AN ABSTRACT OF THE DISSERTATION OF

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Title: Livelihoods and Land Use Change in Highland Ethiopia

Abstract approved:

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John C. Bliss

Abstract:

This dissertation investigates livelihood and land use change dynamics in a community at the farm-forest periphery in highland Ethiopia. I use interviews and livelihood assessment data to compare the strategies used by members of different wealth groups to negotiate and maintain access to forest resources, and integrate socioeconomic, bio-physical and spatially explicit data to examine changing land use and household vulnerability. This approach sheds new light on scalar aspects of poverty-environment relationships with implications for environmental justice and rural development policy.

Chapter one provides an overview of the context and approach to this research. Chapter two illustrates the importance of scale in understanding household vulnerability. It uses diverse data to describe political, historic, biophysical and economic factors that shape vulnerability. Chapter three describes household livelihoods and increasing foreign investment pressure in Ethiopia's natural forests, with an emphasis on the history of forest management and access in the study site. It

describes processes of forest boundary making and conflict in the study area. Chapter four outlines two scenarios to describe the amount of agricultural land required to replace forest incomes in the community under study. These scenarios, termed “fuelwood replacement” and “fuelwood replacement with agricultural intensification,” use agricultural land as a proxy for fuelwood incomes, retaining the connection to physical space that is inherent to natural resources, rather than presenting abstracted monetary values that disassociate resources from power and access dynamics. Chapter five draws together unifying ideas, outlines policy recommendations and describes areas for future research.

Livelihoods and Land Use Change in Highland Ethiopia

by

Kathleen Guillozet

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I understand that my dissertation will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my dissertation to any reader upon request.

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Kathleen Guillozet, Author

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Dr. John C Bliss contributed to the writing of all chapters.

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Livelihoods and Land Use Change in Highland Ethiopia

Chapter 1 - General Introduction

As forests change in size and composition, and as markets develop to exploit them in new ways, communities whose livelihoods are integrated with forests transform in response to shifting ecological, economic and policy landscapes. This dissertation addresses two broad themes pertaining to livelihoods and land use change in a rural community located at the forest periphery in highland Ethiopia. First, it investigates the ways in which forest benefits are defined and distributed in a specific case. This includes an emphasis on how ecological, social and political factors interact to shape outcomes. It also includes attention to the changing nature of forest values over time, as new forms of social and economic significance are ascribed to forests, and new mechanisms are developed to make use of them. Second, it examines the interplay between household vulnerability and forest access. Within communities, households have unique capabilities and entitlements, based in part on characteristics like gender and clan affiliation, and tend to rely upon forest-based incomes in different ways. Contemporary policy approaches to forest management in the global South are aimed at stemming both forest loss and human poverty, but are typically formulated in the absence of thorough place-specific understandings of the processes that underpin forest access.

This dissertation is based upon field research conducted from September 2009 to May 2010 in a highland Oromo farming community comprised of approximately 7000 people. The community bordered a government-run plantation forestry operation and a government-managed natural forest area that is part of a larger forest complex known as the Arsi Forest. Plantation products served urban markets and local livelihoods centered upon semi-subsistence farming, fuelwood sale and daily labor.

The community under study is located within close proximity (18 kilometers) to a major fuelwood market that served largely urban and semi-urban consumers.

The three manuscripts presented in this dissertation illuminate livelihood-related implications of forest access for local households. While evidence suggests that vulnerability is the outcome of processes and policies created at local, regional, national and international scales, interventions tend to focus on the household and community scales. Chapter two addresses this deficiency by providing a multi scalar approach to understanding household vulnerability. While it is difficult to 1) calculate the degree to which forests contribute to local livelihoods and 2) understand how forest benefits are distributed among community members, it is generally believed that the economic contribution that forests make to rural livelihoods is underestimated (Angelsen et al. 2011). This underestimation fuels a range of emerging approaches to forest management that I investigate in chapters three and four, including foreign investment and ecosystem service payment programs like REDD+. Foreign investment in forests in places like Ethiopia is often touted in the name of economic development, and yet economic benefits for local people are highly uncertain (Li 2011; Daniel and Mittal 2010). The enumeration of the incomes that 'hidden harvests' bring to local communities is important from a policy perspective as different actors attempt to pencil out whether programs like REDD+ make financial sense. Ideally, the costs associated with needed livelihood and conservation investments will be less than or equal to carbon payments. Fischer et al. (2011) calculate implementation and opportunity costs associated with reducing deforestation and forest degradation in a Tanzanian case. They find that implementation costs exceed opportunity costs at current levels of agricultural productivity but that under agricultural intensification (the doubling of agricultural yields and increased adoption of fuel-efficient stoves) implementation is competitive. The authors assert that:

> *[T]hose [REDD+ projects] that directly target the local drivers of deforestation will be far less prone to within-country and cross-border leakage, and hence will be more likely to lead to sustained emission reductions and hence greater carbon, biodiversity and social benefits* (163).

This quote highlights a number of questionable claims common to REDD+ and climate change discourses, including those surrounding: 1) deforestation drivers, 2) leakage and 3) poverty. I present three sets of questions pointing to logical inconsistencies that underpin these claims:

First, while poverty and encroachment are often listed as drivers of deforestation, a careful examination of evidence suggests that this is a deeply flawed characterization. Geist and Lambin's (2002) analysis of proximate and underlying causes of deforestation suggests that they are region-specific and "subject to changing national – to global-scale economic opportunities and /or policies, as mediated by local-scale institutional factors" (151). They propose the need for place-specific investigations to identify appropriate approaches in each case. Evidence from this case supports these calls.

Second, it is questionable whether the direct targeting of local drivers of deforestation will make projects less prone to leakage. Local drivers might include things like agricultural expansion and fuelwood demand, but these are linked to changes associated with demographics and infrastructure, local, regional, national and international markets (Shively and Pagiola 2004; DeFries et al. 2010; Cropper, Griffiths, and Mani 1999; Ewers 2006; Lambin and Meyfroidt 2011) and a host of other factors enumerated in Chapter 4. This research indicates that it is impossible to meaningfully address deforestation without attention to multiple proximate and underlying drivers.

Third, policymakers need to more critically engage with the question of what constitutes a social benefit. The replacement of forest incomes with carbon incomes and more efficient fuelwood stoves would likely do little, if anything, to alter local conditions of poverty. This approach may make sense in light of larger-scale ecological and economic goals, but does it qualify as a social benefit? What opportunities do people have to pursue alternate livelihoods? What are their long term aspirations for themselves and their children? Research also suggests that the social costs of carbon are woefully underestimated. Valued at $21 per ton in 2010, the actual social costs of carbon may be as high as nearly $900 per ton in 2010 (Ackerman and Stanton 2011).

Local social relations indicate that the formalization of payments would likely lead to the exclusion of marginalized people such as female household heads. The natural forest is to some degree an "equalizer" in that people's access to it is limited primarily by their own labor in their use of fuelwood to supplement incomes. Thus, the enumeration of forest incomes as part of REDD+ feasibility assessments may make some sense from an accounting perspective, but it obscures a fundamental dilemma in terms of program sustainability and social justice. Inherent to these calculations are assumptions of static rural livelihoods in which conservation payments replace forest incomes but do not address persistent poverty. These concerns all relate, at least in part, to power. Green (2006) describes how the emphasis on poverty as the problem and the locus of analysis diverts attention from the social relations that produce power. Poverty is "relational as well as categorical" and "is likely to deepen when people are trapped in arrangements that limit their power, which the World Bank defines as their 'capacity to make choice effective'" (Moncrieffe 2004, 7-8).

In the next section I illustrate some of the complexities of the case by introducing two composite characters: Amiina and Madiina.

1.1 Livelihoods and Forests: The context for this study

Amiina is the mother of four children, all under the age of seven. Now in her mid-thirties, she became a widow three years ago when her husband died from injuries sustained from a tree that fell on him in the nearby forest[1]. Amiina did not want to follow custom and marry her husband's brother Mustafa, deciding that she preferred to remain on her own. Still, the 0.4 hectares that she and her husband once farmed was transferred to Mustafa. She now sustains her family by collecting fuelwood from the forest. About four times per week, she walks into the forest, processes and ties together a large bundle of wood with leather straps that she then lashes to her back and carries home. Sometimes her eldest daughter Kadijaa, now six years old, accompanies her and carries her own bundle of wood that is about one quarter the size of her mother's. Amiina used to bring her fuelwood to Arsi Negele, a town some 18 kilometers to the west, but for the past eleven months since her donkey died she sells her wood locally for about half the price. She earns about 320 birr, or 25 dollars per month, enough to buy some maize, salt, peppers and a small amount of sugar and coffee.

Amiina and her neighbor Madiina are originally from the same community, which is located about 15 kilometers to the southwest. Oromo custom dictates that people marry outside of their clan, with the wife coming into the community from the outside. As my translator described, the clan "tells a person who he is." He explained that "when you travel to another place, first people will ask your name, then your father's name, then your clan and then your place". Clan members "help and

[1] This section represents fictional composite characters based on community members in very poor and medium-wealth households.

protect" each other. Madiina has nine children and is in her late forties. Her husband plants maize (*Zea mays*) and potatoes (*Solanum tuberosum*) on their 0.75 hectares and she cultivates enset (*Ensete ventricosum*), onions (*Allium sp*.), cabbage (*Brassica oleracea*) and a few herbs in a small garden plot adjacent to her home. Her pre-teen daughters collect fuelwood and water when they are not in school. Each week, they collect once for household use and twice for sale. Madiina brings the wood to market in Arsi Negele on her two donkeys. She uses part of the money for things like soap, sugar, lentils and coffee, and she invests 50 birr per week in an informal savings group she participates in with six other women. Every seventh week, Madiina receives the rotating pot of 300 birr. She might save this money for future expenses such as a new donkey, or buy goat that she will fatten and resell, or give some money to her two children who are in high school in Arsi Negele.

Amiina and Madiina live in a community that borders one of the few remaining highland forest areas in Ethiopia. A century ago, their 18 kilometer walk to Arsi Negele would have been shaded by large *Croton macrostachys* and *Podocarpus falcatus* trees, reaching 25 to 35 meters into the sky, respectively. Today, a few scattered trees and small eucalyptus groves remain on what is now largely farmland. The natural forest remains in the more steeply sloped areas to the south, ranging in elevation from 2100 to 2700 meters above sea level. This natural forest is also significantly changed from a century ago, due to selective harvesting of high value species, human settlement, fire suppression and livestock grazing. Still, a forest remains and the 1200 hectare portion of it used by Amiina and Madiina's community, along with at six other communities, holds opportunity.

Though still largely undefined, this opportunity is discussed by local resource managers and may someday materialize in the form of ecotourism revenues, carbon

payments or payments for ecosystem services such as water. This dissertation addresses the nature and implications of these opportunities for local livelihoods. Perhaps due to its moral and practical appeal, integrating forest livelihoods with conservation objectives to offset poverty and forest degradation has been an enduring approach for development, conservation and governmental organizations. Communities located at the farm-forest periphery are commonly portrayed as the agents of deforestation. As such, they are targeted for interventions aimed at relieving human pressures on forests, often by reducing access to or eliminating local forests uses deemed inappropriate in exchange for alternative revenue streams. Contemporary climate change and food security concerns add another layer of complexity to this dynamic. Climate change threatens agricultural production but also has led to the development of new funding mechanisms like REDD+ (Reducing Emissions from Deforestation and Forest Degradation).

These dynamics complicate assumptions about relationships between livelihoods and forest conservation. This research investigates the following questions:

> 1) How will emerging investments in forests affect rural household livelihoods?
>
> 2) How can multi-scalar approaches inform global debates on deforestation and rural livelihoods and contribute to pro-poor policy formation?

The above questions relate directly to the two overarching themes that tie together this research in that they they investigate the complications associated with defining forest benefits and their distribution and attempt to understand the interplay between household vulnerability and forest access.

1.2 Dissertation Structure

This dissertation investigates livelihood and land use change dynamics in a community at the farm-forest periphery in highland Ethiopia and then places them in the context of theoretical discussions of power and access. I use interviews and livelihood assessment data to compare the strategies used by members of different wealth groups to negotiate and maintain access to forest resources, and integrate socioeconomic, bio-physical and spatially explicit data to examine dynamics of changing land use and household vulnerability. This approach sheds new light on poverty-environment relationships with implications for rural development policy.

This research focuses on one smallholder farming community located at the periphery of the Arsi Forest in highland Ethiopia. It draws upon a range of data to illustrate and triangulate findings. These data include the following:

1. A household livelihood survey which describes household expenditure, income patterns and forest use among different wealth groups.
2. Interviews which describe experiences and perspectives of community members and resource managers.
3. Secondary data which provides context to land use change and social change.
4. Forest measurements that describe the structure and composition of the forest area.
5. Mapping data that situates resources and communities spatially and describes boundaries.

Chapter two describes household livelihoods and increasing foreign investment pressure in Ethiopia's natural forests, with an emphasis on the history of forest management and access in the study site. It describes processes of forest boundary making and conflict in the study area. Chapter three describes household livelihoods in the context of climate change adaptation. It illustrates how scale can enhance or

limit conceptions of vulnerability. Chapter four presents two scenarios that describe the amount of agricultural land required to replace forest incomes in order to depict opportunities and constraints to different livelihood trajectories. Chapter five draws together unifying ideas, outlines policy recommendations and describes areas of future research.

1.3 Study Design and Approach

This research is structured as a single case with multiple embedded units of analysis (Figure 1.1). The case serves as an example of what Stake (1995) terms an "instrumental case study" in that the objective is to gain insight into a set of research questions through the exploration of a specific case. The researcher works to understand "complicated problems [located] within situations and contexts" (Stake 1995, 133). To Stake, the issues themselves play a key role in helping the researcher define the data sources and methods. In this case, the phenomenon under study is household vulnerability in the context of changing forest access. It involves examination of a household livelihoods and vulnerability in a community at the farm forest periphery. I investigate the implications of emerging opportunities for forest-based revenue generation that would also restrict forest access.

Given these interests, I focus on human relations, land use change and household livelihood dynamics and also incorporate meso and macro scale data on neighboring communities, regional infrastructure and markets, global change and politico-economic factors, as appropriate. This research seeks to investigate human-environment relationships in their real world context (Yin 2003) and shed light on broader "demographic, cultural, and institutional factors as important variables in the poverty environmental degradation nexus" (Duraiappah 1998, 2169). This

research focuses on specific “people in places” (351) to illustrate the impacts macro-level structures on local people (Zussman 2004).

Case study research is often referred to as “progressively focused” (Stake 1995), meaning that the organizing concepts are adapted and modified in the course of the research. This research began with a focus on household livelihoods, natural forest management and power relations. At a coarse-grained perspective, the issues at the center of the research have remained the same. These include an interest in questions concerning how different actors gain and maintain access to forest resources, how environmental crisis narratives figure in the development and management of forest resources and how history and policy shape current circumstances and limit or enhance future opportunities. As the research progressed, I also became interested in the idea of the forest itself as an actor that shapes and responds to power and access dynamics. The individuals and institutions in the community under study and beyond have conceptions of the forest, take actions that alter its structure and composition. In so doing, they altered the productive capacity of the forest on economic, cultural, ecological, spiritual and political levels, with implications for their families, communities and the region as a whole. I grew more interested in incorporating ideas of how a forest as a unique resource and how its specific temporal patterns of change and growth affect political, economic and social opportunities.

Though natural resources provide the raw materials for wealth creation, livelihoods also shape the values associated with natural resources. I adopt McCusker and Carr’s conception of the relationship between land use change and livelihoods, which places them in a dialogue with one another instead of suggesting that one precedes the other:

> *Rather than searching for cause/effect relationships, we point out that envisioning land use and livelihoods as coproduced has led us to a place where we begin to see how patterns in the landscape reflect not deeper "driving forces", but complex relations of meaning and materiality that manifest themselves in these patterns.* (McCusker and Carr 2006, 801)

This framing emphasizes both critical realist perspectives and political economy-new regional geography orientations (e.g. Neumann 2001, 2010). It steers away from overly rigid or prescriptive descriptions of how land use and livelihoods are interrelated, focusing instead on more nuanced understandings.

This in turn led me to investigate the theorization of "space", in particular the work of Henri Lefebvre. Lefebvre describes how space exists on multiple levels: it represents the physical place and resources that people use for daily living and also the social-political realities that define livelihood opportunities and decision-making authority (Lefebvre 1991). Space is defined and transformed by society through capitalism and becomes charged by competing interests and social relations. Forests in particular illustrate these multiple dimensions of space. Lefebvre argues that, through the logics of capitalism, space becomes "homogeneous, rationalized, and as such constraining; yet at the same time utterly dislocated" (97). On the one hand forests provide those who live within and near them with a range of physical products used for a range of basic living requirements such as homes, tools, energy for cooking, food for people and livestock and medicines for treating illness. On the other, forest products are a globally traded commodity and "forest" is an internationally-recognized land use classification that determines eligibility for funding mechanisms like the Clean Development Mechanism and REDD+. Forests are spaces of interest for conservationists and capitalists, and with the advent of ecosystem service markets the two appear to be merging (McKenzie 2009; Igoe and Brockington 2007). Forests have proven to be malleable resources for wealth

generation, from non timber forest products to carbon sequestration. This malleability is made possible by changing social constructions of value and meaning. Figure 1.2 illustrates Lefebvre's "truth of space" in the context of this study. The outlying circles depict what Lefebvre terms "true space," the social and material realities embodied in a range of socially-constructed though materially-grounded entities such as markets, global change, and human relations. Truth of space is what is found when we examine social and material realities in the context of power and political economic realities.

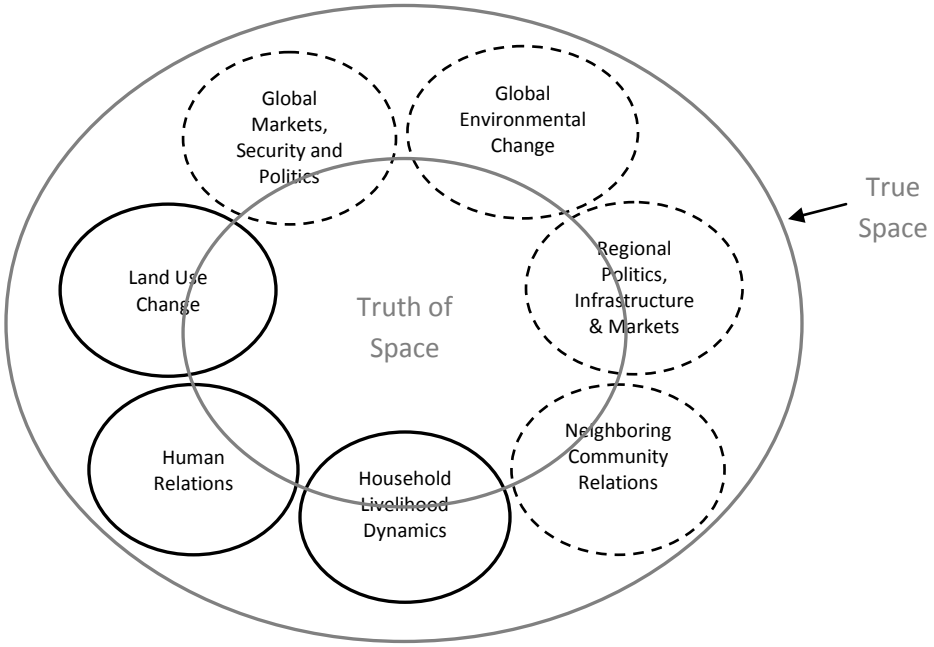


Figure 1.1: Lefebvre's True Space and Truth of Space in the Context of Power and Political Economic Realities (with focal areas in solid black circles)

The truth of space thus helps the researcher identify the root causes of inequities and links together larger processes of exploitation. The increasingly visible relationships between social, ecological and physical processes make people keenly

aware of global connections as well as extremely localized phenomena (Leichenko and O'Brien 2008).

This research draws together a number of disciplinary approaches, which is appropriate to the investigation of complex problems and the desire to produce results that are relevant to policy and practice (Hulme and Toye 2006; Borooah et al. 1994). This diversity of approaches also complements my theoretical grounding because an interdisciplinary perspective can help unveil underlying social conditions that construct and perpetuate inequitable resource management practices (Forsyth 2003) and shed light on management misconceptions (Turner, Lambin, and Reenberg 2007; Zimmerer 1994). Interdisciplinary approaches also reveal of how science and policy co-produce one another (Keeley and Scoones 2003), a dynamic that can further concentrate power among elite groups by promoting agendas that suit the objectives of those in control (Jasanoff 2004).

My research questions, design and analysis are grounded in a political ecology approach. Political ecology emphasizes power relations, examines uncertainty in dominant discourses, and encourages historically and geographically-oriented analysis. This helps the researcher identify the ways in which political economic forces shape ecological realities and reinforce centralized control over resources and decision-making (e.g. Dea and Scoones 2003; Gould, Schnaiberg, and Weinberg 1998; Klooster 2006; McCarthy 2004). I find political ecology approaches compelling because they draw upon multiple disciplines and methodologies, but also because they commonly emphasize social justice concerns. Political ecology studies that emphasize history address “how and why [society-nature]…relations have changed (or not changed) over time and space, and the significance of those interpretations for improving social justice and nature conservation” (Offen 2004, 21). Research in Ethiopia suggests that crisis narratives may serve to conceal political factors that play

a significant role in human vulnerability and environmental degradation (Rahmato 1993; Hoben 1995; Keeley and Scoones 2003) making it an appropriate place for political ecology research. Walker and Bulkeley (2006) describe how equity concerns are necessary in the case of social-ecological questions that are so often dominated by sustainability discourses: "Given that sustainable development provides the meta-narrative for environmental concerns it is necessary to ask if the environmental justice vocabulary and analytical lens adds anything useful to what is already in place" (657).

My research also engages with critical realist approaches in that it merges "real" physical elements of the case with analyses of how they are socially situated (Forsyth 2008). Critical realist theory shares a focus on the co-production of social and ecological knowledge and builds upon postmodern developments in anthropology and emerging applications of cultural ecology (Forsyth 2003). These concepts are relevant to the present study because the rapidly changing nature of production patterns and resource access in Ethiopia reflects observable micro- and macro level changes in social and economic systems but are also imbedded in complex relationships between actors that are often left unexamined. The examination of local discourses with respect to their capacity to position actors in society and reinforce power relations highlights the dynamic relationship between cognitive structures and the outward expression of social structures (Bordieu 1984). My research is also grounded in the idea that discourses, defined as shared interpretations of a phenomenon (Adger et al. 2001), reflect collections of ideas and practices that lend meaning to physical and social realities (Hajer 1995). These narratives can play a significant role in framing global issues and positioning actors, and therefore can serve as a vehicle for either reinforcing existing power relations or promoting socio-political change (Davies and Harre 1990). Critical examinations of

“regional discursive formations” or the “modes of thought, logics, themes, styles of expression, and typical metaphors [that] run through the discursive history of a region” (Peet and Watts 2004, 230) can help unveil the power dynamics that underpin them (Forsyth 2008). In the case of highland Ethiopia, regional discursive formations surrounding deforestation, environmental degradation, food insecurity and poverty are deeply entrenched in political, social, economic and ecological discussions among and between domestic and international actors (Yeraswork 2000; Keeley and Scoones 2000). These discursive formations underpin access to a range of things like resources, aid and authority, that in turn confer power.

Peluso and Ribot (2003) define access as the ability to benefit from things, in contrast to the formal right to do so. If an individual’s capacity to benefit from a resource does not necessarily relate to a formal ownership claims, as is often the case in rural contexts, then understanding the specific mechanisms of access will shed some light on vulnerability dynamics. Access in the Ethiopian context is tied to enforcement of formal and customary rules. Patterns of decentralization are also relevant to understanding relations between actors. Decentralization is associated with democratic reforms because it stimulates increased accountability, equity and efficiency through the promotion of participation and competition (Ribot, Agrawal, and Larson 2006). Ribot et al. (2006) use the degree to which local actors remain accountable to the central government as a metric of decentralization. To the extent that they remain tied, power is less decentralized because these ties tend to inhibit the ability of local managers to exercise discretionary authority over public resources, and thereby maintain downward accountability. At the other extreme, too much discretionary authority can lead to local instability through the establishment of insecure access or privileges that are insecure, unclear of indefensible (Sivaramakrishnan 1999). Peters (2009) points to the “dangers of over-privileging

notions of flexibility and negotiability in the social relations around land in Africa, and the need to assess ongoing processes of exclusion and the production of winners and losers" (1322). These principles of access and decentralization inform my study, which focuses attention on forest resources benefit distributions and the ability of different actors to assert their interests.

