILRI and ICRAF as they look for solutions to the livelihoods of herders and farmers alike.

*Identifying conflict hot spots and addressing land-use conflicts*

The first paper in this dissertation examined the nature of farmer-herder conflicts and where they occur. It suggested that land use tensions are context-specific. Creating a LULC map of Sondré-Est has helped the main researcher identify such contentious areas (e.g. encroaching agricultural fields along the borders of the pastoral zone with Sondré Village and Kaïbo-Nord V2). Findings showed that conflicts occur in very particular places along the border where key resources, such as water, are located. These places corresponded to areas where land use practices intersect – specifically in savanna and forested areas that farmers clear to create new farms and that herders preserve to secure pasture lands. This also happened near water points where farmers create gardens and herders take their livestock to graze and water. This study suggests that the ambiguous borders and the absence of maps fuel land-use conflicts. Thus, the researcher has integrated ethnography with GIS to re-create the boundaries of Sondré-Est using

diverse GIS data sources from 1975 to 2013. The map of pastoral zone and its surroundings has helped contextualize border conflicts resulting from LULC changes inside and outside the pastoral zone over time. Narratives alone would not have shed light on the patterns among conflict hot spots as it displayed on the maps. Contextualizing land use conflict areas can help policy-makers better address them with clearly demarcated signposts and maps. The maps created for this study are only for analytical purposes, but political maps created together by the government and local communities –though challenging to create or re-create – can be beneficial in clarifying boundaries and mitigating conflicts.

This first paper, inspired by political ecology, argued that LULC changes, enclosure, and encroachment in particular locations explain many of the border tensions in Soudré-Est. This study shed light on external social, economic, political and ecological factors that have influenced local land use in space and time. In the study site, this is the case of development interventions such as the AVV resettlement program and the Soudré-Est project, funded by international organizations and promoted by the government. These interventions did not predict that demographic pressure following massive migrations in formerly lowly populated valleys would lead to the enclosure of farming and pastoral areas and dramatic LULC changes in AVV villages outside of Soudré-Est a few decades after resettlement. This enclosure exacerbates border tensions, especially in areas where there is perceived encroachment, but no map to regulate land use. Indeed, differentiated access to resources in Soudré-Est exacerbates conflicts between herders and farmers who are struggling to secure their livelihoods as land resources become scarce in the area. This situation is even more crucial for farmers who rely on mobility but can no more extend their fields South of the pastoral zone because of demographic

pressure and land scarcity. They have a false notion of unused land in Sondré-Est where there are very few agricultural lands.

In addition, at the creation of the zone, sociological or anthropological studies were not conducted to examine and predict the impact of settling one ethnic group (Fulbé pastoralists) on another ethnic group's customary land (Mossi agriculturalists). As the borders issue is becoming more and more problematic, the major question is whether or not it is more efficient to have a homogenous group within a pastoral enclave. In Burkina Faso, the Fulbé are not the only ethnic group involved in pastoralism. The Tuareg are also pastoralists but they have different herding practices based on their ethnicity. Thus, focusing on one specific ethnic group involved in pastoralism could be easier for extension agents as they would be working with people who have similar herding practices. Similarly, mixing traditional herders and agriculturalists into a pastoral enclave would have been more challenging as these two livelihood groups have a history of conflictual contacts during the rainy season when livestock enter agricultural fields. Ethnic and livelihood diversities could have stimulated conflicts inside the zone as the agriculturalists – especially the Mossi – could have later wanted to dominate the Fulbé inside the zone as they would claim their ancestral land. Here, someone else could contradict that the conflicts around the borders of the zone can be explained by this ethnic divide. One would argue that if other ethnic groups, more specifically the Mossi, were allowed to settle in the zone, these borders would be more porous and the residents would not be talking about borders with neighboring villages as they would share analogous identities.

Similar resettlement projects can learn from the limitations of these past projects (e.g. the resettlement of herders near farming villages, the unclear status of land tenure in pastoral zones and the ambiguous borders between the pastoral zone and farming villages) order to minimize

border tensions, especially in the times of climate change. This study showed that life in the study area did not only revolve around conflicts; they were also instances of symbiosis. The next paper addressed this complementarity between farmers and herders.

*Documenting cooperative relationships and reinforcing them*

The second paper looked at the nature of farmer-herder cooperation as both groups converge toward agro-pastoralism. The researcher emphasized that, on the ground, farmers and herders rely on each other for their adaptation even though they claim that they do not. Social position determines access to specific livelihood resources. Though both farmers and herders in the study site show a great sign of dependence on external assistance as they struggle to sustain their livelihoods, farmer and herders also rely on each other. In this relationship, they maximize access to diverse resources because of their differences in ethnicity and livelihoods. Therefore, rather than looking at farmers and herders as two distinct and antagonistic communities based on the border tensions, the first author of this study highlighted farmer-herder complementarity as both groups converge toward mixed crop-livestock systems. Farmers and herders cooperate as they begin to share greater common interests, considering that these common interests generate production-related relationships. These groups therefore exchange labor, technical and material resources to strengthen their adaptive capacity to social, economic, ecological and political changes in their area.

Adapting to similar climatic stresses in variable ways reduces competition as they employ different resources. For instance, Mossi livestock husbandry targets capital accumulation, whereas Fulbé fodder cropping seeks to feed cattle and by the same token increase prestige, which is closely intertwined with cattle ownership. The Mossi tie and stall-feed their cattle for the purposes of animal traction, compost, and sale while practicing intensive agriculture of

various crops on large fields. In contrast, Fulbé cattle roam freely in the bush for pasture. They supplement natural grass with cultivated grass and specific dual-purpose crops grown on fields that are much smaller than Mossi fields.

Even though women play crucial roles in household adaptation, they remain excluded from community decision-making processes despite top-down policies and gender quotas encouraging their participation. The first two papers considered gender relations in household adaptation, but without properly addressing gender relations in overall community management. The third paper addresses this question, but at the community level.

#### *Understanding within-group differences*

The third paper assessed gender differences in land resource management and the causes of rural women's exclusion. It found that the exclusion of women from community land management results from interrelated cultural, religious and social structures, among them pervasive patriarchy and Islam. This paper concluded that the existence of quotas and parity policies coming from international donors does not guarantee that men and women have equal access to decision-making processes regarding land resources management. These policies are federal in nature and therefore technically above and beyond community organization. This paper uses the case of gender parity policies and their non-respect in COGES – a community organization purely led by Fulbé men – to illustrate this situation. The divide between these top-down state policies (that aim for gender parity) and local values lead to an exclusion of women from activities culturally-perceived as male (e.g. land management). The result may be a failing of the policies and the authority of the government, rather than obstinance of the local organization. Through this study, the first author questioned the State's ability to promote gender parity in rural areas, at the same time shedding light on underlying traditional and religious rules

restricting gender parity in rural community management in Burkina Faso. The State will gain not only by providing more resources to local organizations to directly implement adaptation projects, but also by directly working with these organizations on the ground to understand and guarantee the participation of all community members, including women.



## REFERENCES

- Adriansen, H.  
2006 Continuity and change in pastoral livelihoods of Senegalese Fulani. *Agriculture and Human Values* 23(2): 215-229.
- Agrawal, A.  
2008 "The role of local institutions in adaptation to climate change. Paper prepared for the Social Dimensions of Climate Change", Social Development Department, The World Bank, Washington DC, March 5-6, 2008.
- Barrett, C., T. Reardon, and P. Webb  
2001 Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Food Policy* 26 (4):315-331.
- Bassett, T.  
1994 Hired herders and herd management in Fulani pastoralism (Northern Côte d'Ivoire). *Cahiers d'Études Africaines* 34: 147-73.
- Bassett, T.  
1988 The political ecology of peasant-herder conflicts in the northern Ivory Coast. *Annals of the Association of American Geographers* 78:453-72.
- Bassett, T. and M. Turner  
2006 Sudden shift or migratory drift? Fulbé herd movements to the Sudano-Guinean region of West Africa. *Human Ecology* 35 (1): 33-49.
- Batterbury, S.  
1998 Local environmental management, land degradation and the 'gestion des terroirs' approach in West Africa: policies and pitfalls. *Journal of International Development* 10(7):871-898.
- Batterbury, S. and A. Warren  
2001 The African Sahel 25 years after the great drought: assessing progress and moving towards new agendas and approaches. *Global Environmental Change* 11 (1): 1-8
- Bauer, K.  
2009 On the politics and the possibilities of participatory mapping and GIS: using spatial technologies to study common property and land use change among pastoralists in Central Tibet. *Cultural Geographies* 16(2):229-252.
- Bauer, K.  
2006 Common property and power: insights from a spatial analysis of historical and contemporary pasture boundaries among pastoralists in central Tibet. *Journal of Political Ecology* 13: 24-47.