1.4 Site Selection and Community Introduction

I arrived in Ethiopia in August 2009 and spent three weeks at the Wondo Genet College of Forestry near Shashemene. While at Wondo Genet, I read completed student theses available in the College library, met a number of academics and researchers and was able to join a few of them on field visits. I was looking for an appropriate field site to investigate the interplay between smallholder farming household livelihoods and trees. Initially I imagined that I would be investigating on-farm tree planting, but I learned that significant natural forests remained in the region. I met a PhD student who had previously worked as an instructor at Wondo Genet and who was planning to conduct his research in the Munessa Forest, near what would become my research site. I visited the area with him four or five times before deciding to relocate there and pursue the necessary research permissions. The factors that influenced my decision to select this site included the: 1) predominance of semi-subsistence agricultural livelihoods, 2) contribution of natural forest products to livelihoods and 3) occurrence of a forest boundary demarcation exercise by the Forest Enterprise that coincided with my term of field work. I thought that this demarcation would provide me with opportunities to learn more about the relationships between the government, Forest Enterprise and community members in ways that I would be unable to otherwise observe. I was welcomed by the Forest Enterprise, who had been engaged in discussions about natural forest management alternatives and expressed enthusiasm about a livelihoods-oriented

study. My husband and I camped in the Forest Enterprise compound for a few days until someone suggested that we inquire about accommodations with the neighboring Catholic Mission. We were welcomed there and allowed to stay in housing built for local doctors, nurses and visiting volunteers. A formal forest demarcation started shortly after our arrival, and a few small units of Ethiopian Military personnel were also staying within the Enterprise compound, making it busier than usual. The Catholic Mission also ran a subsidized hospital and center for leprosy patients and had a somewhat mixed, though generally positive reputation among the community.

I approached the *kebele* (Peasant Association) council, who arranged for a larger community meeting in order to learn more about my proposed research and determine whether they felt it was appropriate. Following this meeting, the council determined that they would support my research if I obtained the written consent of the Ministry of Agriculture. I obtained this letter and provided a copy to the *kebele*, who then granted me permission to work in the community.

The student who I first accompanied to the area had previously worked on an agricultural extension project in the community. He was recognized by a number of people and was warmly welcomed back. He did not in the end conduct his dissertation research at the site, but my initial association with him was likely an asset to me. I had initially planned to conduct my household survey first, but there were long delays in obtaining the list of households needed for the preliminary wealth ranking activity. After a number of weeks, I decided to rearrange my study plan and collect the forest data first. This involved six weeks of field work, which allowed me to see and meet people who were going about their daily business in and around the forest. I worked with two Muslim Oromo forest guards who had strong ties to the community and who were highly knowledgeable about the ecology and

history of the forest. We walked long distances each day, allowing me to gain a better sense of the landscape and to meet people from many of the neighboring communities and learn some of the complexities of community forest access and enforcement. The unintended reordering of the forest work in advance of the household survey also likely had positive implications, as I was able to meet a number of people for the first time while on foot in the forest, which turned out to be a novel place for a foreigner to be, and often led to conversation about my interests and purpose.

By the time I completed my forest data collection, I had met Shukuri, an Enterprise employee and Muslim Oromo community member who became my main translator for all of the household surveys and most interviews (Translator B). Shukuri was in his late forties and had obtained a bachelor's degree from Wondo Genet College of Forestry and Natural Resources. His father had been an important healer and community leader, having five wives and an estimated fifty children. Shukuri worked as a sawmill operator and obtained a leave of absence to help me with my household survey and interviews. He had a quiet but authoritative presence and was received by people with warmth and respect. See Appendix A for notes on all translators who assisted me in this study.

With some 7000 residents spread across over 1100 hectares, my presence in the *kebele* never became a routine part of community life and always drew some attention. The Catholic hospital attracted a steady stream of volunteer foreign doctors and nurses from Spain and Italy, but people were unused to foreigners walking around in the community and forest and typically responded positively to me. I arrived with basic proficiency in spoken and written Amharic, but the community was dominated by Afaan Oromo-speaking people. Higher-level Forest Enterprise staff had good English proficiency and many men spoke some Amharic,

but Oromo was the primary language for daily communication. I gained sufficient proficiency in daily greetings, pleasantries and in words and phrases relating to the forest and farming, but my language limitations restricted my ability to integrate more deeply in to the community. I believe that my loose association with a range of actors and institutions including the Forest Enterprise, the Catholic Mission, and Wondo Genet College of Forestry made me more accessible to a range of people. Over time, people shared a range of perspectives on the work of these different entities, making me believe that they did not view me as tightly affiliated with any one institution.

1.5 Research Methods

Baerwald describes how contemporary "problems lie beyond the margins of existing disciplines or…are much larger than any one discipline (495)." I used a variety of methods in conducting this research, including interviews, a household livelihoods survey, forest stand measurements and secondary literature review.

1.5.1 Interviews

This research involved semi-structured and open-ended interviews with a range of people including community members, forest resource managers and government experts. A list of the people interviewed in the course of this research can be found in Appendix A. Interview selection was both purposive and opportunistic. I aimed to reach as diverse a cross-section of the community as possible with respect to gender, age and wealth status, and asked respondents and community members for recommendations of additional interviewees. I interviewed to reach a "saturation point" in which additional interviews with similarly positioned individuals no longer yielded new information (Creswell and Clark 2007). Some interviews were semi-structured and others unstructured, and some occurred in group contexts; the choice of interview driven by circumstance, the preference of the respondent and logistics.

Interviews most often took place at the home of the interviewee, typically in the grassy area in front of the home, lasting anywhere from fifteen minutes to four hours. I transcribed interviews from hand-written notes, coded and then memoed to explain and elaborate on themes developed in data analysis (Glaser and Strauss 1967). Translators were used for all interviews not conducted in English (see Appendix A).

1.5.2 Household Livelihood Survey

The household livelihood survey allowed me to gain a sense of the livelihood strategies used by households in different wealth classes and identify similarities and differences in forest use. I conducted the livelihood survey, which was based on the previous twelve months of household consumption and production, in a six week period during the spring of 2010. The twelve months prior were considered a normal production year. The survey is based upon the USAID Famine Early Warning Systems Livelihoods Profile used in the area (USAID FEWS 2009). The purpose of the survey was to generate descriptive data about the community, investigate potential production and consumption differences within the community related to wealth status and compare the data to regional trends. Twenty eight households were selected using a stratified random sampling design based on wealth status as ranked by community leaders (Laderchi 2005). Under this sampling protocol, community leaders ranked each of the 698 households into one of four wealth groups: very poor, poor, medium and better off. I randomly selected seven *garees* (groups of 20-30 households similar to neighborhoods) by pulling names out of a hat and then randomly selected one household from each wealth group to interview. In the event that a garee did not have any households representing a certain wealth group, only the wealth groups present were to be sampled. The survey instrument is included in Appendix B.

The survey was administered by the author with the help of a translator and in the company of a member of the *kebele* council who resided near the *garee.* Each survey took place at the household residence and lasted between 45 minutes and two and a half hours. Twenty-four of the interviews were conducted with the male and female head of household, with the male usually answering questions about crop production and sale and the female usually answering questions about household expenditures. Of the other four interviews, three took place with female-headed households and one took place with women whose husband was not present. Between one and four surveys were conducted per day of interviewing. Surveys were administered between Monday and Thursday as schedules permitted to avoid conflicts with the Friday market day in Arsi Negele. Interviews occurred between March and May 2011.

The "household" included co-resident and non-resident members who depended upon the same financial and food resources. Non-resident household members included high-school and college aged students who lived in urban or semi-urban areas to attend school, but whose tuition and living expenses were paid for by household heads. Supplementary food in the form of potatoes, vegetables and maize was also often provided to non-residents. In the cases in which husbands had multiple wives, households were considered distinct if they had separate residences and incomes but the same if wives resided together and household members shared the same incomes.

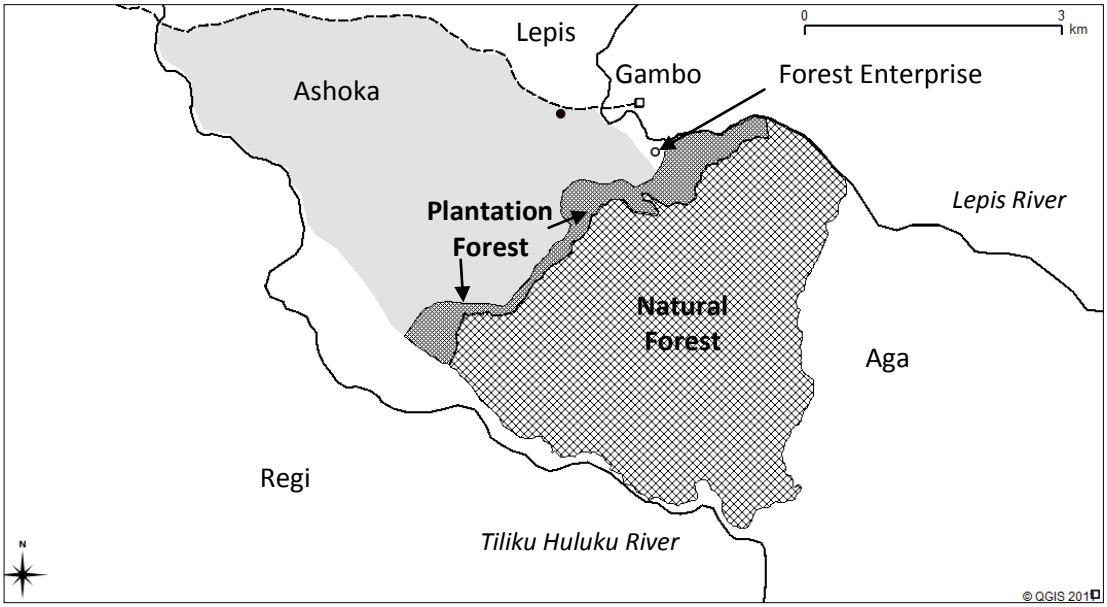
1.5.3 Natural Forest Inventory

The silvicultural assessment that is part of this study provides baseline data on the structure and composition of the natural forest area. I use this data to understand changes in the natural forest and to compare it with other similar studies in the region. The process of data collection also served to familiarize me with the area, allowed me to meet people and to observe normal daily patterns of forest use by the

people who use it. Data describing contemporary species composition and diameter class distributions will hopefully allow the community and resource managers to understand commercial and subsistence values of the forest, which can inform future management decisions.

The data I collected describes the structure (specifically the stems per hectare and diameter class distribution) and composition (species abundance and frequency) of the 1209 hectare natural forest area adjacent to the Gambo Forest Enterprise using methods adapted from Wilson (Wilson 2008). Native vegetation in the study area is classified as dry afromontane evergreen forest. Common tree species include *Podocarpus falcatus* and *Croton macrostachys*. The natural forest area under study is part of a larger natural forest and plantation complex known as the Arsi Forest, which extends over 21,513 hectares, some 28 percent of which is plantation forest.

The statistical population under study consists of a 1,209-hectare forested area that ranges in elevation from 2100 to 2700 meters above sea level (Map 1.1). To the west, the study area is adjacent to the Ashoka kebele forest plantation, which extends from northeast to southwest in a strip that also borders Ashoka kebele farms and homesteads. The southern boundary of the forest is bordered by the Regi kebele forest area and the Tiliku Huluku River. The southwest and western forest boundary is adjacent to homes and farms in the Aga kebele. To the north, the forest area is delineated by the Lepis River and Ashoka plantation forest.



Map 1.1: Ashoka kebele natural forest area boundaries

Complete protocols used to obtain the forest measurements are enumerated in Appendix C. Data collection took place over a period of two months, from December 2009 through February 2010

Chapter 2 - Understanding smallholder vulnerability through a multi-scalar perspective

Kathleen Guillozet and John Bliss

2.1 Introduction

While policymakers commonly reference the need for household vulnerability reduction in the global South, conversations seldom reflect the complexity that characterizes relationships between rural household livelihoods, natural resource access and processes of global change. The conditions that create vulnerability are grounded in multiple factors that exist across numerous scales. Yet researchers, who are often constrained by time, funds, expertise and capacity, usually characterize vulnerability in more discrete terms, focusing on interactions such as those between rainfall variability and crop production or relationships between household asset holdings and resistance to external shocks. This tendency can yield important findings but also may perpetuate simplistic conceptions of vulnerability that reinforce the centralized systems of control that often play a large role in perpetuating inequality and poverty. The challenge of connecting place-specific aspects of vulnerability to the regional and global processes that also shape local realities remains largely unattended.

This paper partially addresses this gap by using evidence from a case study of a farming community in Ethiopia's highland forest periphery to examine how vulnerability is created and reproduced at multiple scales. It accomplishes this by: 1) presenting an overview of vulnerability in the context of a rural community at the forest periphery 2) describing why scale matters in terms of defining and addressing vulnerability and 3) providing evidence from a specific case to shed light on relationships between livelihoods, natural resources and vulnerability.

2.2 Background

2.2.1 Vulnerability

Amartya Sen's entitlement approach (Sen 1976) has shaped contemporary research on vulnerability. Sen described entitlements as "the set of alternative commodity bundles

that a person can command in a society using the totality of rights and opportunities that he or she faces" (Sen 1984, 497). Vulnerability, then, can be seen as the risk that a household's entitlements are insufficient to buffer them against losses (Ribot 2010). Global change scientists often describe vulnerability as having "an external dimension, which is represented here by the 'exposure' of a system . . . as well as an internal dimension, which comprises its 'sensitivity' and its 'adaptive capacity' to these stressors" (Fussel and Klein 2006, 306). External dimensions relevant to the case presented in this paper include political, social and policy dimensions in addition to environmental ones. Internal dimensions include processes relating to resource access or exclusion, social dynamics and political marginalization.

Vulnerability research pertains to the "magnitude of the threat of future poverty" and its effects on decision-making and resource use (Calvo and Dercon 2005, 7). Vulnerability approaches can reflect dimensions of household well-being that are not captured by prevailing poverty indices (Bigsten and Shimeles 2008). They can acknowledge risks obscured by other metrics such as GDP, akin to those that often occur with shifts from staple to commodity crop production, as rising household incomes are accompanied by overall increases in vulnerability (Block, Barrett, and Maxwell 2005). Factors commonly cited as exacerbating household vulnerability in Ethiopia include drought, commodity price fluctuation, crop pests, death and illness (Calvo and Dercon 2005). Investigations by social scientists and others into the efficacy of rural development programs have led to a gradual expansion in the types of factors considered relevant to household vulnerability. While livelihood interventions tend to focus on micro-level aspects of household economies, there are increasing calls to also include "knowledge, politics, scale and dynamics" (Scoones 2009, 190), situating land use and livelihood change as the outcome of social relations (McCusker and Carr 2006).

2.2.2 Vulnerability at the Forest Periphery

The case presented in this paper focuses on a smallholder farming community at the forest periphery. Forests often contribute substantially to the incomes of the households that live near them, sometimes also serving as safety nets during periods of economic and environmental stress (Hobley 2005; Colfer, Sheil, and Kishi 2006). At the same time, the multiple values that forests possess also make them areas of interest to the state and to elite groups (Scott 1998; Scott 2009; Rudel 2007), a dynamic that can drive access-related conflicts (Angelsen 2001; Donovan, deJong, and Abe 2007; Peluso and Watts 2001). Forests are central elements of global strategies to offset climate change, and the presence of forested and previously forested areas are key determinants of country eligibility for funding opportunities such as Reducing Emissions from Deforestation and Degradation (REDD+) and the Clean Development Mechanism (CDM). This means that communities that live near forests may have a greater likelihood of being the subjects of policy and economic interventions focused at vulnerability reduction, for better or for worse. Mamo et al. (2007) suggest that "[g]reater local participation in decision making, promotion of improved forest management practices, and enhanced marketing infrastructure may contribute positively but will ultimately have limited effect" on livelihoods (926), problematizing conventional approaches to vulnerability reduction that tend to emphasize these factors.

2.2.3 Vulnerability at Multiple Scales

Vulnerability reduction is further complicated by the interconnectedness of economic, political and ecological systems, as illustrated in the following three wide-ranging examples: 1) Ecotourism development, which creates new opportunities for some households, while constraining others (Roshetko, Lasco, and Angeles 2007); 2) Agricultural intensification, which can make farmers more vulnerable through increased reliance on commodity crops that are subject to dramatic price fluctuations (Eakin

2006); 3) Small-scale irrigation schemes, which can decrease the vulnerability of some farmers, but lead to greater inequality (Tapela 2008) with direct impacts on vulnerability (Tchouassi 2011; Adger et al. 2002). Vulnerability reduction is thus a value-based decision-making process with associated costs and tradeoffs. The effects of policies associated with globalization, such as the elimination of price protections for staple commodities, can counter the positive impacts of strategies that increase production (O'Brien and Leichenko 2000).

2.2.4 Vulnerability in Ethiopia

Vulnerability in Ethiopia is created and compounded by a host of factors. Rural extension services are criticized for representing political interests and not adequately reaching the most vulnerable members of communities (Belay and Abebaw 2004; Pausewang 2009). Marginalized farming households tend to occupy the most unproductive and erosion-prone land (Fliegel 1993) and are prone to significant asset loss during periods of extreme hardship (Hobley 2005). These households often have less power in their communities (Rocheleau 1995), less education, and are less likely to adopt conservation strategies like tree planting (Zeleke 2009). Diminishing farm size is noted throughout Ethiopia and much of Africa (Jayne, Yamano et al. 2003). However, the relationship between farm size and productivity is context-specific (Place 2009). Variables such as markets, opportunities for cash cropping and access to extension, inputs and improved crop and livestock varieties play a large role in shaping the capacity of farmers to intensify production in ways that maintain or enhance household well-being. The role of investment flows, which are often directed towards medium and large-scale agriculture in developing countries, may further disadvantage smallholder farmers (Tschirley and Benfica 2001). The Ethiopian economy is described as “one of several post-socialist economies undergoing an ambivalent transformation process towards some kind of capitalist economy” (Crewett and Korf 2008, 203). Smallholder

farmers have struggled against government-driven market distortions such as those governing fertilizer markets (Jayne, Govereh et al. 2003) and agricultural and food aid programs that affect cereal crop production and pricing (Cline 2004). Farmers in Africa pay more for fertilizers than those in other developing countries (Jayne, Govereh et al. 2003) and in Ethiopia, fertilizer importation, distribution, and pricing is concentrated among two holding companies with close government relations (ibid). Distribution of inputs at local levels is tightly associated with political affiliations, with non-party members often excluded (HRW 2010).

2.3 Approach

Identifying the kinds of approaches that will impact smallholder vulnerability remains difficult. Should vulnerability reduction efforts be directed at households, communities, regions, nation-states, or all of the above? How can researchers develop a more comprehensive picture of vulnerability in order to identify appropriate approaches? I draw upon a theorization of space and scale in order to allow for a more critical examination of these issues.

Henri Lefebvre (1991) asserted that our cognizance of social reality or space is largely shaped by the state and by capitalism, and therefore people's actions tend to unconsciously reinforce centralized forms of power. He explained that one way to transcend these limitations, and to see what he termed the "truth of space" is to examine processes at multiple scales, including both the "macro-structures of politics and economy on the one hand and everyday life on the other" (Molotch 1993, 891). This strategy is grounded in the notion that the atomization of knowledge and understanding tends to perpetuate simplistic narratives. Ribot (2010) presents a complementary approach that places localized inventories of the "processes that shape vulnerability" as the starting point for discussions on effective strategies to reduce household vulnerability (72). His framework places livelihood loss as the outcome of political,

ecological and economic processes that exist at multiple scales. Ribot stresses the need to identify areas of “active” vulnerability production, including exploitation, resource access, political exclusion, market fluctuation, unstable policy, environmental change, poor infrastructure, poor social security systems, and a lack of planning (61).

Lefebvre and Ribot both propose the need to identify active vulnerability production through multi-scalar approaches. This “truth of space” is represented in Figure 2.1 by point *a*.2, where the three scales (household, bioregion and nation) and focal areas (livelihood, spatial and politico-historical aspects of vulnerability) of my research overlap. While the household is necessarily embedded in the local and regional, each scale is also framed and understood partly in its own terms. The diversity of data types makes them impossible to normalize across scales. Instead, I weave them loosely together with the aim of developing a more comprehensive understanding of household vulnerability. Researchers working in other contexts or with different interests and expertise may identify different focal areas and scales that bear greater relevance to their research questions. Figure 2.1 describes the focal areas and scales highlighted in this research, and may be of utility to researchers who seek to identify the processes that shape vulnerability.

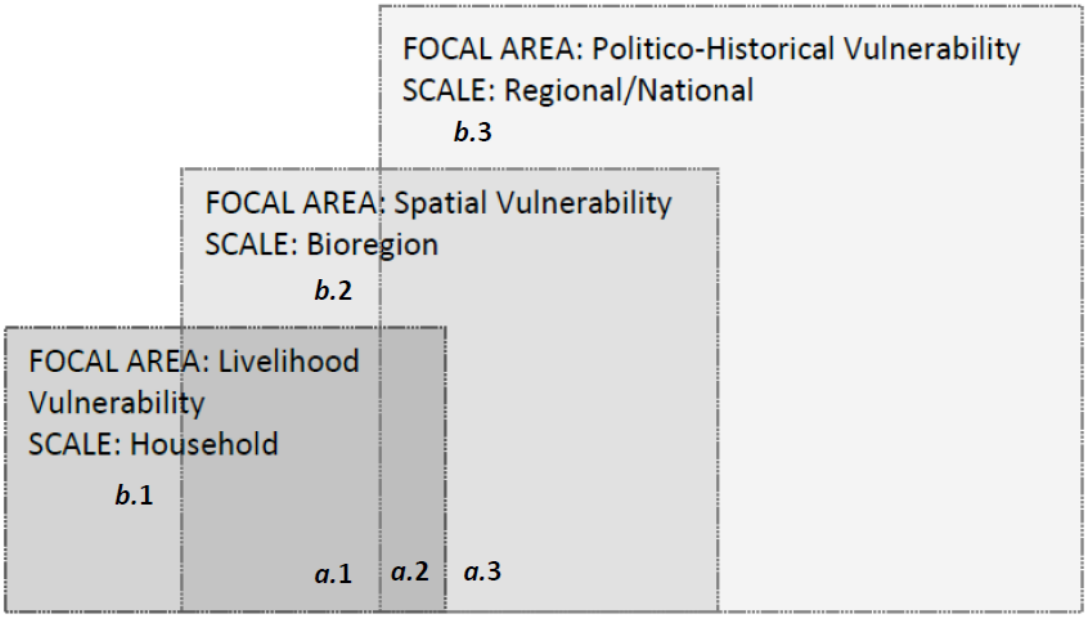


Figure 2.1: Focal areas and scalar levels of analysis

While single-discipline approaches, signified by points *b*.1, *b*.2 and *b*.3, generate valuable information, they may be less likely to yield interpretations that question or contradict predominant political and economic institutions and systems of control. Areas of overlap between scales (Figure 3.1, *a*.1-*a*.3) may or may not be the best possible spaces for policy change and intervention, but likely serve as optimal vantage points for identifying broader systems that produce vulnerability.

The next three sections present data that illuminate various aspects of vulnerability in the case. Section 2.4.1 describes politico-historical aspects of vulnerability and uses secondary data including reports, historical records and interviews with community members and other experts. Section 2.4.2 investigates spatial aspects of vulnerability at the forest-farm interface and uses interview data, historical records, and natural forest plot data on stand structure and composition. Section 2.4.3 uses evidence from a

household livelihoods survey and interviews to illuminate aspects of household vulnerability.

2.4 Findings

2.4.1 Politico-historic aspects of vulnerability in the Arsi Region

This section describes politico-historic aspects of vulnerability, situated at the regional and national scale. While evidence focuses on the case, politico-historic aspects of vulnerability are fundamentally driven by larger processes of state-making and capital accumulation and therefore reside at the regional and national scale. This scale provides broader context to livelihood changes relevant to vulnerability. Since many contemporary vulnerability and risk reduction approaches operate under assumption that "a good understanding of how people have survived in the past provides a sound basis for projecting into the future"(FEG 2008, 20), knowledge of the history of livelihood change and resource access will inform contemporary approaches to vulnerability reduction. Because livelihoods in many places are characterized by change rather than continuity, a historic grounding allows researchers a glimpse into the scope and pace of change over time. Historical investigations may also provide insight into the place-specific nature of livelihood change, which also affects vulnerability.