- Behnke, R.  
1985 Open-range Management and Property Rights in Pastoral Africa: A Case of Spontaneous Range Enclosure in South Darfur, Sudan. London: Overseas Development Institute.
- Benjaminsen, T. and B. Ba  
2009 Farmer–herder conflicts, pastoral marginalisation and corruption: a case study from the inland Niger delta of Mali. *The Geographical Journal* 175(1): 71-81.
- Blaikie, P. and H. Brookfield  
1987 *Land Degradation and Society*. New York: Methuen&Co.
- Bleiberg, F., T. Brun, S. Goihman, E. Gouba  
1980 Duration of activities and energy expenditure of female farmers in dry and rainy seasons in Upper-Volta. *British Journal of Nutrition* 43(1):71-82.
- Boone, R.  
2007 Effects of fragmentation on cattle in African savannas under variable precipitation. *Landscape Ecology* 22(9):1355-1369.
- Braidotti, R., E. Charkiewicz, S. Hausler and S. Wieringa  
1994 *Women, the Environment and Sustainable Development: Towards a Theoretical Synthesis*. London: Zed Books.
- Breusers, M.  
2013 Mossi-Fulbé borderlands: towards a history of interconnectedness. *Borderlands and Frontiers in Africa*. Münster: LIT Verlag: 55-89.  
—  
1999 *On the Move: Mobility, Land Use and Livelihood Practices on the Central Plateau in Burkina Faso*. Münster: LIT Verlag.
- Breusers, M., S. Nederlof, and T. Van Rheenen  
1998 Conflict or symbiosis? Disentangling farmer-herdsman relations: the Mossi and Fulbé of the Central Plateau, Burkina Faso. *The Journal of Modern African Studies* 36 (3):357-380.
- Brockhaus, M., B. Rischkowsky, E. Nuppenau, and J. Steinbach  
2003 “The role of the State in the management of farmer herder conflicts in South West Burkina Faso.” In *Deutscher Tropentag*, University of Goettingen.
- Brockington, D.  
2001 Women's income and the livelihood strategies of dispossessed pastoralists near the Mkomazi Game Reserve, Tanzania. *Human Ecology* 29(3):307-338.

- Brooks, N., W. Adger, and P. Kelly  
2005. The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation. *Global Environmental Change* 15(2): 151-163.
- Brown, G. and C. Raymond  
2014 Methods for identifying land use conflict potential using participatory mapping. *Landscape and Urban Planning* 122:196-208.
- Bryan, J.  
2011 Walking the line: Participatory mapping, indigenous rights, and neoliberalism. *Geoforum* 42(1):40-50.
- Burge, E. and M. Haughey  
2002 *Using Learning Technologies: International Perspectives on Practice*. London: Routledge.
- Cabot, C.  
2017 "Climate change and farmer–herder conflicts in West Africa." Pp 11-44 in *Climate Change, Security Risks and Conflict Reduction in Africa. Hexagon Series on Human and Environmental Security and Peace* (12). Berlin, Heidelberg: Springer-Verlag.
- Cordell, D., J. Gregory, and V. Piché  
1996 *Hoe and Wage: A Social History of a Circular Migration System in West Africa*. Boulder, CO: Westview Press.
- Cotillon, S.  
2017, West Africa land use and land cover time series: U.S. Geological Survey Fact Sheet 2017–3004, 4 p., <https://doi.org/10.3133/fs20173004>.
- Crane, T., C. Roncoli, and G. Hoogenboom  
2011 Adaptation to climate change and climate variability: The importance of understanding agriculture as performance. *NJAS-Wageningen Journal of Life Sciences* 57(3-4):179-185.
- Cunningham, H. and Heyman, J.  
2004 Introduction: mobilities and enclosures at borders', *Identities: Global Studies in Culture and Power* 11(3): 289-302.
- Dafinger, A. and M. Pelican  
2006 Sharing or dividing the land? Land rights and farmer-herder relations in Burkina Faso and Northwest Cameroon. *Canadian Journal of African Studies* 40(1): 127-151.
- Dankelman, I. and J. Davidson  
1988 *Women and the Environment in the Third World: Alliance for the Future*. London: Earthscan.

- De Bruijn, M. and H. Van Dijk  
2003 Changing population mobility in West Africa: Fulbé pastoralists in central and south Mali. *African Affairs* 102(407): 285-307.
- 1999 Insecurity and pastoral development in the Sahel. *Development and Change* 30(1):115-139.
- De St Croix, F.  
1972 *The Fulani of Northern Nigeria: Some General Notes*. Hants, England: Gregg International Publishing Limited.
- Diallo, Y.  
2001 *Conflict, Cooperation and Integration: a West African Example (Côte d'Ivoire)*, Working Papers 22. Halle/Saale: Max Planck Institute for Social Anthropology.
- Dianda, N.  
1981 *Contribution à l'Etude des Paramètres Zootechniques de l'Elevage Traditionnel Ovin dans le Bloc Pastoral de Sondré-Est*. Thesis, Autorité des Aménagements des Vallées de la Volta.
- Djouidi, H. and M. Brockhaus  
2011 Is adaptation to climate change gender neutral? Lessons from communities dependent on livestock and forests in northern Mali. *International Forestry Review* 13(2):123-135.
- Dong, B. and R. Sutton  
2015 Dominant role of greenhouse-gas forcing in the recovery of Sahel rainfall. *Nature Climate Change* 5 (8): 757.
- Dossa, L., M. Sangaré, A. Buerkert, and E. Schlecht  
2015 Intra-urban and peri-urban differences in cattle farming systems of Burkina Faso. *Land Use Policy* 48: 401-411.
- Ejigu, M.  
2009 "Environmental scarcity, insecurity and conflict: the cases of Uganda, Rwanda, Ethiopia and Burundi." Pp 885-895 in *Facing Global Environmental Change*, edited by H. Brauch, U. Oswald Spring, J. Grin, C. Mesjasz, P. Kimeri-Mbote, N. Behera, B. Chourou, H. Krummenacher. Berlin: Springer Berlin Heidelberg.
- Faure, A.  
1995 *Private Land Ownership in Rural Burkina Faso*. Drylands Issue Paper 59. London: International Institute for Environment and Development (IIED).
- Fortmann, L. and D. Rocheleau