Data illustrating politico-historical aspects of vulnerability include secondary data such as reports and historical accounts, augmented and triangulated through interviews with purposively selected community members and resource managers. History is inherently incomplete, and the information accessed in the course of this research is no exception. Interviews were also opportunistic in nature, and therefore may not reflect the total diversity of experiences and perspectives held in the community under study. Still, they do provide insight into the nature of livelihood change and vulnerability over time.

The study site, located at the edge of a government-run plantation and natural forest area, has been inhabited by Muslim Oromo people for over one hundred years. Following conquest of the Arsi area at the end of the 19th century, all forests became the property of the state. Concessions of land, with accompanying rights to local labor, were granted by Emperor Haile Selassie, primarily to Amhara military officials, widows and other extra-local elites (Poulsen 1973). These "were compounded by a host of illegal impositions levied by the ruling class on the peasantry" associated with land rents and labor obligations (Markakis 1987). The state has historically maintained tight control over the area as it has seen fit to do so, as described in the following quote: "The experience of Arsi's inhabitants since Menelik's conquest [in the 1880's] has been that unless the writ of central government is followed, then the army and/or the police will enforce it" (Cohen and Isaacson, 1987, 452 in de Waal 1991, 235).

Local access to forest benefits has diminished through the course of three political regimes that have exercised strong state control of forest resources. Shrinking forest resources and recent demands from a range of actors for conservation, ecotourism and other forms of capital development mean that the existing use rights of local community members are increasingly tenuous.

Local people used raw material from the forest for animal fodder, building, tool-making, fuelwood, medicines and other cultural purposes. Extra-local elites have historically used the forest for revenue generation from timber concessions. For example, elder community members described an Italian logging company, Gino, which selectively harvested *Podocarpus falcatus* during Haile Selassie's reignand practiced "the infamous 'cut out-get out' principle of concessioners" (MoA 1990, 44). Extra-local elites and other outsiders benefit from informal fuelwood harvest through their ability to purchase below-market priced building materials and fuelwood.

Economic benefits extracted from the forest by the state include incomes from timber harvest, plantations, bequests to patrons and tax revenues. Haile Selassie solidified ties to military leaders and advisors by granting them forest concessions in the region, and the Derg sought the allegiance of the peasantry through the clearing of forestland for farm establishment. As Rahmato (2009) described:

> *The chief resource of the country still remains the land, and access to it has invariably been keenly sought by all concerned- the peasant, the privileged classes as well as the state- for the economic benefits this would confer as well as social and political dominance …With improvements in transportation and communication, and the role played by state controlled political parties which came to exercise influence in rural affairs during the Derg and at present, the strong arm of the state has been extended to the far reaches of the countryside, far more so than at any time in the past. (284-285*)

In 2010, state benefits from the forest were largely obtained through the government-run Forest Enterprise plantation system. In 2009, Arsi forest plantation landholdings and timber were valued at $37,756,432 USD (Enterprise 2010).

Broad livelihood system changes have accompanied political changes in the area (Table 2.1). The rapid shift from sedentary grazing to rainfed mixed farming systems that has occurred over the past few decades has also led to increased household vulnerability. During Haile Haile Selassie's reign, local Oromo people lived in sparse settlements and relied mainly upon livestock for nutrition and asset holdings. As one elder described: "Before there was no plowing, only many cattle. With the increase of farming the forest was destroyed" (116, community elder). Oromo people were viewed by the ruling Amhara as slaves and had no access to formal education. Under Derg rule, every household was granted a small plot of farmland, community grazing areas were largely settled and collective farms were established. Today, households practice what Seré and

Steinfeld (1996) term rainfed mixed farming.[2] Declining soil fertility is a risk associated with this production system, which is also sometimes considered indicative of resource scarcity (FAO 2011).

Table 2.1: Livelihood Characteristics 1970-present

	Haile Selassie	Communist Derg	EPRDF
Livelihood System[3]	Sedentary temperate/tropical highland grazing	Rainfed mixed farming	Rainfed mixed farming
Local Governance	Gadaa system	*Kebele* (Peasant association)	*Kebele* (Peasant association)
Religion	Wakefata/Muslim	Muslim	Muslim/Evangelical Christian
Formal Education	No access	Access granted	Local K-8 school built

Source: Author's Fieldwork

Until recent decades, local people practiced a traditional Oromo system of democratic governance. Known as the Gadaa system[4], it provided a range of physical and social protections relevant to household vulnerability. Under Derg rule, the authority of the Gadaa system was superseded by the *kebele* (Peasant Association) which had strong ties to zonal, regional and national levels of government. One community member explained:

> *The Derg was good in terms of giving land to the public. The disadvantage was the high land rents and the corruption. Before the Derg the plantations [forests] were owned by the community and the*

[2] In rainfed mixed farming systems, "more than 10 percent of the dry matter fed to animals comes from crop by-products or more than 10 percent of the total value of production comes from non-livestock farming activities. In these systems, more than 90 percent of the value of non-livestock farm produce comes from rainfed land use" (Otte and Chilonda 2002)

[3] Livelihood systems are described in accordance with the FAO's (2011) Livestock Production Systems Classification.

[4] The Gadaa system is a complex system of democratic governance characterized by eight year cycles of change and age class-related participation in a range of socio-cultural systems. It is still practiced today to varying degrees by different branches of Oromo people in Ethiopia.

> *Derg displaced people. [The] community had no power to resist the Derg and people were forced to release their land and move elsewhere or work as daily laborers. [Immediately after the fall of the Derg, the people were angry and wanted to destroy the hospital and the plantations. We had] two tools: the Gadaa system and the elders. [We held a meeting to] convince people about the value of the project and hospital and describe their future plans and objectives. We had the power to lead and show the people then. Now the Gadaa system has stopped. There is no Gadaa system anymore. Partly this is because of religious freedom. Now some people are Muslim, some people are Christian. During the Derg the Gadaa system is strong but we don't have that understanding today.* (101, Retired forest guard)

While community members did not technically own forestlands prior to the Derg, land allocation was complex, and many households were settled in forested areas and paid land taxes to the government. With the establishment of more formal state interest in the forests under the Derg, forcible evictions and relocations as well as landholding reductions were common. In 2010, most households occupied the same farm plots granted to them by the Derg in the 1970's and 1980's. As described by de Waal (1991):

> *The land reform of 1975 gave the Dergue [sic] great political capital in the Oromo areas -- which it promptly began to deplete by heavily taxing the peasants and requisitioning food from them for the army and the towns. The land reform also set up Peasant Associations (PAs), with the initial aim of re-distributing land. PAs were given wider-ranging powers shortly afterwards* (69).

Dessalegn Rahmato estimated that "by the end of the 1960's average per capita holdings in Arssi [sic] were between two-and-half to three hectares" (2009, 39). By 2010, landholdings at the study site averaged one hectare. Aside from a few community grazing areas which were typically too wet to farm, there was no "surplus" farmland available. Children gradually began to attend the local elementary school and parents sent their children away to high school as they could afford to do so. Educated children then competed for limited jobs, described further in the next sections. The *kebele* and

higher strata of government such as the Woreda and the Ministry of Agriculture established during Derg rule remained intact and powerful (Pausewang 2009).

The politico-historic aspects of vulnerability that are illustrated in this section include state-driven livelihood change that has proceeded over the past 100 years, forest appropriations by the state and extra-local elites, increased access to education, shrinking farm sizes and the decline of local institutions such as the Gadaa system. Each of these processes has contributed to livelihood change with impacts on household vulnerability that are difficult to measure but are nonetheless important.

2.3.2 Spatial aspects of vulnerability: Forest change

Assumptions about the behaviors and asset preferences of smallholder farmers in Ethiopia are based largely on studies of households that lack forest access (e.g. Barrett, Holden, and Clay 2004; Burg 2008; Dercon and Krishnan 2000). Customary forest uses supplement local incomes and provide resource inputs to households. Shifts in resource availability underscore the need to understand the unique livelihood dynamics of these households. In this section I describe bioregional changes that have occurred in the forest area surrounding the study site in order to ground the case in physical space and describe the circumstances underlying historic land use change. These have a direct bearing on vulnerability in three primary ways: 1) because households depend on forests to fill household needs, the changing structure and composition of the natural forest affects household vulnerability, 2) a historically-informed picture of land use change shifts the burden of environmental degradation and deforestation off the shoulders of the rural poor establishes more accurate chains of causality *sensu* Ribot (2011), and it also 3) illustrates the social relations that underpin vulnerability, land use and livelihood change.

Data used in this section include historic reports and forest assessments, interviews with community members and forest measurements collected by the author in 66 randomly assigned 25m x 25m plots using methods adapted from Wilson (2008).

The case study site is located in Ethiopia's Arsi forest, an upper wet broad-leaved Afro-montane rainforest. Today the Arsi forest extends over approximately 21,513 hectares, some 28 percent of which is plantation forest. Natural forests persist largely in areas that are steeply sloped and difficult to access, while flatter areas have been converted to farmland (Poulsen 1973). The forest and surrounding villages are located in a transition area between two agro-ecological zones, known as the *Weina Dega* or *Baddaa Dareetti* (temperate, cool sub-humid highlands) located between 1,500-2,300 meters in elevation and the *Dega* or *Badaa* (cool and humid highlands) between 2,300-3,200 meters in elevation (Aalbaek and Kide 1993).

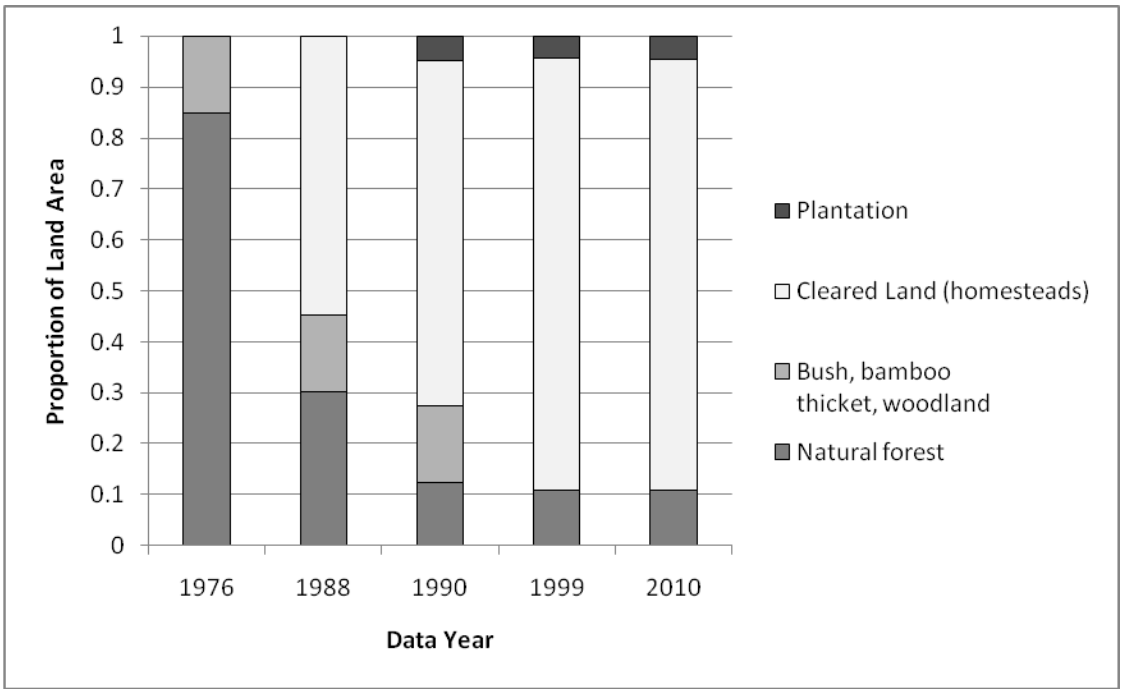


Figure 2.2: Land use change within a 141,976 hectare area of the Arsi Forest, 1976-present

Sources: (Guillozet and Bliss 2011) citing Ministry of Agriculture (1990); (Didha 2008). Notes: 1) Land cover estimates of 'Bush, bamboo thicket, woodland' are carried backwards from 1990 figures as placeholders; actual pre-1990 figures are unknown. 2) The area includes the study site as well as lands that today are under the jurisdiction of different kebeles.

As mentioned in section 2.1, concessioners operating under Haile Selassie's reign high-graded forests, exiting without attending to replanting requirements. Though the land area could still be defined as forest, it was significantly diminished in terms of timber value. Figure 2.2 shows land use change within a 141,976 ha land area in which the study site is embedded. Conversion to plantation forest (largely *Eucalyptus, Pinus* and *Cupressus* spp.) began in the 1970s and accelerated in the 1980s under communist Derg rule. This work was funded in large part through harvest of the natural forest, which consisted of *Podocarpus falcatus* and to a lesser degree *Aningeria adolfi-friederici,*

Cordia africana, *Hagenia abssinica*, *Juniperus excelsa* and *Prunus Africana* (Didha 2008). Plantations do not appear in the demarcation records until 1990, though their establishment began earlier (Figure 2.2). It is uncertain how they were categorized prior to 1990, but given their location they were likely considered cleared land or natural forest. Historic information and interviews indicate that the natural forest area has changed significantly in structure and composition over the past five decades. We can begin to understand the nature of this change by comparing data from forest plots collected in 2010 with data collected in 1969 by a team of Swedish foresters (Lundgren and Lundgren 1969).

The Swedes worked with the Ethiopian government to establish a plantation forest for state revenue generation. Their interest in the natural forest lay in identifying merchantable timber. They used six plant community classifications, based on species and elevational distributions (Table 2.2) and identified three diameter classes: class 1 (>60 cm dbh), class 2 (60-20 dbh) and class 3 (<20 dbh). Of these, they considered classes 1 and 2 merchantable. Located below the lowest reaches of the remaining forest, the Croton-forest type (Table 2.2) has been converted to farmland and plantation, and therefore not sampled in 2010.

Table 2.2: Plant Communities and Elevation Ranges, in Meters Above Sea Level (masl), Identified in 1969

Plant Community	Elevation Range	2010 Plots (#)
Croton-forest	< 2200 masl	0
Podocarpus-Croton-forest	2200-2265 masl	4
Podocarpus-forest	2250-2400 masl	21
Podocarpus-forest Arundinaria-thicket	2400-2450 masl	4
Arundinaria-Rapanea-thicket	2450-2675 masl	34
Pastureland	>2700 masl	3

Sources: Lundgren and Lundgren (1969) and author's fieldwork

Based on data from Lundgren and Lundgren's 1969 report, I compare mean tree diameter class distributions by plant community type to 2010 data (Figure 2.2). While I do not have information about their sampling size and methods, the data are still useful for descriptive comparison.

Lundgren and Lundgren's report also contains descriptions of the contribution of different species to stand basal area (SBA) by diameter class. Because of their interest in merchantable timber, they only referenced species larger than 20 cm dbh. While there are significant gaps in the 1969 data, a picture of the change in forest composition emerges, nonetheless (Figure 2.3). Because the incomplete copy of Lundgren and Lundgren's report does not provide comprehensive data on all species present in each diameter class, species not mentioned are left blank rather than assigned a "zero". While one might assume that Lundgren and Lundgren would have mentioned all valuable species (indicated by an asterisk), this cannot be stated with certainty. Typical heights in meters are shown, based on estimates by Bekele-Tesemma (2007b). For the 2010 data, all species comprising a minimum of three percent of SBA are listed, as are valuable species.

The change in trees per hectare (TPH) from 1969 to 2010 is most notable in the Class 1 *Podocarpus-Croton* forest type, which was completely absent in 2010. The *Podocarpus-Croton* forest type was located in closest proximity to the *kebele* (Peasant Association), and the large diameter trees located here were accessible to the Forest Enterprise, informal timber harvesters and fuelwood collectors. The mean number of trees per hectare (TPH) in diameter class 2 in the *Podocarpus-Croton* type decreased by 75 percent, from 105 TPH in 1969 to 26 in 2010 (Figure 2.3). Mean TPH across all plant community types declined by 61 percent in class 1 and 20 percent in class 2.

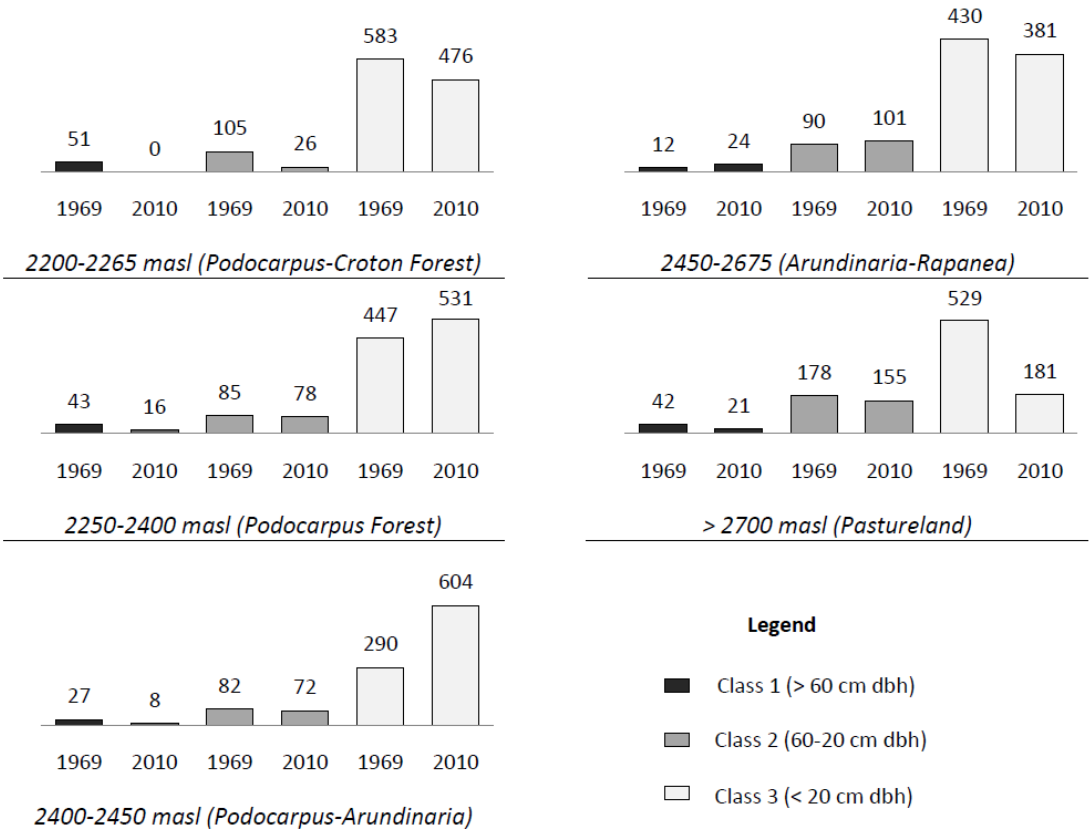


Figure 2.3: Change in number of trees per hectare among three diameter classes in five plant communities (1969 and 2010)

Source: Author's fieldwork

Trees per Hectare by Diameter Class, Podocarpus Forest			
Year	>60 cm dbh	60-20 cm dbh	<20 cm dbh
1969	43	85	447
2010	16	78	531
% change	-63	-8	+16

Podocarpus Forest			
	Height (m)**	% Total SBA	
CLASS 1 (>60 cm dbh)		**1969**	**2010**
*Podocarpus falcatus**	25	80	17
*Croton macrostachyus**	25		20
Ficus sur Forssk	25		15
Maytenus unduata	2-10		14
Allophylus abyssinicus	15-25		11
*Juniperus excelsa**	40		6
Teclia nobilis	2		6
Spatodia nalotica			5
Sum		80	94
CLASS 2 (20-60 cm dbh)		**1969**	**2010**
*Prunus africana**	40	24	1
*Croton macrostachyus**	25		43
Milletia ferruginea			16
Bersama abyssinica	3-35		12
Teclia nobilis	2		8
Myrica salicifolia	3-20		6
*Podocarpus falcatus**	25		4
Sum		24	90
CLASS 3 (<20 cm dbh)		**1969**	**2010**
*Croton macrostachyus**	25	n/a	35
Myrica salicifolia	3-20	n/a	25
Maesa lanceolata	5	n/a	16
Teclia nobilis	2	n/a	11
*Podocarpus falcatus**	25	n/a	3
Bersama abyssinica	3-35	n/a	3
Maytenus unduata	2-10	n/a	2
Sum			**95**

Figure 2.4: Class 1 and 2 stand basal area (SBA), by species, Podocarpus forest (1969 and 2010) and diameter class distributions

*Valuable species for timber; **From Bekele-Tessemma 2007, representing estimated heights when fully grown.
Source: Author's fieldwork

I present detailed data describing one plant community type, the *Podocarpus* forest, which ranges from 2250-2400 meters above sea level (masl) and constitutes a significant proportion of the study area. *Croton macrostachyus,* a common pioneer species that

grows up to 25 meters tall and can be used for commercial laminates, fuelwood, beehive construction and fodder, comprised a significant percentage of stand basal area (SBA) among all diameter classes in 2010 (Figure 2.4). *Podocarpus*, valued for timber, has declined by 79 percent since 1969, representing four percent of SBA in diameter class 2. *Prunus Africana*, a species valued for its medicinal bark and high-density wood, has declined in diameter class 2 by 96 percent.

Data describing the percentage of stand basal area by species shows that the composition and distribution of species in the forest has changed since 1969, exhibiting a general trend towards smaller stature trees. Over 25 years ago, an assessment deemed 60% if the total area (17,200ha) as 'severely disturbed' and the remainder as 'slightly disturbed' (MoA 1990).

Mean TPH decreased for diameter class 1 and class 2 trees in all forest types except the *Podocarpus-Arundinaria* forest (Figure 2.3). This exception may be the result of intensive harvest prior to 1969, which opened the forest for regeneration and augmented the growth rates of remaining trees. Alternatively, it may simply be too difficult for today's informal harvesters, who lack the equipment, resources and political capital held by the companies that operated in the mid-twentieth century, to remove timber from this area.

The broad changes in forest composition and diameter class distributions are attributed to state-driven forest clearing, conversion to farms and tree plantations, sanctioned and unsanctioned timber harvest for urban consumption, fuelwood collection (Didha 2008), livestock grazing, trampling and fire suppression (Bussmann 2001). Despite this diversity of causes, contemporary narratives often attribute loss of forestland simply to the unregulated actions of local people. This view is even held by the local people themselves:

> *The whole community regrets the degradation of the natural forest but the reason for it is the unlimited demand of the poor. One household has many children, when they grow, they need a house and more land to farm. They have full knowledge of what they are doing. Students learn about the importance of forests in school, from government officials and public education and training. People compare their lives to those people who have no forest near them and they know the effects of deforestation on rainfall and heat. They are forced by the problem of poverty to transfer the tree into money. They dislike forest degradation and if they have an alternative, they will do it.* (135, Community member/farmer).

The above quote highlights a number of key ideas reiterated in other conversations with community members. These include the following sentiments: 1) we recognize "the unlimited demand of the poor", 2) we recognize consequences of deforestation and 3) we have few alternatives, but would use them if they were available. Local people have certainly contributed to the changes in forest structure and composition noted over the past four decades. Livestock grazing, particularly of cattle, inhibits seedling regeneration and trampling can destroy seedlings. Fuelwood harvest is also significant. However, some women explained that they targeted their fuelwood collection towards diseased or dead trees and left smaller diameter trees to grow. As one woman stated, "we have been protecting the land until now without any guards or payment" (109, fuelwood collector) referring to the tendency to leave species that provide fodder, such as *Dombeya torridum* or medicine, such as *Pittosporum viridflorum* and *Hagenia abyssinica*. This indicates that people also see themselves as stewards managing the forest to reflect certain goals. This further denotes the role of the forest in offsetting household vulnerability, and describes how local people are managing it, albeit on a limited scale, to supplement household resources.

Local people also distinguished between fuelwood collection and timber harvest, the latter often associated with outsiders from the nearby town of Arsi Negele. One woman

described how “we know how to select the trees. We are not the same [as timber collectors] we cut the trees they leave” (112, fuelwood collector) referring to branches and unused parts of trees left by pit sawyers. These comments shed light on the complex social relations underpinning forest access, and offer a glimpse into how different forest management scenarios might select for or exclude different interest groups, with implications for household vulnerability.

Operating in parallel to these forest activities were farm activities. While forest and farm represent two different land uses, local farming practices relied heavily on forest inputs, in the form of land, raw materials for building, plow and tool making and fodder. Most farmland in the area consisted of recently converted forestland that exhibited declining soil fertility (Tolera et al. 2008), and farmers preferred recently converted fields to state-identified relocation sites, leading them to return to the forest periphery to farm.

Over time, through a combination of population growth, in-migration and forest harvest, households have undergone what Feldman and Geisler term “in situ displacement,” the gradual process of “semi-invisible material deprivation” (Feldman and Geisler 2011, 4) through which the pool of resources upon which households depend contracts qualitatively and quantitatively. One farmer described:

> *Before the present we had wide land and many children. Now the land is less and the cattle is finished. There is no milk now. There are no good cattle, there is no grazing land. When we had grazing land one milk cow was enough for me and my neighbors, [the cow] was eating well and it was enough. In the future thanks to Allah the children are in school.* (136, Community member/ farmer)

Animal fodder has similarly declined in quality and availability, leading to reduced milk production per cow and increasing household dependency on the forest as a source for fodder. While fertilizers and improved seeds had recently become available, farmers expressed skepticism that inputs would be supplied on time and at fair prices.

Another spatial aspect of household vulnerability revealed at the bioregional scale includes the lack of livelihood alternatives. This lack of alternatives combined with resource constraints leads households to invested significant resources in their children's education, despite the lack of jobs that await them. As one community member explained:

> *I have ten children. This is the challenge of my life. The land is not available for my children or my family for the future. I will send the children to school. They can get government work. For the future that is the best option. By that we can live, if God says.* (134, community member/farmer).

Urban unemployment rates for men aged 15-30 hovered around 50 percent in Ethiopia (Serneels 2004). The government sector has also been contracting, largely in response to austerity measures imposed by international development agencies and a lack of government investment in the job creation, leading to fewer opportunities available for more people (Denu, Tekeste and van der Deij 2005). Women-headed households also suffered from the lack of livelihood alternatives and were often relegated to fuelwood collection and sale to support their children, a phenomenon described in greater detail in the next section.

There have been a number of recent (ca. 2010) discussions in the Arsi Forest Enterprise about the future of the natural forest area. The United States Agency for International Development (USAID) is currently (ca. 2011) funding an ecotourism project with a neighboring community that uses the same forest area. In general, communities located in forest peripheries may reap benefits in the forms of livelihood diversification and payments for ecosystem services via these kinds of programs. However, uncertainty surrounding benefit distribution mechanisms and the effects of new forest access restrictions on household vulnerability make the net effects of projects unclear. Modified access arrangements will affect the ability of households to spread risk across

space and time. Contemporary livelihoods are shaped by the interplay between local culture, historical land use and politics, and broader processes of political, economic and ecological change. These dynamics are all grounded in the material world of farm and forest, with feedback loops affecting cultural and social relations.

The bioregional aspects of spatial vulnerability presented in this section illustrate a number of factors relevant to the nature of vulnerability in the case. First, in line with the politico-historic elements of vulnerability described in the previous section, the attribution of forest conversion and degradation to the rural poor is misleading. The state and extra-local elites have played a large role in forest conversion and compositional change. While this may not functionally affect household vulnerability, it is important in terms of understanding causality, which can affect policy processes and public sentiment. Second, evidence from interviews suggests that local people actively managed the forest through targeted fuelwood harvest in response to other signals such as declining grazing land availability. While the forest was highly degraded and much of this harvest was technically illegal, local users still recognized it as an important resource and tended to preserve fodder-producing, culturally important and medicinal species. These forest products, though locally important, are easily overlooked by natural resource managers and planners who see the forest as degraded and in need of new forms of management. Careful attention should be paid to understanding contemporary values and how they might be affected by new management regimes. Third, in the face of declining resource availability, households actively shift their investments towards the education of their children, a trend described in greater detail in section 4.3. This is important for understanding household risk perception and planning for the future and also in understanding farm-related decision making and investment.

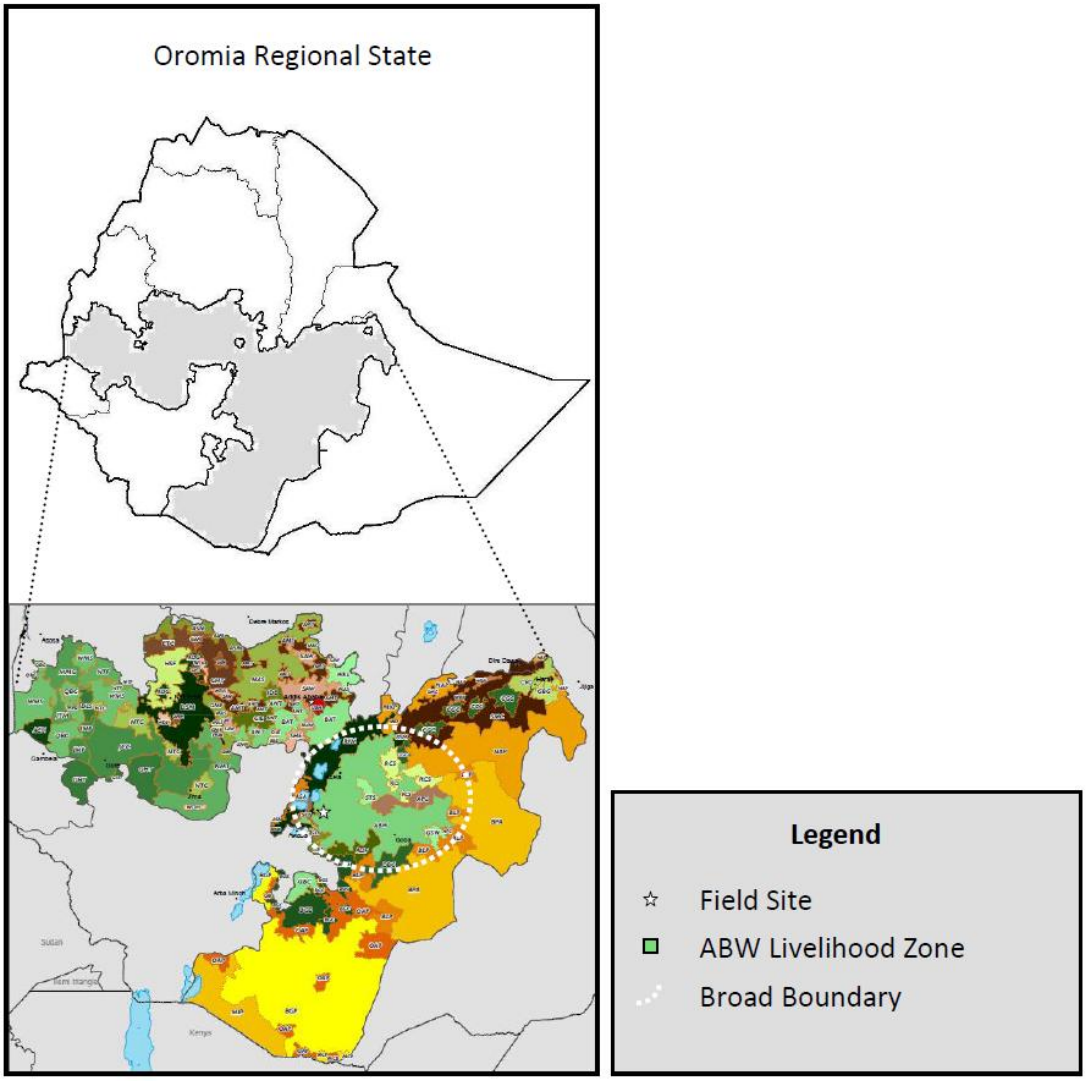
2.4.3 Livelihood aspects of vulnerability at the household scale

In this section, data from a household livelihood survey conducted in 2010 describe household production, consumption and expenditure patterns among different wealth groups in the community under study, revealing a number of trends that emerged in the previous sections.

The livelihood survey was adapted from a livelihood baseline questionnaire developed and used by the USAID Famine Early Warning System (2007). I used a stratified random sampling design (n=28) based on wealth status (very poor, poor, medium and better off). A group of local leaders participated in the wealth ranking exercise of all households, which informed the wealth status stratification in the community, using an approach described by Laderchi (2005).

The USAID FEWS Livelihood Baseline survey was designed to produce a quantifiable description of household food production, income and expenditures over a 12-month period. This reliance upon respondent recall of production, income and expenditures is therefore subject to error, and production, income and expenditure figures are estimates. The survey instrument was designed to reveal a snapshot in time, and therefore does not capture important nuances relevant to variables including a host of factors ranging from individual nutrition and long term economic development.

The study site is located on the eastern edge of what USAID terms the Arsi Bale Wheat, Potato and Barley (ABW) Livelihood Zone (Map 2.1). Primary economic activities in this livelihood zone include crop (wheat, barley, potatoes, pulses, maize) and livestock (cattle, sheep and horse) production. Variations in wealth status are determined largely by landholdings and the amounts of crops and livestock produced.



Map 2.1: Arsi Bale Wheat, Potato and Barley (ABW) Livelihood Zone
Source: modified from USAID Famine Early Warning System (2011) shapefiles

Household wealth and demographic characteristics are described in 2.3. Data from 2010 (in bold) is presented alongside data from a 2006-2007 livelihood survey conducted by USAID FEWS in six kebeles (in italics) located throughout the livelihood zone.

Table 2.3: Household Characteristics by Wealth Group at the Study Site in 2009-2010 and in the Arsi Bale Wheat Livelihood Zone (ABW LZ) in 2006-2007

	Study Site (n=6)	*ABW LZ (n=8)*	**Study Site (n=8)**	*ABW LZ (n=8)*	**Study Site (n=8)**	*ABW LZ (n=8)*	**Study Site (n=6)**	*ABW LZ (n=8)*
	Very Poor		**Poor**		**Medium**		**Better Off**	
HHs per wealth ranking (%)	**6**	*15*	**28**	*30*	**54**	*40*	**12**	*15*
HH size (people)	**6.8**	*5.0*	**8.1**	*6.5*	**11**	*8.0*	**11.7**	*9.5*
Land area (ha)	**0.3**	*0.6*	**0.9**	*1.5*	**1.3**	*3.0*	**1.4**	*4.5*
Cattle owned (#)	**0.5**	*1.0*	**0.9**	*3.0*	**5.5**	*6.0*	**7.8**	*10.0*
Oxen owned (#)	**0.7**	*0.8*	**0.8**	*1.5*	**1.6**	*3.0*	**2**	*4.5*
Donkey owned (#)	**0.7**	*0.5*	**0.9**	*1.0*	**1.3**	*1.5*	**1.5**	*2.5*
Goat owned (#)	**0**	*0.0*	**0.3**	*0.0*	**0**	*0.0*	**1.7**	*0.0*
Sheep owned (#)	**0.2**	*4.0*	**1.6**	*5.0*	**3.4**	*10.0*	**2.5**	*15.0*

Sources: Author's Fieldwork and USAID Famine Early Warning System (2008)

A comparison between the study site and the broader ABW livelihood zone indicates that on average, households in the study site were 18 percent larger than households in the ABW livelihood zone, but commanded fewer resources, illustrated by their 117 percent smaller-sized farms, and 29 percent and 74 percent smaller cattle and oxen holdings, respectively. Since asset holdings are a measure of a household's capacity to weather shocks, this indicates that households in the study site had a high level of vulnerability relative to other households in the same livelihood zone. Household expenditures, shown in Table 2.4, illustrate distinctions among wealth groups relevant to household vulnerability. Households of all wealth groups purchased a larger proportion of their staple and non-staple foodstuffs than those in the broader ABW livelihood zone. Higher staple food purchases were likely attributed to smaller farm sizes and larger family sizes. The higher non-staple food purchases among households in the study site may be attributable to better market access.

Table 2.4: Household Expenditures* by Wealth Group at the Study Site in 2009-2010 and in the Arsi Bale Wheat Livelihood Zone (ABW LZ) in 2006-2007.

	Study Site (n=6)	*ABW LZ (n=8)*	**Study Site (n=8)**	*ABW LZ (n=8)*	**Study Site (n=8)**	*ABW LZ (n=8)*	**Study Site (n=6)**	*ABW LZ (n=8)*
	Very Poor		**Poor**		**Medium**		**Better Off**	
Staple food	**1049**	*760*	**1658**	*941*	**1677**	*0*	**781**	*0*
Non-staple food	**1209**	*420*	**1735**	*519*	**2570**	*1526*	**3344**	*1663*
Staple purchase /income (%)	**31**	*24*	**24**	*19*	**22**	*0*	**10**	*0*
Tax	**9.2**	*23.0*	**24.4**	*31.5*	**46.5**	*66.8*	**73.3**	*82.5*
School	**100.8**	*140.0*	**100**	*200.0*	**652.9**	*570.0*	**2370.9**	*975.0*

*Expenditures are in Ethiopian Birr; Sources: Author's Fieldwork and USAID Famine Early Warning System (2009)
Sources: Author's Fieldwork and USAID Famine Early Warning System (2008)

The diversity of household attributes and vulnerability characteristics within the study site become apparent through examination of the differences between wealth groups. Very poor households (representing 6% of the community) were typically female-headed, non-clan members or other marginalized groups with little agricultural land (averaging 0.3 ha). These households purchased an average of 31 percent of their staple food calories and often received food gifts from wealthier households. Approximately 78 percent of incomes come from fuelwood sales, revealing the importance of forest access to very poor households (Figure 2.5). In response to the survey questions one interviewee responded in exasperation: "We have nothing…My husband is dead and I am left with four children. My body is finished from work" (110, fuelwood collector). Another woman, not part of the survey, described her situation in an interview:

> *This is our forest. We cannot live without this forest. Other people leave the forest for rain or for air conditioning, but for me it is different. I have eight children. They live by my economy. I do not destroy it too much, I*

> *keep it like a guard…my husband is lazy. We have less than 0.25 hectares. He was not born here and lost his land.* (112, fuelwood collector)

She alluded to government sponsored education programs that taught people about the effects of forests on freshwater resources and temperature moderation and distinguished herself from those who can afford to make alternative livelihood choices. Clan outsiders have reduced leverage in local level decision-making over land allocations, underscoring relationships between social standing, resource access and vulnerability.

Poor households (representing 28% of the community) were often unable to produce enough food for the entire year due to insufficient landholdings and a lack of storage capacity. These households typically purchased food in the lean time prior to harvest when prices were highest. Their livestock assets were marginal. These households have suffered most from the declining farm labor needs of wealthier households, whose labor demands have fallen off as landholdings have decreased and household sizes have increased. Very few households of any wealth status ate meat more than once per year. One man declared that: "When we eat meat, we are poor" (134, community member, farmer) indicating the toll meat consumption takes on livestock assets and the fact that, outside of Ramadan, households typically only ate meat when an animal died.

Medium wealth households (representing 54% of the community) also lacked quality storage capacity and replenished staple foods when prices were highest. These households typically provided all labor for farm production. When asked whether he used daily labor, one respondent laughed, "yes, I am a daily laborer for myself!" (137, community member/farmer). Mean fuelwood sales for these households (2660 ETB) were nearly equivalent to mean crop sales (2863 ETB). *Ekubs*, a form of traditional cooperatives, were particularly important to women in medium-wealth households. Through ekubs, small self-organized groups of women made monthly or weekly

contributions to a revolving fund that each woman received in turn. Women typically met payment obligations through the collection and sale of fuelwood and commonly used their funds to purchase a sheep or goat for fattening and resale, underscoring the importance of forests to medium-wealth household economies.

Better-off households (12% of the community) had mean landholdings marginally larger than medium-ranked households, but they typically owned higher quality land and could invest capital in wheat production, which typically yielded higher profit margins than maize or potatoes. Better-off households also typically had steel roofs that enhanced storage capacity. These households could purchase supplementary maize when prices were lowest and store it for consumption or resale during the lean seasons. Still, even those better off households expressed frustration over declines in livestock holdings and in the overall quality of food. One woman stated that “our milk is coffee” (138, community member, housewife), referring to the fact that in the past her family drank milk on its own, but now there is only enough to flavor coffee. Fuelwood sales among better-off households contributed the least to incomes of any wealth group in absolute and relative terms, though it still served as a significant source of income (Figure 2.5). Wealthy households hired daily seasonal labor, but in lesser amounts compared to other households in the ABW livelihood zone. While household size had a partial leveling effect on the income increases felt as households move from very poor to better-off, better-off households were able to leverage the timing of purchases both to take advantage of cheaper food prices and to purchase inputs. Educational expenditures were significant among better-off households, with most households sending students to high school and, in some cases, college. By comparison, households in the broader ABW livelihood zone spent 273 percent less on education (Table 2.4), perhaps due to the proximity of the study site to high schools. It was also likely due to the perception that farm livelihoods would not be feasible for most children, given land and resource constraints.

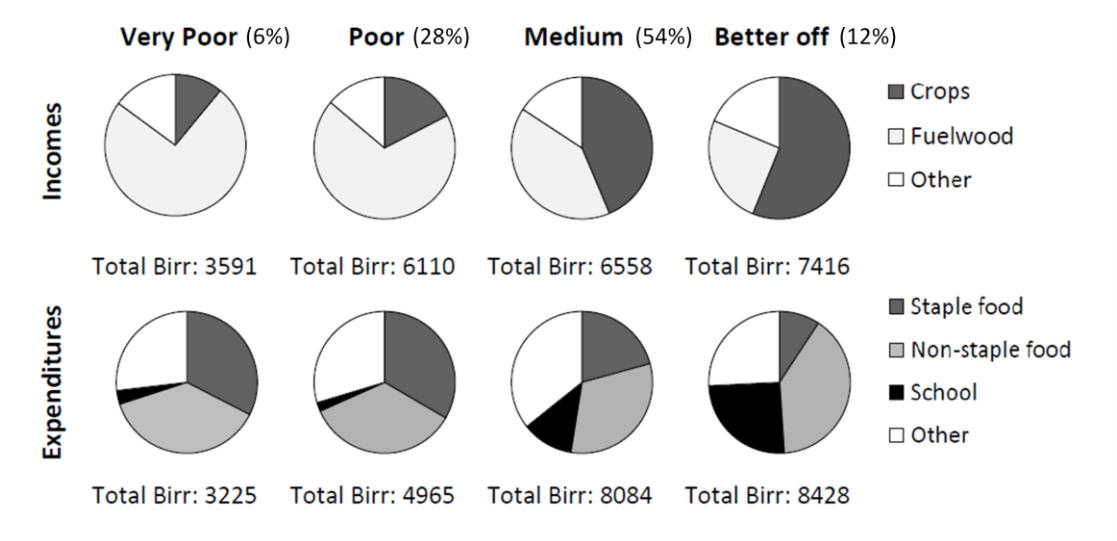


Figure 2.5: Household Incomes and Expenditures by Wealth Group
Source: Author's fieldwork

Figure 2.5 presents income and expenditure patterns among wealth groups. The category "other incomes" included petty sales, labor, donations and remittances. Crop sales included maize and potatoes, with some households in the "Better-off" group also selling wheat. "Other" expenditures included medical expenses, household items, clothing, maize grinding, inputs and pesticides. Staple food purchases included maize and wheat. Non-staple food purchases included vegetables, milk, salt, lentils, coffee, sugar, and *berbere* (chili based seasoning). School expenses included annual school fees for all students and expenses such as rent, food and clothing associated with covering living expenses and fees for high school or college level students.

Fuelwood collection for household income generation was practiced among all wealth groups, illustrating the shifting social norms that accompanied a declining resource base. In the past, fuelwood collection for sale was relegated to the poorest and was considered a task beneath the status of most households. In 2010, all wealth groups engaged in fuelwood collection for sale. When a husband and wife from a medium-wealth household described their fuelwood incomes, the husband explained "I don't

drink, I don't use chaat [*Catha edulis*], I only use fuelwood for income" (137, community member/farmer) in reference to the association of fuelwood incomes with disenfranchisement and socially unacceptable behaviors.

Families respond to limited resources livelihood options in part by investing in the education of their children, though professional jobs are limited, urban unemployment is high and the public sector is shrinking. Non-professional off-farm employment rarely provided surplus income, as one woman described: "I have one son in floriculture in Ziway, but we don't wait for his hand" (139, community member/housewife).

Elements of vulnerability at the household scale become apparent through a more nuanced understanding of forest incomes. Fuelwood incomes are important for all households. Marginalized households depend on fuelwood collection in the absence of livelihood alternatives and limited land. Women in medium-wealth households leverage fuelwood incomes through informal investment groups to generate more revenue for household expenses. Wealthy households depend on fuelwood incomes to subsidize educational expenses. Social norms surrounding fuelwood collection have shifted with changing livelihood opportunities, growing more acceptable as resources become increasingly limited.

2.5 Discussion

Brace and Geohegan's (2011) characterization of climate change, as a "relational phenomenon that needs to be understood on a local level, attending to its distinctive spatialities and temporalities" (297) also serves as an apt descriptor of vulnerability. While the data presented in this chapter reflect different scales and methodological approaches, similar themes emerge. These themes hint at what Lefebvre terms the "truth of space", and can inform a process-based understanding of vulnerability. In the

context of the focal areas and scales identified in Figure 2.1 and described in the preceding sections, I outline the themes that emerge in each of the three scales and focal areas (Table 2.5) and show how they intersect with the causal factors of vulnerability described by Ribot (2010). These causal factors include exploitation, resource access, political exclusion, market fluctuations, unstable policy, environmental change, poor infrastructure, poor social security systems, and a lack of planning.

Table 2.5: Vulnerability focal areas and scales

Ribot's (2010) Causal Factors	Politico-historic Focus; National Scale	Spatial Focus; Bioregional Scale	Livelihood Focus; Household Scale
Exploitation	- Forest benefits diverted to extra-local elites	- Forests high-graded; benefits diverted to extra-local elites	
Resource Access		- Decline in farm size and grazing land - Agricultural revenues invested in education	- Lack of livelihood alternatives
Political Exclusion	- Historic marginalization - State control over forests - Limited political freedom - Rapid state-driven livelihood change	- Decline of Gadaa system	
Market Fluctuations			- Cereal crop price fluctuation
Unstable Policy			
Environmental Change		- Reduced forest cover	
Poor Infrastructure			- Limited grain storage capacity
Poor Social Security Systems			- Evolving norms surrounding fuelwood sale
Lack of Planning			

The evidence presented in this case does not provide a definitive overview of all issues of importance to all people in the community under study, but rather serves as a means to identify active areas of vulnerability production. Many of the themes identified could be housed under additional causal factors. For example, evolving norms surrounding fuelwood sale are related to resource access and exploitation concerns. Others themes are related to multiple processes, such as reduced forest cover, which reflects environmental change as well as resource access and political exclusion. Unstable policy and lack of planning did not emerge as active areas of vulnerability production in the case. However, this is subject to change as policies, institutions and power relations change, and as additional research highlights dynamics across new scales and focal areas.

Predominant active areas of vulnerability production in the case include exploitation, resource access and political exclusion (Table 2.5). Policymakers working to address vulnerability concerns among communities at Ethiopia's forest periphery will want to consider how proposed changes address these three processes in particular. Vulnerability is the outcome of social relations and resource access that operate across multiple scales, often in a non-linear fashion. While the mechanisms of vulnerability creation are location-specific and grounded in particular social, political, economic and ecological realities, vulnerability is the outcome of processes of exclusion and access that operate at many scales. This approach to understanding scalar aspects of vulnerability can help researchers and policymakers move beyond confining narratives to address the social, economic and ecological factors that create and perpetuate vulnerability.

Chapter 3 - Household Livelihoods and Increasing Foreign Investment Pressure in Ethiopia's Natural Forests

Kathleen Guillozet and John Bliss

3.1 Introduction

The Ethiopian government expressed renewed interest in attracting foreign investment to the nation's forestry sector through its Forest Development, Conservation and Utilization Proclamation (Proclamation No. 542/2007). However, limited capacity to manage administrative and regulatory elements of foreign investments, pervasive tenure uncertainty and rural livelihood insecurity all point to the need for caution as the government proceeds with land deals involving forests. This paper aims to clarify discussions relating to foreign investment in Ethiopia's forests by describing the nature of these investments and outlining the challenges and opportunities associated with implementing them. First, I describe issues relevant to foreign investment in forests throughout Ethiopia. Second, I outline characteristics of households at the farm-forest interface who are likely to be directly affected by new investments. Third, I use evidence from a case study of a highland community located at the forest-farm interface to highlight competing forest access claims in a specific context and outline recommendations for addressing them.