- 1997 "Women and agroforestry: four myths and three case studies." Pp 193-211 in *Women Working in the Environment*, edited by C. Sachs. Washington, DC: Taylor & Francis Edition.
- Furth, R.  
1998 Burkina Faso Country Profile: Country Profiles of Land Tenure, Africa, 1996, Research Paper 130. Madison, WI: University of Wisconsin-Madison Land Tenure Center.
- Giannini, A., M. Biasutti, and M. Verstraete  
2008 A climate model-based review of drought in the Sahel: desertification, the re-greening and climate change. *Global and Planetary Change* 64(3-4):119-128.
- Grandia, L.  
2012 *Enclosed: Conservation, Cattle, and Commerce Among the Qeqchi Maya Lowlanders*. Seattle, WA: University of Washington Press.
- Goldstein, M. and C. Udry  
2004 "Gender, Power and Agricultural Investment in Ghana." Manuscript. London, UK: London School of Economics; New Haven, CT: Yale University.
- Greenberg, J. and T. Park  
1994 Political ecology. *Journal of Political Ecology* 1:1-12.
- Herrmann, S., A. Anyambab, and C. Tucker  
2005 Recent trends in vegetation dynamics in the African Sahel and their relationship to climate. *Global Environmental Change* 15 (4):394-404.
- Hampshire, K.  
2006 Flexibility in domestic organization and seasonal migration among the Fulani of northern Burkina Faso. *Africa* 76(3): 402-426.
- Hodgson, D.  
2000 "Gender, culture & myth of the patriarchal pastoralist." Pp 1-28 in *Rethinking Pastoralism in Africa*, edited by D. Hodgson. London: James Currey.
- Howorth, C. and P. O'Keefe  
1999 Farmers do it better: local management of change in southern Burkina Faso. *Land Degradation & Development* 10(2): 93-109.
- Hulme, M.  
2001 Climatic perspectives on Sahelian desiccation: 1973-1998. *Global Environmental Change* 11(1): 19-29.
- Institut Géographique du Burkina Faso (IGB)  
2015 Document de Spécifications Externes de Contenu de la Base Nationale de Données Topographiques (BNDT), Version 1.0. Paris: IGN France International.

- Institut National de la Statistique et de la Démographie (INSD)  
 2009 Recensement Général de la Population et de l'Habitation (RGPH) de 2006  
 —  
 2000 Analyse des Résultats du Recensement Général de la Population et de l'Habitation de 1996
- Izard, M.  
 1970 Introduction à l'Histoire des Royaumes Mossi. Tomes 1 et 2. Recherches Voltaïques 12-13. Paris: CNRS-CVRS.
- Jones, L. and E. Boyd  
 2011 Exploring social barriers to adaptation: insights from Western Nepal. *Global Environmental Change* 21(4):1262-1274.
- Kevane, M., and L. Gray  
 1999 A Woman's field is made at night: gendered land rights and norms in Burkina Faso. *Feminist Economics* 5(3):26.
- Kevane, M. and B. Wydick  
 2001 Social norms and the time allocation of women's labor in Burkina Faso. *Review of Development Economics* 5(1):119-129.
- Klare, M.  
 2001 The new geography of conflict. *Foreign Affairs* 80 (3): 49-61.
- Kusha, H.  
 1990. Minority status of women in Islam: A debate between traditional and modern Islam. *Institute of Muslim Minority Affairs. Journal* 11(1): 58-72.
- Leung, A. and D. Cohen  
 2011 Within-and between-culture variation: individual differences and the cultural logics of honor, face, and dignity cultures. *Journal of Personality and Social Psychology* 100(3): 507:526.
- Lindsay, L.  
 2007 "Working with gender: the emergence of the 'male breadwinner' in colonial southwestern Nigeria." Pp 241-252 in *Africa After Gender?*, edited by C. Cole, T. Manuh, and S. Miescher. Bloomington, IN: Indiana University Press
- Maathai, W.  
 2003 *The Green Belt Movement: Sharing the Approach and the Experience*. New York, NY: Lantern Books.
- Marchal, J.  
 1983 *La Dynamique d'un Espace Rural Soudano-Sahélien*. Paris: ORSTOM.