Recent publications on agricultural land grabbing (e.g. Cotula et al. 2009; Rice 2009; Daniel and Mittal 2010) have raised the visibility of concerns over equity and social justice issues associated with contemporary foreign investments in natural resources in the global South. Ethiopia's economy is firmly grounded in the agricultural sector, with an estimated 83 percent of the population engaged in agricultural livelihoods. The government's formal economic development approach, termed *Agricultural Development Led Industrialisation* (ADLI), highlights the central position of agriculture in economic planning and prioritization and heightens the significance of investments in the country's productive land base.

Foreign investments in the forestry sector are distinct from agricultural investments that affect forests. The latter include forest clearing for farm establishment, a practice with a decades-long history driven by a range of government policies affecting land use, resettlement and investment incentives. Forest clearing for agricultural establishment is a common practice in both highland and lowland regions of Ethiopia. In most contemporary cases, forests are cleared with the use of fire, leaving forest products largely unexploited (see, for example, the case of Bale Mountain described by Teshome, Kinahan, and Randall 2010). The clearing of dryland deciduous woodlands for cash crop production (primarily sesame, sugarcane and cotton) occurs frequently in lowland areas. The prevalence of land conversion in the lowlands is linked to the resettlement of highland agriculturalists into traditionally pastoral areas (Lemenih, Feleke, and Tadesse 2007) and to a climate of loosely regulated natural resource exploitation and weak government influence in remote areas (140, scientist). Contemporary highland forest clearing is typically the result of forest encroachment for agricultural expansion including tea and coffee cultivation by both large-scale investors and rural people (Reusing 2000; Agribusiness 2004). These actions are also affected by external markets and government policies.

3.2 Processes driving forest investment in Ethiopia

Researchers commonly identify land and water scarcity as a primary driver of foreign investment in the global South (e.g. Rice 2009; Deininger, Byerlee et al. 2011). Zoomers (2010) emphasizes additional contemporary processes including increased foreign demand for non-food crops (especially biofuels), conservation, tourism and land purchases by retirees and Diaspora. In Ethiopia, investment trends affecting forests reflect historic relations between governments, elites and international institutions surrounding control over natural resource benefits.

An estimated 3.6 to 4.5 million hectares of land is currently available for commercial investment in Ethiopia, some 1.2 million hectares of which is located in the Oromia Regional State (Horne 2011). Foreign investors in Oromia, who are primarily from the Gulf States and India, are mainly producing flowers, *Jatropha* species, oilseeds and sugarcane on lowland concessions (ibid).

3.2.1 Narratives of under-exploitation and overexploitation

Ethiopian forestlands have long been characterized as under-exploited areas in need of economic development or as overexploited areas in need of conservation-oriented management. Over the past few decades, calls for increased foreign investment in agricultural practices that involve forest clearing (under-exploitation) have paralleled clearly articulated plans to halt deforestation and land degradation (overexploitation), creating conflicting policy recommendations. This conflict is illustrated in the two quotes juxtaposed below. The first is from a report issued by a United Nations Emergencies Unit for Ethiopia (UNEUE) field officer commenting on strategies for incentivizing agricultural investment by Ethiopian citizens returning after the fall of the Derg regime.

> *Land allocations for investment purposes is ongoing but government authorities need to be encouraged to move investors to hinterland areas and allocate the land located near the villages to returnees. This may require compensation to investors for clearing and infrastructure facility development (Shank 1994, 2).*

The second quote is taken from the Ethiopian National Action Programme to Combat Desertification, drafted in conjunction with a separate United Nations body, the Convention to Combat Desertification (UNCCD).

> *The policy provisions contained in this draft…encourage the development of forests by individuals, organizations and government and the designation of protected forests and productive forests to be administered in accordance with laws to be enacted for each. The draft stresses the need to give security of ownership of forest*

> *products to the developer and the importance of protecting every kind of forest from natural and man-made destruction (FDRE 1998, 62).*

These quotes illustrate the lack of integration between forest conservation and market liberalization that confound efforts to develop transparent and equitable strategies for natural resource-based economic development. They also mirror patterns identified in relationships between the state and private enterprise in peripheral resource-rich areas throughout the world that have led to forest benefit divestment from rural people to outside elites (Scott 1998; Scott 2009; Rudel 2007; Lunstrum 2009). Cursory references to laws governing rights and restrictions over forest use like those mentioned in the second quote are sufficient to propel processes forward, allowing forest benefits to be extracted before specific rights, restrictions and responsibilities are articulated. The often multi-decadal planning timelines that characterise forest management endeavours compound challenges associated with ensuring that investors abide social and ecological protections.

The absence of clear institutional authority and communication between agencies further hampers transparency in forest management. For example, foreign investors work primarily with the Ethiopian Investment Authority in establishing their business operations, while government forestry specialists are housed in the Forestry Research Centre, a subdivision of the Ministry of Agriculture. Forestry is marginalized by the current government as evidenced by budgetary allocations. In 2010, these amounted to approximately 6 million Ethiopian birr (£226,110) to the Forestry Research Centre, as compared to the 90 million Ethiopian birr (£3,391,792) allocated to Agriculture. This difference may be attributed to the political importance of agriculture. Annual crop production figures are closely monitored, especially in election years, and high production is associated with political success, compelling officials to use the means at

their disposal to favor agricultural output, sometimes at the expense of other land uses like forestry or livestock grazing.

Forestry-based emissions reduction programs are approved and managed through a different government office, the Environmental Protection Authority. Jurisdictional separations make it difficult to identify and monitor investments that affect forests. While forest investors must submit a Forest Management Plan to the Ministry of Agriculture as part of their application process, only those projects that fall within the forestry sector require these approvals. Agricultural projects that involve forest clearing are seldom reviewed by forestry officials.

Integration across agencies is further hampered by financial benefits that are granted to those who succeed in attracting foreign investors. Regional actors have incentive to attract and retain foreign investors to their districts because it allows them to compete more effectively for scarce regional development funds for infrastructure improvements that bring status and additional economic development opportunities (142, government worker). There exist a number of financially unattractive aspects of forest sector investment in Ethiopia, but foreign investors are perceived as having securer rights in comparison to domestic investors, giving them a comparative advantage:

> *There is unwillingness on the behalf of domestic investors to invest in forest resources for a number of reasons: length of time for return on investment, insecure land tenure, disputes with local people, problems in the courts because judges and police are subject to bribes. [Foreign investors are less vulnerable to these problems because] their interests are more visible* (140, scientist).

Challenges associated with routine bribing of officials were also mentioned in conversations with community members. The effects of foreign investors on these dynamics are uncertain. On the one hand, foreign investors could bring about increased transparency in enforcement and on the other they could aggravate the climate of

corruption if they participate in bribes. In the next section I outline additional challenges and opportunities related to foreign investment in forests.

3.2.2 Forest Investment Challenges and Opportunities

Formally recognized private foreign investment in Ethiopia's forestry sector, defined here as activities involving afforestation, reforestation, and non-timber forest product market development, is currently limited. Of the handful of foreigners who made inquiries about investment opportunities to a government forestry official over the past few years, only one was moving forward with developing a business plan and securing appropriate permissions (141, government official). Concerns about feasibility, human resources, security of long-term lease arrangements and perceptions of political instability are commonly raised by foreign investors. The lack of investment is rooted in ecological, socio-economic and institutional challenges outlined briefly below (Table 3.1) and expanded upon in section 4. These challenges combine to create a climate of uncertainty surrounding forest investment that favours illegal conversion of forested lands to agriculture by government actors, large-scale investors and rural people, threatening the livelihoods of households living at the forest-farm interface and limiting future afforestation and reforestation possibilities.

Table 3.1: Challenges to forest management and investment in Ethiopia

Ecological	Socio-economic	Institutional
Lack of knowledge & probable high expense of native tree propagation & establishment Lack of clear guidelines for native vs. exotic replanting obligations Increased pressures on forest from land degradation, shrinking farm size & reduced grazing land Forest fragmentation	Unclear tenure arrangements and boundaries Lack of economic diversification Lack of funding for forest management Human resettlement driving land conversion & new land use practices Ethnic tension Currency inflation	Competing jurisdictional authority over activities affecting forests Weak enforcement capacity Political inferiority of forestry to agriculture Inexperience in enforcing reforestation regulations Unclear reporting requirements

Source: Author's fieldwork (Deininger et al. 2011)

The challenges described in Table 3.1 are additional to investment challenges common to most forestry ventures, including delayed and intermittent benefit flows, large capital outlays and dependence upon fluctuating markets (Bliss and Kelly 2008).

Ethiopia's Forest Development, Conservation and Utilization Proclamation encourages private investment in natural forests, outlining incentives such as tax abatement programs and low cost long-term land concessions. A more detailed implementation plan intended to serve as an investor guide may be published in 2011 (141, government official). Investors are allowed to harvest and process remaining timber, import processing equipment at a tax-free status, and establish timber plantations using exotic or native species at their discretion (129, forest investor). Specific lease agreements are negotiated between investors and local, regional and national government entities.

Some scientists envision increased foreign and domestic investment in Ethiopia's forestlands as a means to alleviate rural poverty and enhance forest ecosystem protection and function (Bongers and Tennigkeit 2010). The high demand for wood products in Ethiopia and neighbouring East African countries may justify increased investment in the forestry sector (Bekele-Tesemma 2007a), but conditions described in Table 3.1 have stifled investor confidence.

While a number of the challenges outlined above weigh heavily in the decision making processes of foreign investors, others may not enter into typical cost-benefit analyses. Project impacts that are perhaps least likely to be understood or acknowledged by investors pertain to the rights of rural residents. The invocation of under-exploitation and overexploitation narratives to describe forest utilization legitimizes foreign entry into these markets, a point I return to later in the paper. Evidence from the agricultural sector underscores three additional concerns pertaining to the broad affects of foreign investor presence on forests and forest-dependent communities:

> 1. Aside from low-skilled and low-waged jobs, foreign investment may not yield many direct benefits to the rural poor and may leave the poorest more vulnerable (Melese and Helmsing 2010). A recent global assessment of the impacts of conservation programs on poverty found that timber harvest rarely benefits the poor, and non-timber forest product programs have low impacts in terms of poverty reduction (Leisher et al. 2010).
>
> 2. Forced human resettlement remains an issue of concern (Hammond 2008). It affects relationships between people within communities, land use practices and socio-political mobilization.
>
> 3. Inadequate domestic markets for agricultural inputs, outputs and financial services, which may be the most important limiting factors to smallholder income growth, are not necessarily improved by the entrance of large-scale investors into a sector (Hazell et al. 2010).

Increased foreign investment is associated with economic development and poverty alleviation by many economists, development agencies and governments (Haile and Assefa 2006). The rationale that it will "contribute significantly to development-through the injection of capital, technology, management know-how and market access" (UNCTAD 2000) may not hold true for most rural people, particularly given the constraints surrounding free expression and market access (HRW 2010). In the following sections I elaborate upon the potential implications of increased foreign investment for rural livelihoods.

3.3 Communities at the Forest-Farm Interface

The forest-farm interface is the locus of investment attention in highland forests. This area is home to rural households with unique livelihood characteristics and benefit claims to forest resources that distinguish them from other agricultural households.

3.3.1 The forest-farm interface

The forest-farm interface is characterized by ecological, social and economic change. Defined here as the zone within or near forests occupied by smallholder farmers, the forest-farm interface is historically remote from markets and typically difficult to access (Fisher and Hirsch 2008). It often includes both *ambiguous lands*, or lands cultivated by people who do not have official use rights (Sato 2000), and legally cultivated lands. Households located within Ethiopia's forest-farm interface tend to be highly dependent upon forest resources for fuelwood, livestock grazing and building materials (Mamo, Sjaastad et al. 2007; Yemiru, Roos et al. 2010). I focus attention on these households because they are at the greatest risk of livelihood loss under foreign investment in highland forests.

Undisturbed highland forests represent a small fraction of remaining highland forests, estimated at 0.2 percent of the land area in the late 1990s (Reusing 1998). National Forest Priority Areas (NFPAs) were established in the late 1980s (Cheng et al. 1989) giving the government control over the bulk of the remaining natural forest stands, most of which are found in remote parts of the Gambella and Oromia regional states (Reusing 2000). Natural forests are managed by the government through a system of 58 NFPAs. Thirteen of these are managed under integrated forest management systems involving local communities. While most remaining forestlands are located within NFPAs, less than 10 percent of state forest boundaries have been officially mapped (Bank 2010), and boundary demarcation can be fraught with conflict.

According to an official in Ethiopia's Forestry Research Centre (FRC), investment will be directed towards 'abandoned lands' and places 'where forests are being cleared or encroached' (141, government official). This statement references the dual narratives of under-exploitation and overexploitation that are infused throughout discussions on natural resource management in Ethiopia. It also summarizes government rationales for land seizure in the lowlands and the highlands. Lands termed 'abandoned' are located mainly in the lowlands, where pastoral livelihoods predominate. Widespread use of land for seasonal grazing and shifting cultivation makes the categorizing of land as 'abandoned' questionable (Vermeulen and Cotula 2010; Cotula et al. 2009). Diffuse infrastructure and institutional influence in the lowlands exist in contrast to the more concentrated settlement and strong political networks found in the highlands. Here, processes of dispossession centre on claims that people are encroaching rather than that land is unused. Uncertainty over forest boundaries and the infusion of Northern conservation values creates the political space necessary for the government to remove encroaching farmers, thereby opening land for alternative uses.

3.3.2 Land Tenure

Land privatization is a topic of considerable dispute in Ethiopia (Crewett and Korf 2008; Ali, Dercon, and Gautam 2011). The government owns all forest and agricultural land, granting usufruct rights to citizens in the case of farmland and maintaining all management authority in the case of forestlands. Farmland cannot be bought or sold, but use rights can be transferred within families and people can lease their farmland for limited periods of time. Contemporary farmland distribution is the outcome of complex circumstances including tradition, allocation by the socialist Derg between 1974 and 1991, and local *kebele*-level (Peasant Association) decisions (Kebede 2002). Positioned at the centre of contentious debates preceding the May 2010 elections, land privatization was characterized as either the path to productivity and efficiency or as a neoliberal conspiracy aimed at depriving rural people of land rights (Kidan 2010).

Econometric studies in Ethiopia have not provided definitive evidence that tenure issues significantly affect people's land use decisions, or that most people consider their tenure status as insecure (Benin et al. 2005; Deininger and Jin 2006; Crewett and Korf 2008). Those who argue in favor of enacting policies to ensure more secure and transferable land rights tend to approach the issue from the question of how to increase long-term investments by farmers in their land (Ali, Dercon, and Gautam 2011) rather than examining the potentially harmful implications of formalizing land transfer rights for marginalized people. In the case of forests, access has been negotiated between local actors and the state in processes that have unfolded over decades. Peters (2009) describes such land relations as "open to interpretation…[and that] careful attention has to be paid to the specific meanings and constructions, including narratives and stories placed by different social actors on the principles justifying access, use, and control" (1322). This sentiment is central to concerns over the impacts of foreign investment in forestry on landholders located at the forest-farm interface.

3.4 Case Study Evidence

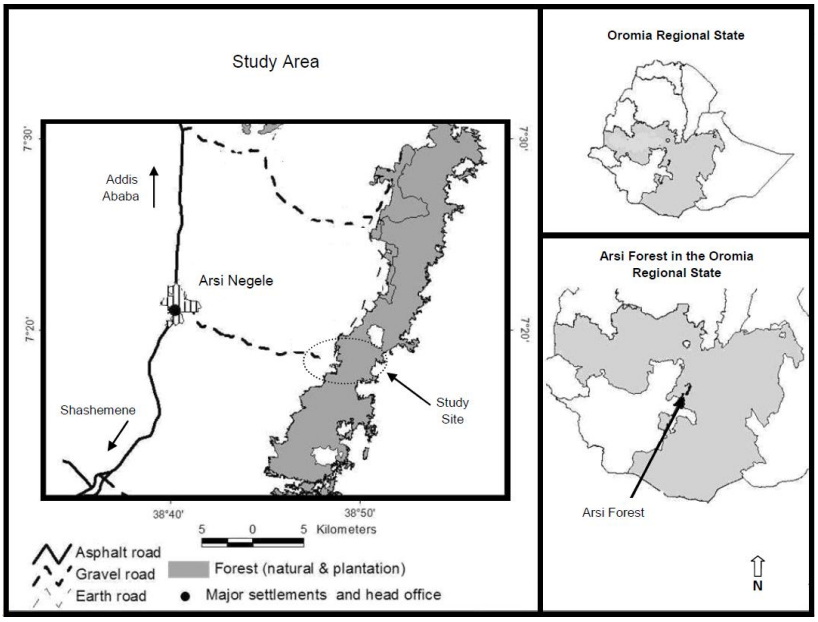
I provide evidence to describe historic and contemporary land use change and forest benefit distributions in a specific case. I investigate how these land relations inform contemporary resource rights in a community located at the forest-farm interface and emphasize the ecological, socio-economic and institutional challenges presented by the new tenure arrangements that would likely accompany foreign investment.

3.4.1 Boundaries of the Case

Case study evidence is based upon field research conducted in Ethiopia in September 2009-May 2010 and December 2010 in a community and an adjacent natural forest area managed by a government operated Forest Enterprise (referred to subsequently as the Enterprise). Data include open-ended interviews with purposively selected experts and community members, a household livelihoods survey, forest plot measurements, ethnographic field notes and secondary sources. The household livelihoods survey uses a stratified random sampling design and is based upon the USAID Famine Early Warning System's livelihood profile system (USAID 2008) modified to include non-marketed extracted forest resources. The household wealth ranking and historical timeline group interview is adapted from Laderchi (2005).

The forest area studied in the case covers approximately 1,220 hectares and is classified as upper wet broad-leaved Afro-montane rainforest. This area is part of a larger natural forest and plantation complex known as the Arsi Forest, which extends over 21,513 hectares, some 28 percent of which is plantation forest (Map 3.1). Natural forests persist largely in areas that are steeply sloped and difficult to access, while flatter areas have been converted to farmland (Poulsen 1973). The area has been inhabited by Muslim Oromo agro-pastoralists for over one hundred years. The forest and surrounding villages are located in a transition area between two agro-ecological zones,

known as the *Weina Dega* or *Baddaa Dareetti* (temperate, cool sub-humid highlands) located between 1,500-2,300 meters in elevation and the *Dega* or *Badaa* (cool and humid highlands) located between 2,300-3,200 meters in elevation (Aalbaek and Kide 1993). Primary crops include maize, potatoes and to a lesser extent, wheat.



Map 3.1: Study Site
Source: modified from Wondo Genet GIS Department, 2008

3.4.2 Historic Land Use Change

According to community elders, forests in the area under study extended 17 kilometres west to the town of Arsi Negele and some 20 kilometres south to the town of Kofele as recently at 70 years ago. These forests were punctuated by highland bamboo thickets, pastures and *chafas* (wetlands) which were used as seasonal grazing areas. Areas that have remained too wet for cropping comprise what is left of community grazing lands.

Forests were heavily exploited by Italian and Ethiopian sawmill operators during the reign of Haile Selassie (1930-1974). Forest concessions were granted by Emperor Haile

Selassie to military officials, religious institutions and patrons. Concessions contracted to sawmillers included mandatory replanting obligations, but regulations were not enforced and companies neglected to follow them (Poulsen 1973). The Chilalo Agricultural Development Unit (CADU), a joint Ethiopian-Swedish development program was established in the late 1960s and outlined their mandate as follows:

> *An area of forest roughly estimated at 100,000 ha. seemed to be disintegrating annually and the almost total elimination of all real forest from the country seemed probable within 30 years at the most. Against this background, the urgent forestry needs within the Project area seemed to be:*
>
> – *Protection and rational utilization of the remaining forests.*
> – *Increased reafforestation of erosion-prone slopes and other areas available for planting.*
> – *Improved wood utilization (Poulsen 1970:3)*

This approach is consistent with the sentiments expressed in the quote by the Ethiopian Government and UNFCCC cited earlier in this paper. Both invoke under-utilization and over-utilization narratives in calls for heightened protection from anthropogenic destruction and greater efficiency and productivity in forest use.

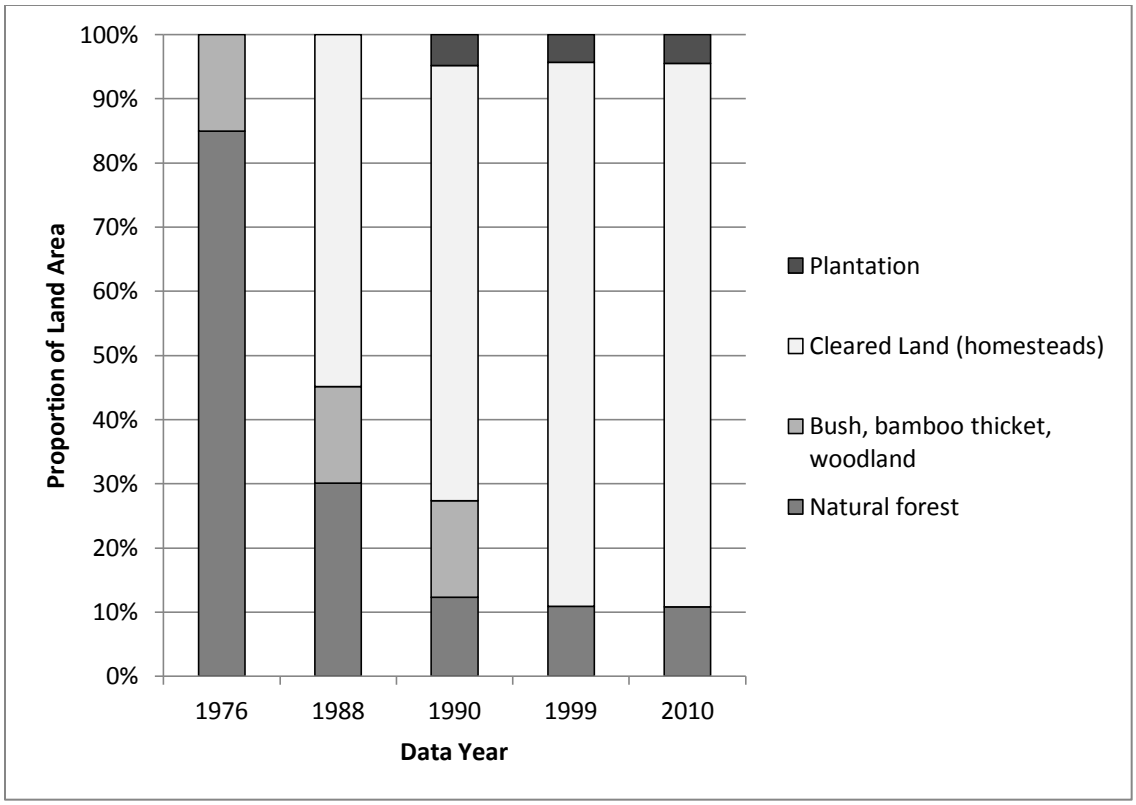


Figure 3.1: Land use change within a 141,976 hectare forest area, 1976-present

Sources: MoA 1990; Didha 2008. Notes: 1) Land cover estimates of "Bush, bamboo thicket, woodland" are carried backwards from 1990 figures as placeholders; actual pre-1990 figures are unknown. 2) The area includes the study site as well as lands that today are under the jurisdiction of different kebeles.

A dramatic conversion of natural forests to farmland occurred in the study area between 1976 and 1988 under the Derg regime (Figure 3.1). During this period, every household was granted a small farm, usually around two hectares, based in part on household size. At the same time, additional organized timber harvesting was undertaken by the Enterprise with technical assistance from the Swedish government. Timber felling was guided by a prescription that called for the conversion of 87 percent of the natural forest to plantation forest for state revenue generation and for the

implementation of restoration and conservation activities on the remaining 13 percent of the forest (MoA 1990).

A forest management plan developed by Swedish consultants divided the natural forest into management units or blocks and established a series of 'working circles' based on forest cover, slope and access (Table 3.2). In 1990, the project produced over 2 million seedlings, targeting approximately 2,000 ha annually for replanting. Insufficient revenues to execute the plan drove overharvesting of standing native timber to make up for account deficits and led to the eventual halt of plantation development. Over 15,000 hectares of plantation were established in the Arsi Forest by the 1980s, but none of the natural forest improvements outlined were realized. While they provided part of the original rationale for forestry engagement in the area, restoration and conservation objectives were not implemented, providing evidence of previous use of conservation language (narratives of overexploitation) to legitimize resource dispossession.

Table 3.2: Natural Forest Working Circles in Study Site (1990)

Block #	Working Circle Type (ha)							
	Reforestation	Wildlife	Protection	Selection	Natural Forest Improvement	Bamboo Development	Nature Reserve	Total
7	6455	0	0	0	0	0	0	6455
8	5455	0	344	374	548	0	0	6722
9	6138	0	0	337	374	0	0	6849
10	4073	0	788	366	1125	0	0	6352
11	7339	0	0	0	0	0	0	7339

Source: Adapted from MoA 1990

Plantation harvests have accelerated into the 2000s as seedlings planted in the 1970s have matured, leading to significant revenue generation. The success of the program led to the establishment of additional Enterprises in other parts of the Oromia Regional State, effectively expanding state revenue generation (Table 3.3). The Enterprise contributes to a range of community development projects such as school and clinic construction in kebeles that border plantation and natural forests. They have engaged in efforts to increase farm incomes through Eucalyptus seedling disbursements and the provision of supplementary agricultural extension services and are currently exploring options for devolving some natural forest management authority to communities. Still, the vast majority of revenues generated from the plantation and natural forest bypass the communities that live near them.

Table 3.3: Extent (ha) and Value (£) of Forest Enterprise Landholdings, 2010

Name of Enterprise	Concession area (ha)				Estimated Value (£)
	Plantation Forest	Natural Forest	Bare Land	Total	
Arsi	15,162	186,690	32,800	234,652	26,269,000
Bale	3,483	248,536	185,089	437,108	26,957,700
Borena-Guji	6,389	97,215	106,175	209,779	18,287,680
Addis Ababa	22,036	16,694	4,174	42,904	7,981,870
Hararge	4,958	10,278	21,183	36,419	6,464,500
Ilubabor	4,446	359,862	6,936	371,244	38,993,800
Jimma	8,948	181,792	36,525	227,265	34,212,670
Wallaga	10,405	100,527	75,436	186,368	15,403,750
Total	**75,827**	**1,201,594**	**468,318**	**1,745,738**	**174,570,970**

Adapted from: Oromia Forest Enterprise 2010

3.4.3 Forest Regulations and Enforcement

In this section I describe the historical basis of current access claims and the selective nature of regulatory enforcement. Discrepancies between ownership claims on paper

and in practice can be traced from the present back to the early days of Amhara rule in the region. Inconsistency in enforcement also appears to have a long history, positioning regulations as secondary to ongoing processes of negotiation over forest access in the context of changing social relations.

Following conquest of the Arsi area at the end of the 19th century, forests became the property of the state (Table 3.4). Concessions of land, with accompanying rights to local labor, were granted by the Emperor primarily to Amhara military officials, widows and other outside elites (Poulsen 1973). While the army and police were summoned on numerous occasions (as recently as spring 2010) to enforce access restrictions, benefit distributions represent a chain of less contentious interactions between the state, outside elites and local people. Specific regulations governing forest access have remained relatively uniform (Table 3.4), though enforcement has varied dramatically over time.

Table 3.4: Forest regulations and governing bodies in Arsi Forest, 1930-present

Regime	Forest Regulations	Arsi Forest Governing Institution
Haile Selassie 1930-1974	Forestlands the property of the Emperor. Hunting days set by the government. Permission required for grazing, wood collection and other activities. Concessions granted at Emperor's discretion.	Imperial Court
The Derg 1974-1991	Forestlands the property of the State. Written permission required to hunt, settle, fell trees, collect, load or transport any forest product, graze cattle and remove resources from the forest. Exceptions include taking fallen branches, leaves, bark, setting beehives or harvesting honey.	Munessa-Shashemene Integrated State Forest Development and Utilization Project, the Chilalo Agricultural Development Unit (CADU)
Ethiopian People's Democratic Republic Front (EPDRF) 1992-present	Forest development encouraged. Permission required to cut trees, settle temporarily or permanently, graze domestic animals, hunt, carry cutting saws and tools used for cutting trees or extracting honey.	Arsi Forest Enterprise

Reports indicate that while the state made early claims to forest resources, the reach of their authority has been moderated by local entitlements. In the early days of Swedish involvement in the forest area under study, project leaders identified a need to establish formal forest boundaries. The Forestry Department sent a team of surveyors to the study site, who were met in the following manner:

> *The team found itself faced by a hostile population and returned almost immediately to Addis Ababa without having achieved anything…Neither the local forestry commissioner, nor the guards stationed in the forest, knew anything about the boundaries, or if they knew they were unwilling to pass on the information* (Poulsen 1973:10-11).

This anecdote highlights the ill-defined nature of many access claims. While few may have questioned the state's right to levy taxes, further steps to establish a formal presence in the area and exert additional controls over resources were met with resistance.

During initial government efforts to establish plantations in the 1970s, seedlings were uprooted by locals or trampled by livestock. Armed military were brought in to guard plantations until local people eventually accepted them. Plantation establishment was one aspect of the work of the Chilalo Agricultural Development Unit (CADU), spearheaded by the Swedish government via its aid agency SIDA. Political scientist and historian Dessalegn Rahmato describes the problematic nature of some of this work:

> *[T]he most serious failure of the project lay in the social consequences of its activities in Chilalo. In the first place, the main beneficiaries were the more prosperous peasants and those with secure tenure arrangements. The poor and a majority of the tenantry benefited the least. The issue of social equity came to weigh heavily on the main donor, Sida, which exerted considerable effort to have the government pass legislation to relieve the burden of those with unsecure tenures who were unable because of it to benefit from CADU programmes. Secondly, considerable peasant evictions from the land took place in the area particularly in the period when CADU was most active and when its programmes were beginning to pay off. Thirdly, the package of innovations offered to the participating peasantry was highly dependent on external economies, and consequently, from a cost-benefit point of view what was achieved would not in the long run be worth the cost or sustainable (2009, 57).*

Contemporary community members describe regulations as being tightly enforced under the Derg and loosely enforced under the current regime. The tight enforcement of forest access restrictions by the Derg was viewed positively by interviewees in hindsight. In a timeline exercise conducted with community elders, interviewees described the early days of the Derg as a time of abundance, as exemplified in the following quote: "At that time people were afraid and the Enterprise was keeping the

forest well. Many people used the forest for production of honey and the people said 'the forest is our shade' so it should not be touched." Another interviewee stated: "the forests were full and wide and every species was present. I used the forest for farming equipment and grasses…all people were keeping the forests, even elders and youth" (116, Community Elder). These quotes reveal that actors actively used forests in ways that did not, in their perceptions, conflict with a climate of rigid enforcement and that they saw themselves as forest managers and stewards. When examined in the context of diminishing natural forests shown in Figure 3.1, the memories of abundance in the late 1970s were also perhaps strongly shaped by higher forest cover and lower human population densities that characterized the region at the time.

Today, plantations are considered well guarded in comparison to natural forests. With the exceptions of limited grazing and periodic access to slash from plantation thinnings, plantation production feeds urban rather than local markets. Community forest product consumption goes largely unregulated in natural forests. Higher order offenses such as timber harvest are sometimes brought to the attention of local police, but rarely result in legal convictions. Corruption, insufficient manpower, a lack of commitment, authority and politicking are all cited as undermining factors. The subjectivity of regulatory enforcement contributes to a sense that forest access is politically and socially negotiable.

Changing values and policies also shape perceptions of resource rights. When asked about the selective harvest by local people of one species (*Podocarpus falcatus*) for fuelwood, a guard explained that during the Derg, the government wanted to eradicate large indigenous trees as part of its plan to convert the natural forest to plantation. People were informally permitted to cut large indigenous species and over time came to believe that this was their right (118, Forest Guard).

Enforcement of forest regulations involves a range of actors with different levels of authority (Figure 3.2). Local forest experts identified what they saw as challenges to effective enforcement at different levels of government, and their responses are shown under the heading "Challenges" in Figure 3.2. Inattention to forest regulatory enforcement is emphasized throughout. Forest protection is a common rallying point in political speeches and community events, but it rarely leads to substantive action. Forest guards expressed frustration at the weak enforcement by government officials: "Officials are afraid to enforce regulations because they don't want to harm their standing in the community or their chances of re-election" (118, Forest Guard). This quote exposes the political nature of enforcement, and reveals the tension between rhetoric and action. Leaders routinely advocate for forest conservation while simultaneously working to maintain their identity as egalitarian men of the people.

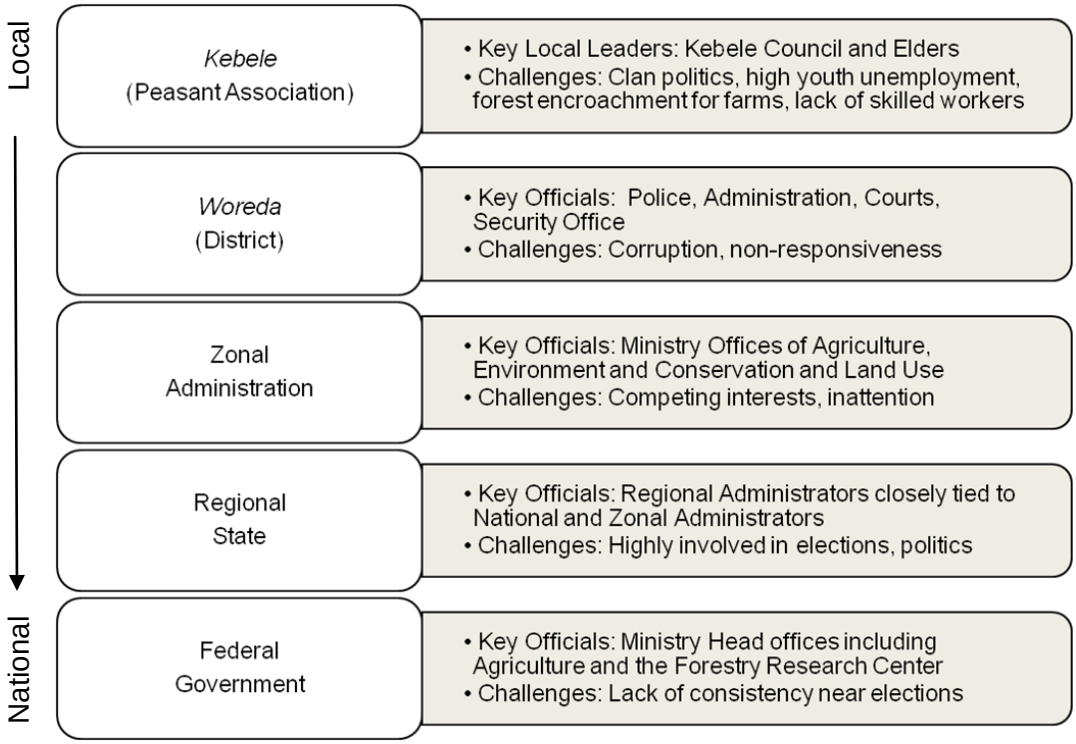


Figure 3.2: Government entities involved in forest regulation enforcement, Arsi Forest
Source: Author's fieldwork

Enforcement patterns noted here also reflect broader trends relating to forest management. In addition to the general willingness of the state to proceed with forest exploitation before specific rights and responsibilities have been detailed, the difference between regulations on paper and in practice shows how forest access is negotiable between actors over time.

3.4.4 Forest Benefit Distributions

In this section I turn to an investigation of forest benefit distribution from the 1880s to the present. I provide a general overview of the benefits, beneficiaries and effects of forest exploitation in the study site. Beneficiaries are divided into three broad categories: the state, outside elites and local people (Table 3.5). While these categories are inherently limiting since they are comprised of individuals who are heterogeneous and hold a range of entitlements and capabilities, this framing provides a coarse-grained lens through which I assess forest benefit allocations.

Table 3.5: Selected Benefits, Beneficiaries and Effects, 1880s-2010

Decade(s)	Benefit	Beneficiary	Other Effects
1880s-1930s	Forest requisition	State	Marginalization of local people
1940s-1960s	Ability to grant land & labour to elites	State & Outside Elites	Social tension; Marginalization of local people
1940s-1970s	Post-harvest replanting requirements not enforced	Outside Elites	Accelerated land conversion; changing forest composition
1970s-2010	Ability to collect fuelwood, timber, graze livestock and hunt (intermittently granted)	Local People	Uncertainty regarding rules and regulations; seedling regeneration inhibited; changing forest composition
1980s	Ability to harvest native timber and convert forest to plantation	State	Accelerated land conversion; changing forest composition
1990s-2010	Forest converted to farmland	Local People	Accelerated land conversion

Benefits include the myriad ways in which actors and institutions are able to access forest resources, ranging from timber harvest to outright forest conversion for agricultural uses. Some benefits constrain other actors or institutions, some may serve as compensation for other lost benefits and most exact costs on the forest resource. Benefits take a variety of forms, and have a range of social, ecological and economic impacts. Reinvestments in forests have been limited to nonexistent.

Foreign investment will likely have broad-reaching effects on existing forest benefit distributions (Table 3.6). These effects will be felt differently among different actors, some bringing direct livelihood impacts as in the case of restricted grazing and fuelwood collection for local people.

Table 3.6: Effects of new tenures on forest benefits, 1940-present

New Tenure Effects	State	Local People	Outside Elites
Historic Benefit	- Timber harvest & sale - Ability to grant land to patrons	- Wildlife hunting access - Medicinal plant harvest - Religious worship	- Timber concession receipt
Benefit likely to change	- Receipt of bribes - Ability to grant access to locals	- Agricultural land conversion - Fuelwood collection - Construction material harvest - Livestock grazing	- Illegal timber harvest - Inexpensive fuelwood availability
Benefit unlikely to change	- Receipt of plantation revenues - Receipt of hunting permit sales	- Access to beekeeping sites	- Plantation wood product availability - Recreational wildlife hunting access

Sources: MoA 1990, author's fieldwork

Historic benefits refer to benefits that existed largely in the past and are either less prevalent or no longer relevant today. In the case of wildlife hunting, the practice persists among local people, but in negligible numbers. Local people do not obtain permits for hunting, in contrast to outside elites, who participate in regulated trophy hunting that generates state revenues. This activity could continue under new investment schemes. Predicted lost benefits to local people under increased foreign investment scenarios represent a substantial loss. When compared to potential benefits associated with foreign investment such as land lease payments, royalties, stumpage fees and other incomes, the losses borne by the state are small, mainly consisting of the political power they forfeit in ceasing to grant local people informal access to forest

resources. The payment of bribes to checkpoint guards, police and judges is common. The former occurs as forest products are transported along main roads and the latter two occur when suspected violators, caught by guards, want to avoid punishment. Bribes will likely continue, possibly shifting from the courts and checkpoints to other recipients. The primary benefits that accrue to outside elites are provided through the availability of wood through plantations and fuelwood sales. The former will be unaffected by new investments.

3.5 Community Forest Benefits and the Potential for Conflict

The forest area under study provides the state, outside elites and local people with a range of benefits. This section details the contribution of forest resources to household livelihoods and explores the effects of forest tenure change on local communities. I describe events from a recent forest boundary demarcation exercise in the area and consider the potential for conflict that might accompany tenure changes.

3.5.1 Household livelihoods and forests

Data from a household livelihood survey highlights attributes of different wealth groups as they relate to forest benefits (Table 3.7). Household attributes vary in terms of average land and livestock holdings, which affect things like crop production and the ability to withstand periods of livelihood stress associated with drought, crop failure or currency devaluation. All wealth groups rely on forests to supplement their livelihoods. Forest products provide households with livestock grazing land, homestead sites, fuelwood, building materials and other non-timber forest products. Fuelwood sale is a primary means by which households in the study site generate cash income. Fuelwood demand in the area is high due in part to a thriving alcohol distillation industry in the nearby town of Arsi Negele. Households with donkeys are able to capture more revenues from fuelwood sales due to their ability to obtain higher prices closer to market, to sell larger volumes of wood, and reduce transportation costs.

Table 3.7: Attributes by Wealth Ranking in Study Site, 2010

Household Attribute	Household Wealth Rank				Weighted Mean
	Very Poor (6%)	*Poor (28%)*	*Medium (54%)*	*Better-off (12%)*	
Mean age of household head	43	37	49	41	44
Female-headed households (%)	33%	0%	0%	0%	3%
Mean number of people per household	6.8	8.1	11	12	10
Mean landholding size (ha)	0.3	.9	1.2	1.4	1.0
Mean Tropical Livestock Units[5] (TLUs) per household	1.38	1.09	6.15	8.44	4.7
Mean staple food expenditures as a % of mean total income	31%	24%	22%	10%	22%
Mean fuelwood income as a % of mean cash income	78%	62%	36%	25%	45%
Mean number of donkeys per household	0.7	0.9	1.25	1.5	1.2

Source: Author's fieldwork

Fuelwood accounts for 45 percent of mean household cash incomes in the community under study. Studies in other parts of Ethiopia have found comparable forest incomes as a percentage of total household cash incomes, at 39 percent in central Ethiopia (Mamo, Sjaastad, and Vedeld 2007), 27 percent in northern Tigray, (Babulo et al. 2009) and 34 to 53 percent in the Bale Mountains (Yemiru et al. 2010). Interviewees described a social shift that has occurred in recent years in which the sale of fuelwood had

[5] A tropical livestock unit is equivalent to roughly 250 kilograms of live animal weight. I use the following animal conversion factors: cattle = 0.7; oxen = 1.0; donkey = 0.5; horse = 0.8; sheep = 0.1; goat = 0.1; chicken = 0.01 (Jahnke 1982; FAO 1987)

become less stigmatized. While formerly only widows and the very poor would collect fuelwood for sale, now it is more common among all wealth groups. Female-headed households and women who are their families' primary income earners are particularly dependent upon fuelwood collection as a relative contribution to household income (Table 3.7) due to small landholdings, their inability to plough fields and a lack of alternative income sources.

3.5.2 Forest Access Change and Conflict

New restrictions on forest access will compromise the ability of households to meet their livelihood needs. These restrictions come into play as new values arise from forests, such as ecotourism revenues, plantation establishment, or carbon payment programs. Access restrictions can incite conflict between communities and those who enforce restrictions. Disputes that occurred over a 2009-2010 forest boundary demarcation provide grounds to explore these dynamics.

Demarcation, or the re-establishment of forest boundaries by the state, reaffirms state claims to authority over forest benefit distributions. Homestead establishment represents a permanent claim over forest resources by households. Conflicts with local communities over homestead and farm encroachment have arisen during each demarcation over the past four decades. State response has been to reduce the size of the natural forest area by varying degrees to accommodate new farms. Due to a combination of cumulative forest loss and emerging values and revenue streams associated with ecotourism, conservation and ecosystem service payments, officials are currently less likely to consent to new homestead claims. In 2009 they elected to demolish and replant forest on homesteads that had been erected in forest areas since the previous demarcation activities of 1999.

The process of demarcation involves the assessment of the forest boundary markers and verification of land use at established points. After an initial visit, a second visit is scheduled during which boundaries are confirmed, additional data collected, meetings held. Houses and fences are demolished later by Enterprise workers in the presence of the Ethiopian military (Photos 3.1-3.2).

Photo 3.1: House Demolition within Natural Forest Area

This photo was taken immediately following the demolition of a homestead. Household possessions are bundled in the foreground and roofing, fencing and other building materials are piled in the mid-ground. A native Podocarpus tree is shown in the centre background.

Photo 3.2: Boundary Marking

Following discussions, a forest guard marks a remnant Croton macrostachyus tree in the midst of crops to demarcate the official natural forest boundary

A demarcation exercise conducted by the Enterprise, local government authorities and the Ethiopian military from the winter of 2009 through the spring of 2010 revealed that 54 households (eight percent of all households in the community) had expanded their farms or established new homesteads (ranging in size from 0.25 to 11.25 hectares) within the boundaries of the natural forest area under study.

In March 2010, demarcation activities resulted in violent conflict in a community adjacent to the case under study. A group of five managerial staff and 43 guards and day laborers from the Enterprise accompanied by six members of the Ethiopian military arrived at a site to prepare already cleared areas for tree planting. An estimated 2,000 members of the local kebele descended upon the Enterprise employees with sticks, rocks and traditional spears, leaving the military untouched. One man was hospitalized

and many sustained broken bones, cuts and other injuries. Planting activities were halted and a series of community meetings followed.

The community, Enterprise and government authorities are still negotiating a resolution to the conflict. Community grazing land located in a different part of the kebele was identified by the government as a relocation site for households with no other landholdings. Eight months later, in December 2010, most of the households had returned to the forest plots because of superior soil conditions for cropping. The decision to divide community grazing land to provide homestead plots to forest encroachers was made by the government and had complex economic and social implications for local communities. When asked about this process, an elder responded:

> *Why do you ask this question? We do not agree. The government is powerful. We are afraid. We have attended many meetings and separated without resolution. Our alternative is to educate our children for government work.* (122, Elder)

Access claims described previously in the case emphasize negotiation between actors, but local people have little recourse when higher level authorities are determined to enforce restrictions. Peasant-state relations have been described as characterized by "political marginalisation, heavy state intervention and highly extractive relations between state and peasants" (Milas and Latif 2000, 363). An argument repeatedly voiced against resettlement on community grazing land asserted that the land was slated to be the future site of a mosque and school, representing an appeal to officials' higher religious and familial values, though this was not successful. The focus of violence on Enterprise employees while community members assiduously avoided harming military personnel exposes the limits of dissent. In effect, households were saying to Enterprise workers, who are for the most part neighbors living under shared circumstances, "how can you deny us our basic subsistence rights?" Aside from other

challenges that would have likely ensued had people attacked soldiers, their moral claims would not have resonated with the same force. These limits to protest may be even more strongly felt as foreign investors enter contested spaces. Given the preferential protections afforded foreign investors, local claims to forest resources may be further marginalized as economic interests come to supersede historically negotiated value-based claims.

Peluso and Ribot (2003) point out that 'States often manage people as subjects to whom privileges, rather than rights, are to be delegated' (p. 163). Household-level forest benefit claims are rooted in customary and historical access to forest resources and local rights are woven into understandings of what constitutes legitimate use. These are increasingly threatened with the emergence of new revenue-generating opportunities in forest areas. Informal forest benefit distributions are not guaranteed since rights were never formally devolved, leaving local people disadvantaged as they attempt to assert their access claims.

3.6 Discussion

Evidence from the case reveals two broad areas of concern regarding increased foreign investment in forests. The first area pertains to the widespread clearing of forests for agriculture that is not subject to appropriate scrutiny. The impacts of this trend are significant in terms of effects on local livelihoods, forests, and potential future engagement in forest-based activities. The second area relates to the diminishing ability of local people to make livelihood claims in the face of new tenures that draw their legitimacy from markets rather than local values. The scope of the impact of foreign investment in forestry is currently small. However, when broadened to incorporate impacts of agricultural investments and potential future investments in forest-based emissions reduction programs like the Clean Development Mechanism (CDM) and

Reducing Emissions from Deforestation and Forest Degradation (REDD), potential effects on household livelihoods are tremendous. The “foreignisation of space” (Zoomers 2010:433) holds few certain benefits for rural people. Narratives of under-exploitation and overexploitation that have legitimized domestic and foreign interventions into rural livelihoods have veiled contradictory policies and facilitated forest benefit transfers to the state and outside elites.

Foreign investment in highland forests will affect rural livelihoods, due to the interconnected nature of forest and agricultural incomes at the forest-farm interface. As noted in studies on the devolution of forest management from the state to rural people, calls for democratic institution-building can be problematic in the context of institutional climates that do not hold ‘inclusion and equity as goals’ (Becker 2001, 506). Competition between elite actors over resources stifles cooperation and the development of transparent policies governing land tenure and investment (Gatzweiler, Reichhuber, and Hein 2007). These realities mean that institutions capable of and interested in protecting rural livelihoods and access claims will likely not materialize without significant pressure from individuals and organizations with power to leverage change.

The socio-political nature of access claims and enforcement highlights the need for a formal process to establish livelihood claims and articulate workable tenure arrangements at the community level. This process should also institute more transparent application, approval and monitoring protocols for all land investments that affect forests. As resources become more limited and as new markets evolve to generate revenues from them, rural livelihood claims tend to be weighed in the context emerging value systems rather that the ones in which established claims have evolved. Equity considerations mandate that the narratives and histories that have shaped access

claims are documented so that rural people and advocates can make comprehensive resource rights claims.