- Marchal, J.Y., et A. Quesnel  
1997 "Dans les vallées du Burkina Faso, l'installation de la mobilité." Pp 595-614 in La Ruralité dans les Pays du Sud à la Fin du XXe Siècle, edited by J. Gastellu and J. Marchal. Paris: Orstom.
- McCauley, J.  
2003 Plowing ahead: The effects of agricultural mechanization on land tenure in Burkina Faso. Journal of Public and International Affairs 14: 1-27.
- McMillan, D.  
1995 Sahel Visions: Planned Settlement and River Blindness Control in Burkina Faso. Tucson, AZ: The University of Arizona Press.
- McMillan, D., J-B. Nana, and K. Savadogo  
1992 "Adaptation of rapid assessment procedures (RAP) to monitoring settlement trends in areas covered by successful disease control programmes: Onchocerciasis." In RAP (Rapid Assessment Procedures): Qualitative Methodologies for Planning and Evaluation of Health Related Programmes, edited by N. Scrimshaw and G. Gleason. Boston, MA: International Nutrition Foundation for Developing Countries (INFDC).
- Mertz, O., C. Mbow, A. Reenberg, A. Diouf  
2009 Farmers' perceptions of climate change and agricultural adaptation strategies in rural Sahel. Environmental Management 43(5):804-816.
- Mies, M.  
1986 Patriarchy and Accumulation on a World Scale: Women in the International Division of Labor. London: Zed Books.
- Ministère de l'Environnement et du Cadre de Vie du Burkina Faso (MECV-BF)  
2017 Programme d'Action National d'Adaptation à la Variabilité et aux Changements Climatiques.
- Ministère de l'Environnement et des Ressources Halieutiques du Burkina Faso (MERH-BF)  
2015 Plan National d'Adaptation aux Changements Climatiques (PNA) du Burkina Faso.
- Ministère des Ressources Animales du Burkina Faso (MRA-BF)  
2006 Arrêté N°2006/ 10/ PRES/PM/MRA, portant Approbation du Cahier des Charges Spécifique de la Zone Pastorale de Sondré-Est.
- Mohanty, C.  
2003 Feminism Without Borders: Decolonizing Theory, Practicing Solidarity. Durham, NC: Duke University Press.
- Moritz, M.

2006 Changing contexts and dynamics of farmer-herder conflicts across West Africa. *Canadian Journal of African Studies* 40(1): 1-40.

—  
2010 Understanding herder-farmer conflicts in West Africa: Outline of a processual approach. *Human Organization* 69(2):138-148.

Mortimore, M.

2010 Adapting to drought in the Sahel: lessons for climate change. *Wiley Interdisciplinary Reviews: Climate Change* 1 (1):134-143.

Nébié, E.

2016 "Social differentiation in adaptive capacity: analyzing climate adaptation as social practice in the pastoral zone of Sondré-Est." International Livestock Research Institute Report to the LGACC Project. International Livestock Research Institute and World Agroforestry Center.

Nébié, E., B. Somé, and P. Yogo

2016 "The pastoral zone of Sondré-Est, Burkina Faso: initial system analysis." International Livestock Research Institute Initial Report to the Local Governance and Adapting to Climate Change in Sub-Saharan Africa Project (LGACC). International Livestock Research Institute and World Agroforestry Center.

Nébié, E. and P. Yogo

2016 "Exploring three climate adaptation strategies in the pastoral zone of Sondré-Est." International Livestock Research Institute Report to the LGACC Project. International Livestock Research Institute and World Agroforestry Center.

Nébié, O.

2005 *Expérience de Peuplement et Stratégies de Développement dans la Vallée du Nakambé, Burkina Faso*. Ph.D. Dissertation, Université de Neuchâtel.

Nicholson, S.

2005 On the question of the "recovery" of the rains in the West African Sahel. *Journal of Arid Environments* 63(3):615-641.

Nielsen, J. and A. Reenberg

2010 Cultural barriers to climate change adaptation: a case study from Northern Burkina Faso. *Global Environmental Change* 20(1):142-152.

Nyantakyi-Frimpong, H. and R. Bezner-Kerr

2015 The relative importance of climate change in the context of multiple stressors in semi-arid Ghana. *Global Environmental Change* 32:40-56.

Orlove, B.