Chapter 4 - Land Use, Livelihoods and Deforestation: Connecting Case Study Evidence to Global Narratives

Kathleen Guillozet and John Bliss

4.1 Introduction

> *Most tropical deforestation results from trees being chopped down to generate space for crops and cattle. Reducing deforestation therefore means slowing down the expansion of agricultural land into forests…Are we then facing an unpleasant choice between 'conserving the forests' and 'feeding the hungry'?* (Angelsen 2010, 19639)

As exemplified above, development agencies, governments and popular media often frame rural poverty and forest loss within the scales of household, community and forest. A comparatively small contingency of geographers and social scientists emphasizes the need to examine drivers of poverty and deforestation that extend well beyond these local levels to include: national and global politics (Hecht et al. 2006), history (Sivaramakrishnan 2000; Leach and Mearns 1996) trade and agricultural policies (Wunder and Verbist 2003; Larson and Bromely 1991; Schmook and Vance 2009; Dauvergne and Neville), state expansion (Angelsen 2001; Scott 2009), globalization (Nygren 2000; Grauab, Aidec, and Gasparrid 2005), urbanization (Browder 2002; DeFries et al.), market privatization (Rudel 2007; Klepeis and Vance 2003), and subsidies (Hecht 1993; Margulis 2004). Despite compelling evidence that rural poverty and deforestation are linked to local, regional and global political and economic systems, simplistic narratives that cast smallholder farmers as the primary agents of deforestation persist. Lambin et al. (2001) critically assess the premise on which these narratives are founded, asserting that they promote "prevalent worldviews, [suggest] simple technical or population control solutions, and may serve the interests of critical groups" (262). They warn that these narratives lead to erroneous findings because they "rest on generalised models of change which may be insecurely linked to the large body of case study reports in the literature. Global scale assessments may therefore conflict with the findings of micro- or meso-scale data sets which, because they are specific to time and place, do

not impact on the global debate" (262). This chapter addresses the following question that flows from Lambin and Meyfroidt's observations:

> How can micro and meso-scale data sets better contribute to global debates on poverty, food security and deforestation?

These global debates span a range of issues, from macro-scale concerns over land use change to micro-scale questions of household economy. This diversity makes it difficult to retain a focus on all relevant scales. As described further in the next section, political ecology studies that examine the production, distribution and marketing of specific commodities illustrate an approach to linking macro and meso scale factors to local realities. Global change scientists draw relationships between land use change trends to national and international trade and income flows. I draw from each of these approaches in this paper.

A key challenge to broadening poverty reduction and environmental conservation narratives lies in moving beyond the trappings of familiar explanatory logics. Livelihood-centered research tends to reference macro-scale concerns as background and then shift to focus on household or community level interventions (e.g. Ansoms and McKay 2010). In contrast, studies that focus on the production of specific export commodities, such as coffee and cotton, effectively link local case studies to macro-level processes that produce inequality (e.g. Bassett; Richardson 2010; Valkila 2009; Bacon et al. 2008; Jaffe 2007). They accomplish this by tracing the webs of relations that facilitate the transfer of economic benefits from producers to outside actors and corporations. Global change scientists present another powerful mode of inquiry by projecting near-future implications of different land use scenarios in combination with economic and policy data. For example, Liu et al. (2008) illustrate that while climate change may actually lead to increased overall crop yields in Ethiopia, distribution effects and limited foreign exchange in combination with population growth may lead to an overall increase in hunger and malnutrition. This approach exposes flawed narratives and encourages

scientists and policymakers to incorporate data in their analyses that speak to a broader range of factors. Lambin and Meyfroidt (2011) examined policies and economic trends in countries that have experienced overall increases in forest cover and agricultural production in recent decades. They identified four mechanisms through which the effects of economic globalization intensify local land use change: displacement, rebound, cascade, and remittance effects:

1. Displacement or leakage occurs when policies or practices shift land use change to another location. For example, when forest conservation in one area drives forest exploitation in another area.
2. Rebound occurs when innovations and efficiencies drive overall increases in consumption patterns. For example, when improved crop yields allow a farmer to purchase or lease more land for cultivation.
3. Cascade effects are "chain[s] of events due to a perturbation affecting a system" (3468). For example, when local, regional or global policies drive crop substitutions from staple crops to biofuels, with multiple effects on livelihoods and land use, often at multiple scales.
4. Remittance effects are associated with labor outmigration. When household members leave their homes to work elsewhere, local land use patterns shift, sometimes leading to reduced farming activity and natural forest regeneration. Household members who remain behind, (often women, children and elderly) become dependent upon cash remittances, and grow increasingly tied to markets and external incomes.

These four mechanisms call into question the fundamental assumptions made by donors and development agencies; namely, that poverty and environmental degradation are primarily the result of land use inefficiencies that can be rectified through agricultural intensification and enhanced market connectivity. Lambin and Meyfroidt's focus on countries that have experienced overall increases in forest cover and agricultural production is the converse to our case. In Ethiopia's experience, as is the case with a number of nations in sub Saharan Africa, declining forest cover and low agricultural production are the norm (Taffesse, Dorosh, and Asrat 2011). I am interested

in exploring whether the inclusion of micro and meso-scale data illuminates new policy alternatives.

4.2 Background

I begin by exploring recent poverty reduction – environmental conservation framings. I describe the shift among conservation organizations and governments from an emphasis on poverty-conservation programs in the 1980s and 1990s to an orientation towards carbon sequestration and smallholder farming. This shift reflects emerging concerns over climate change and food security while retaining the focus of intervention on rural households and communities, rather than on broader politico-economic institutions.

Reducing human impacts on forests, in particular the impacts of rural people who live at the forest margins, is central to the work of many conservation NGOs and development agencies operating in the global South (Gorenflo and Brandon 2006; Fisher and Shively 2005). Approaches have taken a number of forms over the past few decades. Most notably, they have sought to involve rural people who live at the forest-farm interface in different forms of community-based conservation, including: forest buffer zone livelihood enhancement programs (Wells and Brandon 1993; Prins and Wind 1993), ecotourism and "people and parks" campaigns (Brandon 1995), integrated conservation and development projects (Alpert 1996; Niemark and Hough 2000), eco-agriculture (Scherr and McNeely 2007; Gorenflo and Brandon 2005; McNeely and Scherr 2002), forest certification schemes (Klooster 2005; Jaffee, Kloppenburg Jr, and Monroy 2004) and ecosystem service payments (Turner et al. 2007). These approaches each have their advocates and critics[6], but generally speaking have not delivered desired levels of poverty reduction and forest conservation. Common reasons include insufficient local

[6] See (Naughton-Treves, Holland, and Brandon 2005; Schwartzman et al. 2010) for successes, and see (Zhouri 2004; Chapin 2004) for failures.

involvement and authority, patriarchal approaches, inadequate planning and field testing and a lack of attention to larger scale factors like logging, mining and industrial agriculture (Sunderland, Ehringhaus, and Campbell 2007).

More recently, conversations have shifted to include emphases on climate change and food security. In place of conservation-oriented appeals, the climate-mitigating potential of forests has become their primary selling point (O'Connor 2008). Programs such as Reducing Emissions from Deforestation and Environmental Degradation (REDD) have captured the attention of policymakers and conservationists because of their potential to serve as "win-win" solutions to poverty and climate change. However, REDD poses a threat to local economies and food security by locking up large areas of forestland that might otherwise contribute to livelihoods (Negra and Wollenberg 2010). Policymakers have raised these concerns in the aftermath of the 2008 global food crisis, when average food prices increased by 43 percent[7], plunging millions of smallholder farmers into deeper levels of vulnerability and poverty (USAID 2009). Researchers and popular media further link these events to national security, connecting the "Arab spring" of 2010-2011 to food price hikes and climate change (Johnstone and Mazo 2011; Brown 2011). The outcome is a growing focus on smallholder farmers in order to promote food security while "protecting biodiversity, promoting sustainability and advancing equity" (Alliance for a Green Revolution in Africa 2009, 2). Major funders advertising this approach include the Bill and Melinda Gates Foundation (Gates 2011), the United Nations, USAID and the World Bank (Lawder 2010). As exemplified in the words of the United Nations Environment Program's Executive Director, smallholder farmers are increasingly viewed as "an 'untapped resource' in addressing food security and today's environmental challenges" (UN News Centre 2011).

[7] See Appendix 2 for Maize, Potato and Wheat Prices in Ethiopia between 2000-2008.

This focus on smallholder farmers requires scrutiny because it diverts attention away from macroeconomic factors, arriving at a time when "the extension and deepening of the logics of capitalism to new geographical and ecological areas of the planet appears to be unprecedented" (Newell 2011, 6). Food security is the outcome of availability, access and utilization (Sen 1984; Lobell 2011). Food prices, which affect access and utilization, are primarily determined by factors such as global production levels, climate volatility, and trade policies (Hertel, Burke, and Lobell 2010), all of which are beyond the control of smallholder households. Lambin and Meyfroidt (2011) take a fundamentally different perspective in framing food security and forest loss:

> *A central challenge for sustainability is how to preserve forest ecosystems and the services that they provide us while enhancing food production. This challenge for developing countries confronts the forces of economic globalization, which seeks cropland that is shrinking in availability and triggers deforestation.* (Lambin and Meyfroidt 2011, 3465)

While most policymakers and scientists designate farmers as the primary agents of deforestation, Lambin and Meyfroidt place economic globalization front and center. This orientation constitutes a significant shift in the prevailing logic regarding determinants of land use change in the global South.

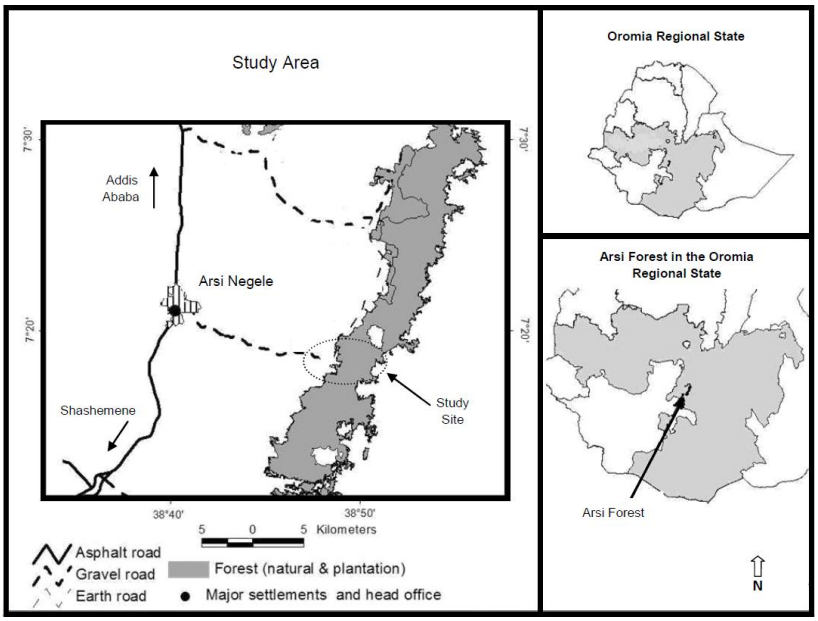
In the next section I use evidence from case study research in a community in highland Ethiopia to explore ways in which micro-scale data can constructively complicate global narratives. I describe community livelihood characteristics and project the effects of forest income substitutions on land use, incorporating economic, policy, ecological and social data. I explore the limitations of dominant narratives and propose alternative approaches. I present this as a "thought experiment" to explore assumptions, costs, benefits and tradeoffs associated with different land use and livelihood interventions. Our experiment consists of: 1) a description of land uses and livelihoods within the study

site, and 2) a projection of the land area required to replace fuelwood incomes under two hypothetical alternatives.

4.3 Case Study Evidence

4.3.1 Overview

The field research that informs this work was conducted from September 2009-May 2010 in a smallholder farming community located at the edge of Ethiopia's Arsi Forest (Map 4.1). Using data from a household livelihoods survey, interviews, GIS and secondary data, I project the implications of forest income substitution on agricultural land use requirements. Forest encroachment and illegal harvest of forest products, especially fuelwood for income generation, are ongoing problems identified by Arsi forest managers (102, Forest Enterprise staff). I describe constraints and opportunities to agricultural intensification and illustrate how they suggest alternative interpretations of local data to those espoused in dominant poverty reduction – environmental conservation narratives.



Map 4.1: Study site
(Source: modified from Wondo Genet GIS Department, 2008)

4.3.2 Study Site Characteristics

The study site consists of a local administrative unit known as a kebele (Peasant Association) located in the West Arsi Zone of the Oromia Regional State. In 2009, the kebele was home to an estimated 7,025 individuals, spread across approximately 698 households. The kebele was historically Afromontane rainforest (Aalbaek and Kide 1993), and ranges in elevation from 2,100 to 2,300 masl. Rainfall averages 1,200 mm per year and is concentrated among two rainy seasons: 1) *Ganna*, the primary cropping season, which extends from July to October, and 2) *Bona*, the short rainy season, which extends from March to May. Mean annual temperatures range from 10 to 25 degrees Celsius. The region is a food-surplus area considered moderately to densely populated (USAID 2008). In general, all households practice similar cropping and livelihood strategies. Variations in wealth status are determined largely by landholding size and the amounts of crops and livestock produced. Table 4.1 gives an overview of predominant agricultural systems, income sources and constraints to production.

Table 4.1: Agricultural practices, income sources and constraints to production modified from USAID FEWS in the ABW Livelihood Zone

Agriculture	Major Income Sources	Main Constraints
• Rain-fed (two growing seasons: *Ganna* and *Bona)* • Dominantly tilled with ox-plow • Manual harvest	• Crop sales: wheat, maize potatoes • Livestock sales: cows and goats • Livestock product sales: milk, butter, hides, eggs • Fuelwood sale • Locally-distilled alcohol sale • Daily labor	• Crop pests: rust, aphids, locust and ball worm. • Livestock diseases: blackleg, anthrax, pasteurolosis, African horse sickness and parasites • Soil water-logging • Inadequate grazing land • Oxen and milk cows replaced from within the herd

Source: Adapted from USAID FEWS ABW Livelihood Profile (2008)

Crop sales constitute the primary household income source. Livestock are held as assets, and are sold in the event of a family medical emergency, wedding, funeral or other occasion requiring a significant cash outlay. Household production is constrained by limited land, labor opportunities and declining forest resources, in addition to a range of crop and livestock diseases, inferior breeding practices, and weather irregularities (Table 4.1). Landholdings average one hectare per household, or 0.11 hectare per person, though land is not distributed equally across the population. As described in Chapter 3, households appear to prioritize investments in the education of their children over reinvestments in farms. Professional prospects seem brighter than agricultural ones. Many parents look to education to provide alternative possibilities for their children despite high levels of urban unemployment and a lack of skilled jobs (Mains 2007). One young man with a high school diploma who was involved in a local USAID-funded

ecotourism project described a different future for himself, his community and the forest. He described:

> "*Society is in a challenging time. We are going to create work to change life. We want to improve the forest, but all people are not educated. I don't know, it is not only a lack of education. It takes time to teach people but this is what I hope to do"* (127, community youth).

People often expressed consternation over the disjuncture between aspirations, opportunity and local realities. Anti-deforestation messages were integrated into school lessons and government sponsored events, leading many to equate a lack of education with fuelwood collection and other illegal forest activities. While ecotourism and other poverty alleviation – environmental conservation programs have the potential to diversify local livelihood opportunities, they are not always grounded in pragmatic assessments of local livelihood requirements. A newspaper article describing the aforementioned USAID ecotourism project termed the local natural forest area the "little-known lush Lepis woodland" which "has the potential to transform the lives of the 2,000 community members in its midst - if [the community] can successfully develop a sustainable community tourism business…[w]ithout any facilities as of yet, the site is one of the Rift Valley's best kept secrets" (Larson 2010). Actually, the site described is quite well known to the thousands of local people who live in Lepis, the community under study, and four additional kebeles that border it. For the project to succeed, the cooperation of all local communities is necessary, and yet it is not clear how revenues will be distributed, whether they will make up for lost fuelwood incomes or how marginalized community members such as female headed households will benefit.

Reliance on the natural forest for fuelwood incomes is shaped by desperation rather than a lack of education. As one woman stated:

> *To solve our problems, we sell wood. To solve our problems, we do a bad thing. It is not good for us. The government has problems, society has*

> *problems. When I get some [alternative] income I will stop. For now, I sell [fuelwood] to buy coffee, salt and sugar* (109, fuelwood collector).

Fuelwood collection and transport is physically taxing work and many women who depend on fuelwood incomes complain of chronic pain and back injuries. However, limited economic alternatives lead women to rely upon fuelwood sales despite awareness of the ecological and personal costs.

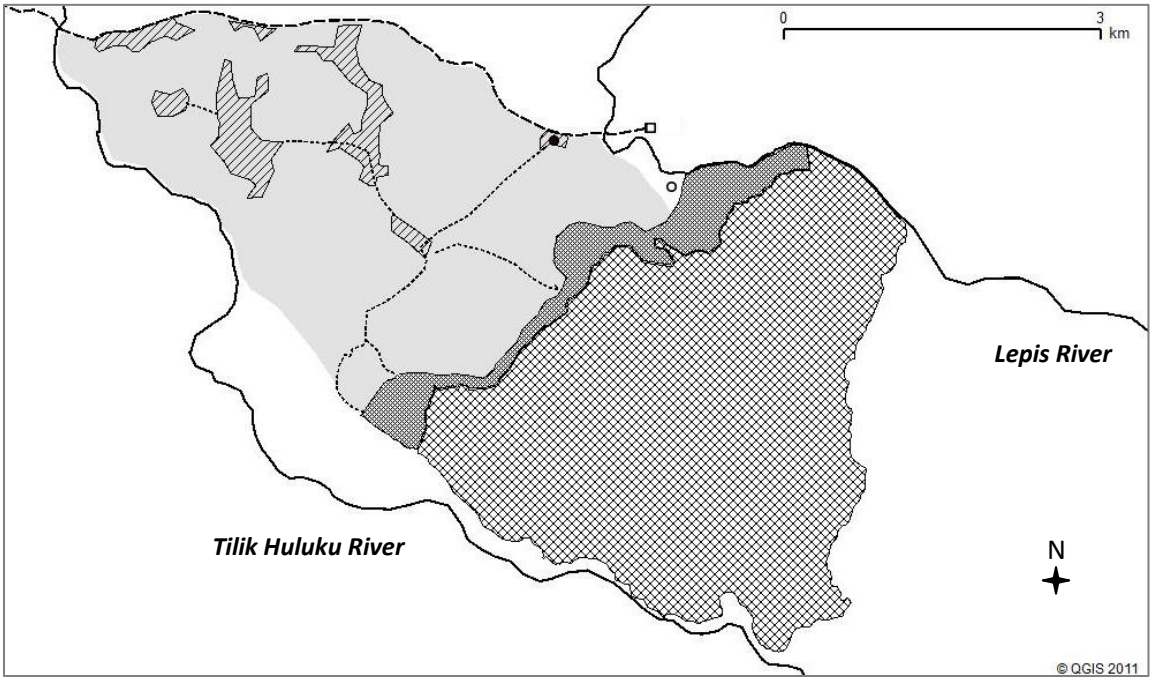
The fuelwood that is collected and sold by local women feeds urban energy markets and supports the distillation of a grain alcohol known as *arake*. Also produced by women, *arake* is a regional specialty distilled in large quantities in the nearby town of Arsi Negele. Production requires high fuelwood, time and labor inputs. Like fuelwood sale, it is considered a difficult and undesirable way to make a living, but is among the few livelihood options available to women. One relatively successful *arake* distiller in Arsi Negele who has collaborated with university researchers on the development of fuel-efficient stoves stated: "Show me an alternative to this work and I will gladly do it!" (144, arake brewer) again underscoring the lack of livelihood alternatives.

The scenarios and interview data presented next provoke questions and concerns over livelihood limitations. In particular, they call into question the extent to which poverty reduction – environmental conservation interventions accurately represent and address local realities and aspirations.

4.3.2 Current Land Use

The study site is located on the edge of a government-run forest plantation known as the Forest Enterprise (Map 4.2). The natural forest, where the majority of fuelwood is collected, is located to the east of this plantation. The northeast corner of the kebele is marked by the Lepis River and Forest Enterprise compound. The northern boundary is marked by a dirt and gravel road that leads to the town of Arsi Negele, located

approximately 18 kilometers to the west. The southeastern boundary is marked by the Tilik-Huluku River and neighboring kebele lands.



Map 4.2: Land use at the study site

Legend

	Natural Forest		Village Roads
	Chafa (wetland) areas		Main Road
	Plantation Forest	○	Forest Enterprise Office
●	Market	□	Gambo Hospital
	Village Land Area		

The light gray area on Map 4.2 marks the 1,109-hectare kebele landholdings, comprised of community members' houses, farms, grazing lands, and other places such as the market, school and mosques.

Using data collected through a community wealth ranking exercise adapted from Laderchi et al. (2005), a household livelihood survey (n=28) adapted from USAID FEWS

(2008), remotely sensed images, GPS and GIS technology, I generated an estimate of different land uses by wealth group within the kebele boundaries (Table 4.2).

Table 4.2: Population by Household (HH) Wealth Group and Landholdings

	Very Poor	Poor	Medium	Better off	Total
Mean Landholding (ha)	0.3	0.9	1.3	1.4	n/a
Proportion of HH per Wealth Group (%)	6	28	54	12	100
Number of HH per Wealth Group (#)	42	195	377	84	698
Estimated Farm Area Managed per Wealth Group (ha)	12.6	175.9	490	117.3	795.7
Estimated House Land Area per Household (ha)	0.003	0.01	0.023	0.04	n/a
Estimated House Land Area per Wealth Group (ha)	0.11	1.95	8.5	3.4	13.9

Source: Author's fieldwork

The total land area allocated to farming extends across an estimated at 795.7 hectares (Table 4.2). Because households pay annual taxes based on their landholdings, households have a relatively precise knowledge of their farm sizes, making these estimates fairly accurate. The total land area occupied by houses and other living spaces is estimated at 6.2 hectares. I arrived at this figure by using photos (e.g. Photos 4.1-4.4) and memory to generate an estimate of the average minimum land area dedicated by a household to their home, outside sitting area, and other structures. Because I did not measure these directly, I used conservative estimates that increase incrementally as

wealth increases, from 5x5 meters (.0025 ha) for very poor households to 20x20 meters (0.04 ha) for better off households (Table 4.2).

Photos 4.1-4.4: Representative households and homes in four wealth groups*

Photo 4.1: Very Poor Household

Photo 4.2: Poor Household

Photo 4.3: Medium Household

Photo 4.4: Better-off Household

**Households pictured are considered representative but may not have participated in the household survey. Not all household members are present.*

Very poor households represented six percent of the community and occupy two percent of the farmland area (0.33 percent per household). These households were economically and socially marginalized, and included female-headed households, male non-clan member headed households, and injured or ill household heads. These households had small landholdings (averaging 0.3 ha) and often relied on the charity of neighbors for supplemental food and other basic needs.

Poor households represented 28 percent of the community and occupied 22 percent of the farmland area (0.8 percent per household). Their landholdings averaged 0.9 hectares, and households typically had limited livestock holdings. Household members sometimes provide farm labor for others, but daily wage opportunities are limited, as exemplified in the following quote:

> *My husband is sick now but he is lazy anyways. About Allah's decisions we do not know. There is not enough fuelwood, there is not enough for me. My children do daily labor for the [Catholic] mission and the Forest Enterprise. There is not enough daily labor, there is not enough farm labor. I want land to live. When I asked they didn't give. I asked the kebele leader but there is no place, there is no farmland.* (110, fuelwood collector)

This quote also highlights constraints to farmland expansion. Local leaders did have authority to redistribute land, but all available lands aside from remaining wetlands or *chafas*, which serve as grazing areas (Photo 4.2), was already allocated.

Medium households represented 54 percent of the community and occupied 62 percent of the farmland areas (1.2 percent per household). Over half of all households fell within this wealth group. Livelihoods were more diverse in this wealth group, with some household members engaged in off-farm enterprises such as *garee* (horse and buggy) driving and other small enterprises, but overall were still limited.

Better-off households represented 12 percent of the community and occupied 15 percent of farmlands, or 1.3 percent per household. Average landholdings, at 1.4 hectares, were slightly larger than those of Medium households. The majority of Better-off households had steel roofs on their homes, which enabled them to store food for future consumption and sale. This is especially important given the variable nature of staple food prices, which peak between harvests when most households' food reserves were typically depleted (Figure 4.1).