- 2005 Human adaptation to climate change: a review of three historical cases and some general perspectives. *Environmental Science & Policy* 8(6): 589-600.
- Ouédraogo, I., M. Tigabu, P. Savadogo, H. Compaoré, P. Odén, and J. Ouadba  
2010 Land cover change and its relation with population dynamics in Burkina Faso, West Africa. *Land Degradation & Development* 21(5): 453-462.
- Paré, S., U. Söderberg, M. Sandewall and J. Ouadba  
2008 Land use analysis from spatial and field data capture in southern Burkina Faso, West Africa. *Agriculture, Ecosystems & Environment* 127(3-4): 277-285.
- Pérez, C., E. Jones, P. Kristjanson, L. Cramer, P. Thornton, W. Förch, and C. Barahona  
2015 How resilient are farming households and communities to a changing climate in Africa? A gender-based perspective. *Global Environmental Change* 34:95-107.
- Poole, P.  
1995 Land-based communities, geomatics and biodiversity conservation. *Cultural Survival Quarterly* 18(4):74-76.
- Porro, N. and S. Stone  
2005. "Diversity in living gender: two cases from the Brazilian Amazon." Pp 242-255 in *The Equitable Forest: Diversity, Community and Resource Management*, edited by C. Colfer. Washington, DC: Resources for the Future and CIFOR Publication.
- Rasmussen, K., S. D'haen, R. Fensholt, B. Fog, S. Horion, J. Nielsen, L. Rasmussen, A. Reenberg  
2016 Environmental change in the Sahel: reconciling contrasting evidence and interpretations. *Regional Environmental Change* 16(3):673-680.
- Reij, C., G. Tappan, and A. Belemvire  
2005 Changing land management practices and vegetation on the central plateau of Burkina Faso (1968–2002). *Journal of Arid Environments* 63 (3):642–659.
- Robinson, L., A. Desalegn, A. Camara, and E. Ontiri  
2015. Governance dimensions of climate change adaptation: methodology for landscape-level institutional assessments. *ILRI Manual* 20. Nairobi : ILRI.
- Rocheleau, D., B. Thomas-Slayter, and E. Wangari  
1996 *Feminist Political Ecology: Global Issues and Local Experiences*. London: Routledge.
- Roncoli, C., T. Crane, and B. Orlove  
2009 "Fielding climate change in cultural anthropology." Pp 87-115 in *Anthropology and Climate Change: From Encounters to Actions*, edited by S. Crate and M. Nuttall. San Francisco, CA: Left Coast Press.
- Rubin, G.

- 1975 "The traffic in women: notes on the 'political economy of sex.'" Pp. 157-210 in *Toward an Anthropology of Women*, edited by R. Reiter. New York, NY: Monthly Review Press.
- Sankara, T.  
1990 *Women's Liberation and the African Freedom Struggle*. New York, NY: Pathfinder Press.
- Schlenker, W. and D. Lobell  
2010 Robust negative impacts of climate change on African agriculture. *Environmental Research Letters* 5(10):014010.
- Scoones, I.  
1998 *Sustainable Rural Livelihoods: A Framework for Analysis*. IDS Discussion Paper 72. Brighton: University of Sussex.  
—  
2009 Livelihoods perspectives and rural development. *The Journal of Peasant Studies* 36 (1):171-196.
- Sivakumar, M., H. Das, and O. Brunini  
2005 Impacts of present and future climate variability and change on agriculture and forestry in the arid and semi-arid tropics. *Climatic Change* 70 (1-2): 31-72: Springer.
- Skinner, E.  
1964 *The Mossi of the Upper Volta: The Political Development of a Sudanese People*. Stanford, CA: Stanford University Press.
- Smit, B. and J. Wandel  
2006 Adaptation, adaptive capacity and vulnerability. *Global Environmental Change* 16(3):282-292.
- Snorek, J., F. Renaud, and J. Kloos  
2014 Divergent adaptation to climate variability: A case study of pastoral and agricultural societies in Niger. *Global Environmental Change* 29: 371-386.
- Stamm, V., J., Sawadogo, S. Ouédraogo, and D. Ouédraogo  
2003 *Micro-policies on Land Tenure in Three Villages in Bam Province, Burkina Faso: Local Strategies for Exchanging Land*. London: IIED.
- Sturgeon, N.  
1999 Ecofeminist appropriations and transnational environmentalisms. *Identities: Global Studies in Culture and Power* 6(2-3):255-279.
- Sun, Y., E. Mwangi, and R. Meinzen-Dick  
2010 Gender, institutions and sustainability in the context of forest decentralisation reforms in Latin America and East Africa. *CIFOR Info-brief*. Bogor: CIFOR.

- Tappan, G. W. Cushing, S. Cotillon, M. Mathis, J. Hutchinson, and K. Dalsted  
2016 West Africa Land Use Land Cover Time Series: U.S. Geological Survey data release.  
URL: <http://dx.doi.org/10.5066/F73N21JF> (accessed on April 12, 2018)
- Tompkins, E. and W. Adger  
2004 Does adaptive management of natural resources enhance resilience to climate change?  
*Ecology and Society* 9(2): 10.
- Tonah, S.  
2002 The Politics of Exclusion: the Expulsion of Fulbé Pastoralists from Ghana in 1999/  
2000, Working Paper 44. Halle/ Saale: Max-Planck-Institute for Social Anthropology.
- Toulmin, C.  
1983 Herders and farmers or farmer-herders and herder-farmers? Pastoral Network Paper  
15d. London: Overseas Development Institute.
- Turner, M., A. Ayantunde, K. Patterson and E. Patterson III  
2011 Livelihood transitions and the changing nature of farmer–herder conflict in Sahelian  
West Africa. *The Journal of Development Studies* 47(2): 183-206.
- Turner, M.  
2004 Political ecology and the moral dimensions of 'resource conflicts': the case of farmer–  
herder conflicts in the Sahel. *Political Geography* 23(7): 863-889.
- United Nations Population Fund (UNFPA/WEDO)  
2009 "Making NAPAs work for women." In *Climate Change Connections: Gender and  
Population*. URL: [https://www.unfpa.org/sites/default/files/pub-pdf/climateconnections\\_4\\_napas.pdf](https://www.unfpa.org/sites/default/files/pub-pdf/climateconnections_4_napas.pdf) (accessed on March 15, 2018).
- Van Haaften, E. and F. Van De Vijver  
1996 Psychological consequences of environmental degradation. *Journal of Health  
Psychology* 1(4): 411-429.
- Vásquez-León, M., West, C. and Finan, T.  
2003 A comparative assessment of climate vulnerability: agriculture and ranching on both  
sides of the US–Mexico border. *Global Environmental Change* 13(3): 159-173.
- VerEecke, C.  
1989 From pasture to purdah: the transformation of women's roles and identity among the  
Adamawa Fulbé. *Ethnology* 28(1):53-73.
- Walby, S.  
1989 Theorising patriarchy. *Sociology* 23(2): 213-234.
- Weiner, D. and T. Harris

2003 Community-integrated GIS for land reform in South Africa. *URISA Journal* 15(2):61-73.

Weiner, D., T. Warner, T. Harris, and R. Levin

1995 Apartheid representations in a digital landscape: GIS, remote sensing and local knowledge in Kiepersol, South Africa. *Cartography and Geographic Information Systems* 22(1):30-44.

West, C.

2015 Public and private responses to food insecurity: complementarity in Burkina Faso. *Culture, Agriculture, Food and Environment* 37(2): 53-62.

West, C., A. Moody, and E. Nébié

2017 Ground-truthing sahelian greening: ethnographic and spatial evidence from Burkina Faso. *Human Ecology* 45(1):89-101.

West, C. and M. Vásquez-León

2008 Misreading the Arizona landscape: Reframing analyses of environmental degradation in southeastern Arizona. *Human Organization* 67(4): 373-383.

Zampaligré, N., L. Dossa, and E. Schlecht

2014 Climate change and variability: perception and adaptation strategies of pastoralists and agro-pastoralists across different zones of Burkina Faso. *Regional Environmental Change* 14(2):769-783.

World Health Organization

2015 Onchocerciasis: Key Facts. Electronic Document, URL:  
<http://www.who.int/mediacentre/factsheets/fs374/en/> (accessed on April 5, 2015).