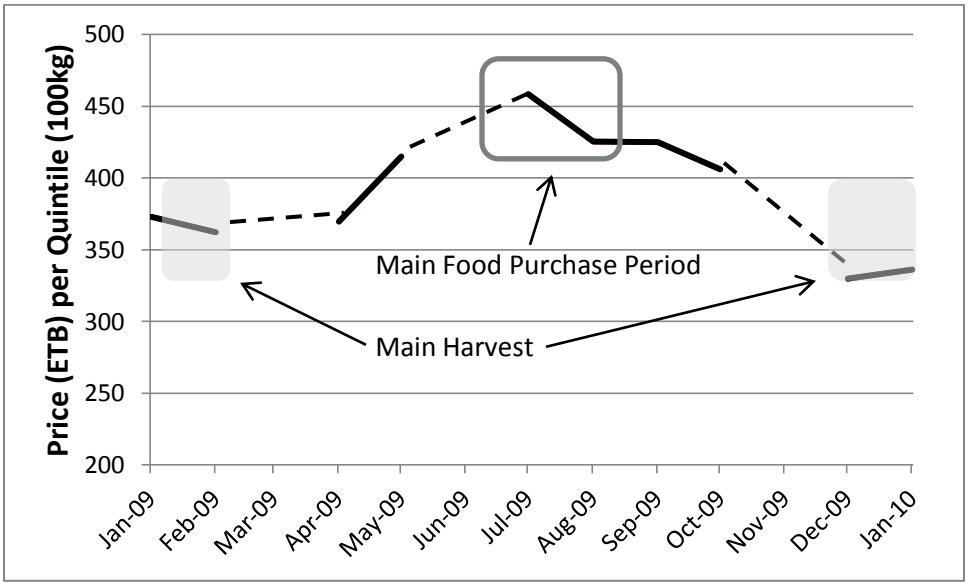


Figure 4.1: Mean Maize Prices in Ethiopian Birr (ETB) in the Arsi Region (January 2009-January 2010)
Note: Dashed lines indicate data gaps; Sources: USAID FEWS, Ethiopian Commodity Exchange Network and Interviews

The main harvest took place from November through January. Most households sold crops in the weeks following the harvest when prices are lowest, giving those who are able to store harvested crops for longer periods a distinct economic advantage. A second harvest typically occurred between June and August, but was smaller and less predictable.

Community grazing land was another important feature of the kebele, occupying an estimated 12 percent of kebele lands. Community grazing lands consisted of seasonally wet areas known as *chafas* (Photo 4.2) that were typically unsuitable for farming due to soil characteristics and seasonal inundation. Though not officially allocated to anyone, *chafas* were generally used and managed by the households that live along their borders. These areas are visible in satellite imagery and the authors estimated their extent using GIS. Classification was confirmed through ground-truthing of selected points in a method adapted from Witmer and O'Loughlin (2009). An estimated 135 hectares of kebele land area is classified as *chafa* (Table 4.3).

Photo 4.5: Chafa (wetland) area, bordered by homes, April 2010

A dense network of pathways used by people, horses and livestock stretched across the kebele. Lacking a thorough inventory of all transportation corridors, I included known pathways having a minimum width of 1.5 meters in our accounting. Using GIS, I calculated the length of these pathways to arrive at our 24-hectare estimate (Table 4.3).

One hundred and forty hectares or 13 percent of the total kebele land area remains unclassified (Table 4.3). This is explained largely by the limited inclusion of transportation pathways, omission of lands dedicated to mosques, conservative estimate of the land area occupied by homes and error.

Table 0.3: Land Uses within Village Boundaries

Land Use	Wealth Group	Hectares
Farmland		
	Better Off (n=84)	117.6
	Medium (n=377)	490.1
	Poor (n=195)	175.5
	Very Poor (n=42)	12.6
	Subtotal	**796**
Homes		
	Better Off (n=84)	3.4
	Medium (n=377)	8.5
	Poor (n=195)	2.0
	Very Poor (n=42)	0.1
	Subtotal	**14**
Wetlands (chafa)		
	n/a	**135**
Dirt Roads and Market Area		
	n/a	**24**
Uncategorized Area		
	n/a	**140**
	Total Land Area in kebele	**1109**

Source: Author's fieldwork

Farmland occupied an estimated 72 percent of the kebele land area, over three quarters of which was held by those households ranked "Medium" and "Better-off" in terms of wealth status (Figure 4.2). These lands comprised the primary productive space available for intensification and agricultural livelihood development.

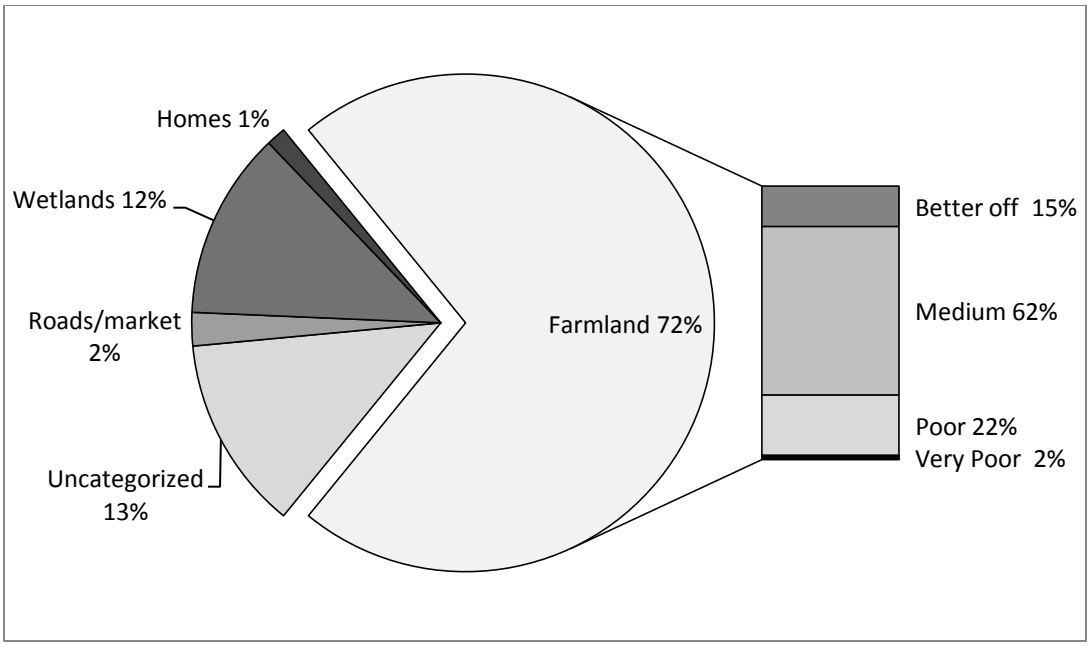


Figure 0.2: Land Use by Area, Farmland by Wealth Group; Source: Field Data
Source: Author's fieldwork

Next, I use these land allocation figures to translate fuelwood incomes into estimates of how much additional farmland area is needed to replace them. This measure has greater resonance than dollar or Ethiopian birr (ETB) values since the community under study practiced semi subsistence farming and economic inflation rates were high, making monetary values difficult to interpret over time.

I use data from the household livelihood survey in combination with land use estimates outlined in the preceding section to describe the material implications of potential restricted forest access. This approach is not intended to represent a proposed intervention, but rather to: 1) demonstrate the scope and scale of required livelihood and conservation interventions and 2) facilitate connections to macro-scale concerns. In actuality, there was very little elasticity in local agricultural land supplies, as previously described.

With the exception of wetland areas, there was no unoccupied land available for additional cultivation. While most of the natural and plantation forest uses by community members were technically illegal, forest products, in particular fuelwood, contributed significantly to local livelihoods (See Chapters 2 and 3 for further detail).

4.3.3 Forest Incomes, Substitution Projections and Implications

In this section I explore potential implications of restricted forest access by presenting two scenarios that enumerate the replacement costs of present day household fuelwood incomes in terms of agricultural land. I use two hypothetical scenarios to explore the cost of replacing fuelwood incomes with agricultural incomes. Fuelwood income is translated into agricultural income, using additional agricultural land to characterize the value of fuelwood incomes (i.e, income lost through restricted access to fuelwood is expressed in equivalent units of agricultural production).

Yield projections are not adjusted for landholding size, wealth status, and other factors that lower production. Scenarios represent minimum fuelwood replacement requirements, and are therefore conservative in terms of the land area required to make up for lost fuelwood incomes. Scenarios do not address the impacts of a number of factors that constrain production in Ethiopia, including price fluctuations (Jayne, Mather, and Mghenyi 2010), climate change (Thornton et al. 2011), the limited availability of improved seed (Howard et al. 2003), unreliability of fertilizer delivery (Spielman, Kelemwork, and Alemu 2011), and effects of political and social marginalization on access to improved seeds and inputs (Pausewang 2009; HRW 2010).

Table 4.4: Production assumptions for Scenarios

	Mean quintals* per ha	Crop Mix	Price per Quintal (ETB)
Potatoes	8.5	0.25	202
Maize	1.9	0.50	350
Wheat	1.5	0.25	528
			Total

*1 quintal=100 kg

Scenario 1: Fuelwood replacement

The first scenario, termed *fuelwood replacement,* assumes cessation of fuelwood collection for revenue generation, but does not include fuelwood collection for home use. Mean fuelwood incomes for each wealth group are generated from household livelihood survey data (Appendix 3). Fuelwood is collected by women and girls and sold in the local market or transported to Arsi Negele (18 kilometers west) by donkey where it can be sold for a higher price. Very poor households tend to sell fuelwood in the local market due to a lack of labor, transportation capacity (donkey ownership) and/or injury. These differences are captured in the wealth-ranked income estimates.

Production assumptions on hypothetical additional farmlands are based on mean national potato, maize and wheat crop yields between the years 2000-2009 (Appendix C). Projections use a cropping system comprised of 25 percent potatoes, 50 percent maize and 25 percent wheat (Table 4.4). While this cropping system is not practiced by all wealth groups (Poor and Very poor households tend to grow only potatoes and maize), it represents a diversified, optimistic cropping scenario. Wheat cultivation is

more sensitive to weather than either potato or and maize and generally requires pesticide inputs. Therefore, it is not planted every year or by all farmers. Potato cultivation is on the rise in Ethiopia (Guenthner 2006), but maize has a longer storage life, is less prone to disease, and the stalks provide supplemental fodder to livestock. Crop, fertilizer, and improved seed prices are based on mean 2009 prices per quintal (100 kg), in the case of crops, and kilograms in the case of fertilizer and seeds. Prices are shown in Ethiopian Birr (ETB). The *fuelwood replacement* scenario indicates that an estimated 264 hectares of additional agricultural land is necessary to replace fuelwood incomes, a 33 percent increase from current cultivation levels (Table 4.5 and Figure 4.3).

Table 4.5: Estimated Hectares Required to Replace Fuelwood Incomes

Wealth Group	Mean Annual Fuelwood Incomes (ETB)	Replacement Hectares Required (ha)	Number of Households	Total (ha)
Fuelwood Replacement				
Very Poor	2120	0.2	42	8.4
Poor	3097	0.29	195	56.55
Medium	5250	0.49	377	184.74
Better off	1780	0.17	84	14.28
			Total	**263.96**
Fuelwood Replacement with Intensification				
Very Poor	2120	0.13	42	5.46
Poor	3097	0.19	195	37.05
Medium	5250	0.33	377	124.41
Better off	1780	0.11	84	9.24
			Total	**176.16**

Source: Author's fieldwork

Scenario 2: Fuelwood replacement with intensification

The second scenario, termed *fuelwood replacement with intensification,* also assumes cessation of fuelwood collection for revenue generation, excepting fuelwood collection

for home use. In this scenario, I also assume adoption of improved cropping practices by all wealth groups. Production assumptions for the *fuelwood replacement with intensification* scenario are based on maximum yield projections in domestic test trials (Table , equivalent to 28 percent yield increases for potatoes (Gildemacher, Demo et al. 2009), 142 percent increases for maize, and 52 percent increases for wheat (Spielman, Kelemwork, and Alemu 2011).

The *fuelwood replacement with intensification* scenario indicates that a minimum of 176 hectares is required to replace fuelwood incomes, assuming maximum production levels with improved seeds and optimal fertilizer application (Table 4.5). This additional land represents a 22 percent increase over the total land area currently dedicated to crop cultivation (Figure 4.3). Under this scenario, increased yields are partly offset by increased expenditures associated with required inputs such as improved seeds and fertilizer.

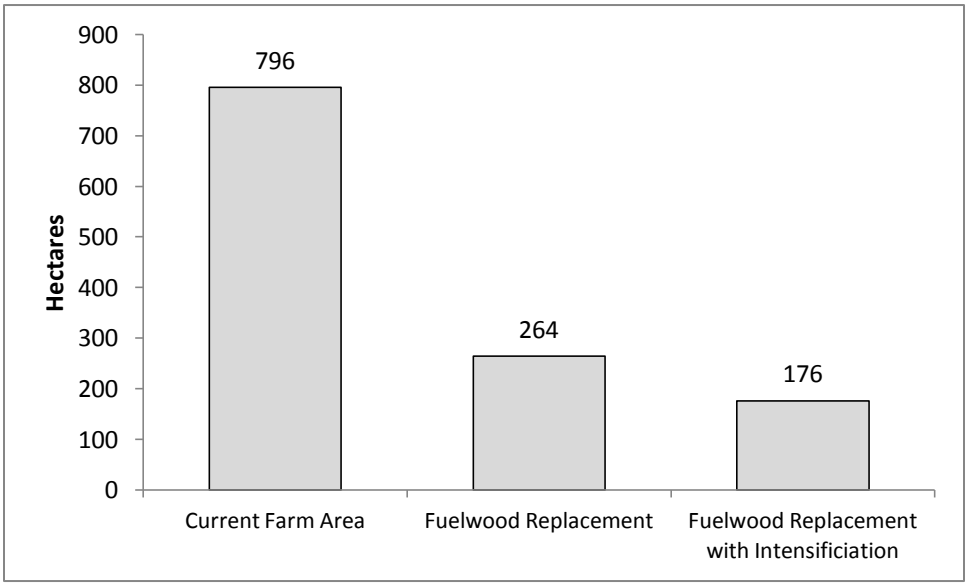


Figure 4.3: Farmland Requirements under Fuelwood Replacement Scenarios

4.4 Discussion

> "Allah says it is important to live with four things: trees, water, wisdom and leadership" (117, community elder)

The scenarios described in Section 4.3 represent an attempt to translate the implications of reduced forest access into a measure that bears relevance across local, national, and global scales. In the attempt to make this translation, I describe both the magnitude of the contribution of fuelwood incomes to livelihoods and also the gaps inherent to these kinds of approaches.

4.4.1 Poverty Alleviation

While these scenarios provide a tangible means to understand the value of fuelwood incomes, they do not yet touch upon poverty alleviation goals. The minimum estimated cost in terms of land area of bringing Very poor and Poor households up to the income status of Medium-ranked households is an additional 182 hectares, assuming production levels outlined in the *fuelwood replacement* scenario. This assessment in turn raises the question of what constitutes an "acceptable" level of poverty, a thorny question that underpins approaches that quantify tradeoffs. In order to be successful, interventions aimed at reducing or eliminating human pressures on forests and improving rural livelihoods must account for both lost forest incomes and needed livelihood improvements. Accomplishing only the former fails to address poverty concerns and will likely be unsustainable.

4.4.2 Resource Constraints

The scenarios presented suggest that rural economies in the study region face serious development constraints. There is certainly room for agricultural intensification, improved access to credit, storage facilities, and other interventions aimed at improving farm incomes. Agricultural research in Ethiopia has yielded a wealth of information to inform interventions directed at farmers, including: gaining access to improved seeds

(Poonyth and Hassan 2000; Tura et al. 2010; Feleke and Zegeye 2006; Howard et al. 2003), understanding production risks (Gildemacher, Demo et al. 2009; Gildemacher, Kaguongo et al. 2009; Hirpa et al.), managing price risks (Fufa and Hassan 2006), identifying problems and opportunities associated with agricultural extension (Alene and Coulibaly 2009), and improving marketing strategies (Guenthner 2006; Bingen, Serrano, and Howard 2003). Conservation-oriented livelihoods can also contribute to livelihood development and diversification, but due diligence should be paid to exploring the limits of proposed interventions. Approaches tend to emphasize "trees and water" with less attention paid to "wisdom and leadership." Critics assert that interventions are grounded in erroneous notions of development trajectories[8], a false "fantasy" of eventual smallholder integration into global market economies, and paternalistic assumptions that most smallholders aspire that they and their children will remain in agriculture (Hall 2009; Li; Oya 2009). Hall asks:

> "*Where, for the World Bank, are agriculture and development supposed to be going?...This aversion to thinking about the future of 'agrarian transition' represents, perhaps, a characteristic tension in neoliberal policymaking: the combination of extremely detailed prescriptions for how life should be organized today with a resistance to any visions of the future*" (2009, 607-608).

The contribution of forests to rural livelihoods is generally underestimated (Angelsen et al. 2011). Still, most interventions fail to make even vague estimates of the degree to which forests contribute to local livelihoods and how forest benefits are distributed among community members. Predominant development perspectives reveal a lack of commitment to the consideration of what diversified, viable livelihood futures might look like. For many rural people facing declining resource access there is "no pathway from country to city, agriculture to industry, or even a clear pathway into stable

[8] Specifically, that there is a linear upward progression from farm-based to transitional and finally to urban-based livelihoods that in time, all people may access and that will lead to progressive improvements in the quality of life (Hall 2009).

plantation work that pays a living wage"(Li, 296). When faced with resource constraints, policymakers tend to look down, towards intensification, rather than up, at the multiple pathways available and at addressing how macro-economic factors perpetuate poverty.

The use of agricultural land as a proxy for fuelwood incomes also retains a connection to physical space inherent to rural resource access, rather than presenting abstracted monetary values. Policymakers can perhaps more easily disassociate dollar or birr figures from local social, political, ecological and economic constraints, imagining new income flows from hoped-for ecotourism, ecosystem service payment programs that transcend the power and access disparities that characterize natural resource use and livelihood alternatives. One scientist working for a large international environmental organization in the Arsi forest described local forests as "precious environmental and economic assets already under siege from encroachment and climactic factors" (140, scientist). This statement places the onus on the shoulders of local people and on the nebulous, apolitical phenomenon of climate change (Swyngedouw 2010). It suggests that the predominant need is for interventions geared towards halting local forest encroachment and combating climate change. This poverty alleviation-environmental conservation narrative disconnects local realities from broader social and economic factors.

In the context of climate change, agricultural intensification is not itself carbon neutral. Agricultural intensification can also lead to increased greenhouse gas emissions (Melillo et al. 2009). Yield-improving innovations and "precision" approaches are more efficient than simple increases in fertilizer application (Burney, Davis, and Lobell 2010) but still require high levels of technical capacity. Developing sustainable farming systems amidst dense and growing human populations is among the major challenges identified by contemporary agricultural scientists working in Africa (Tittonell et al. 2009, Zingore et al. 2009). In recognition of the trend towards increased competition for land among

African smallholder farmers, researchers have sought to identify ways to increase production per unit of land area. Typically, proposed solutions involve input intensification and "qualitative jumps" in the overall system state, typically brought about through a combination of capital investment and livelihood diversification (Thornton et al. 2007).

4.4.3 Problematic Assumptions

In examining the assumption associated with converting fuelwood incomes into farmland incomes, we are confronted by the interrelated nature of local economies with macro-scale processes. This dynamic is illustrated by fuelwood markets. In the absence of a comprehensive energy plan that would establish fuelwood plantations or replace charcoal and wood-based cooking with other forms of energy, the enforcement of fuelwood collection restrictions might have 1) displacement effects and 2) disparate economic impacts on women. With respect to displacement, informal fuelwood markets in Arsi Negele are fed by highland Arsi forests and lowland acacia woodlands. Governance and enforcement is generally weaker in lowland areas (Beyene 2009), increasing the likelihood that the enforcement of fuelwood harvest restrictions in the highlands would drive increased harvest in the lowlands.

Women of all wealth groups relied upon the forest as a total or partial income source. New livelihoods, based in farms, ecotourism or other sources, will develop new hierarchies of power and control. The 'energy ladder' concept, which states that because of income and substitution effects, poorer households are most dependent on forest fuels, has been shown to be flawed, because in many cases medium and better off households actually harvest more forest products than poorer ones (Baland et al. 2007; Hobley 2005). Perhaps what is needed now is a 'gender ladder' approach that can

help policymakers and resource managers understand how replacement incomes affect women's access to livelihoods.

4.5 Conclusion

Concerns over climate change, food security and deforestation have refocused the attention of governments and development agencies towards smallholder farmers. Proposed interventions such as REDD+, that are designed to mitigate global climate change though forest conservation and carbon payments, have also brought issues of land use to the foreground. A review of poverty alleviation – environmental conservation narratives, indicates that livelihoods and natural resource access are imbedded in larger systems. In considering agricultural land area as a proxy for forest fuelwood values, it becomes more difficult to disassociate solutions from local, regional and national socio-economic systems. Dominant discourses tend to confine discussions about poverty and deforestation to local levels, limiting our capacity to see how politics, ecology, and economies interact at macro level scales to reproduce these conditions. As previously mentioned, there is some room for agricultural intensification though this will not be sufficient to offset poverty. Poverty is a condition as well as a product of social and economic relations. A development "discourse that classifies and prioritizes the deserving poor or that does not address the power relations that keep people poor invariably (a) excludes significant segments and (b) fails to recognise [sic] and attack some of the deep causes of poverty" (Moncrieffe 2004, 47).

The scenarios presented in this chapter suggest that restricting access to fuelwood would generate need for alternative sources of income. Increasing agricultural production (extensification) to levels sufficient to replace fuelwood income is not feasible because of limited agricultural land. Intensification has associated economic and ecological costs further complicated by additional political and social hurdles. In

some cases, agricultural extensification and intensification may not necessarily be viable solutions to forest degradation.

While working with smallholder farmers to improve production will likely continue to be an important aspect of livelihood security interventions, researchers and policymakers increase attention to looking “upward” into macroeconomics, trade policy, and global institutional reform for solutions. There are “multiple pathways” that can be explored, specifically focused on information transparency, commodity markets, aid and development delivery and growth.

Chapter 5 - Conclusion

The three preceding chapters describe relationships between household livelihoods and land use change in a community located at highland Ethiopia's farm-forest periphery. These chapters provide a background for considering core questions about household livelihoods in the context of historic and emerging forest values. In Chapter 1 I introduced two composite characters, Amiina and Kadiija, whose experiences typify those of many women in their community. For these and other women, forest products serve as an integral part of household economies. A lack of livelihood alternatives for themselves, their husbands and their children is a primary concern. Few opportunities are available now or appear on the horizon, aside from nebulous hopes that if they can provide their children with an education, they will be positioned to take advantage of off-farm employment opportunities that do not exist in sufficient numbers. Households have sought to find ways to manage livelihood requirements in the face of declining resources and socio-political marginalization that are aggravated as populations grow and competition increases for remaining natural resources. This typifies the context in which many emerging economic development and conservation programs, including ecotourism, REDD+ and CDM, are proposed and implemented, and partially explains why many of them fail. Replacing forest incomes is not sufficient to lift households out of poverty and does not address differential resource access of households within communities or the active sources of vulnerability production that perpetuate poverty.

As described in Chapter 2, the conditions that make households vulnerable are generated across space and time. Vulnerability is produced through historic and contemporary processes including those associated with markets, environmental change, policies, social security systems and planning. While the mechanisms of vulnerability creation are location-specific and grounded in particular social, political,

economic and ecological realities, vulnerability is the outcome of processes of marginalization that operate at many scales. Predominant areas of active vulnerability production that emerged in the case include exploitation, resource access and political exclusion. Because vulnerability is produced at local, regional, national and international levels, a multi-scalar approach is necessary to understand how processes act across scales to shape vulnerability.

Forests provide significant benefits to households that live at forest peripheries. As described in Chapter 3, forest access regimes have developed over decades, and yet households are vulnerable because of the informal nature of their claims and their relatively weak socio-political influence. Inadequate scrutiny over the widespread clearing of forests for agriculture negatively impacts local livelihoods, forests, and potential future engagement in forest-based activities. Transparent processes for dispute resolution are not in place. The ability of local people to make successful livelihood claims will likely diminish in the face of new tenures that draw their legitimacy from markets rather than local values. History has shown that the interests of more powerful and wealthy actors such as investors and development agencies will likely trump local concerns, underscoring the need for a comprehensive approach to securing local resource rights that will require leverage from outside actors and organizations. Historic forest benefit distributions are obscured by contemporary narratives that cast smallholders as the lone agents of forest conversion and degradation. These inaccuracies legitimize interventions that serve to further divest rural people of their forest access claims while obscuring the role of the state and extra-local elites in land use change. Serious attempts to alter the economic and ecological trajectories of the rural poor require significant reinvestment in social and natural capital.

Contemporary solutions to rural poverty and household vulnerability often involve agricultural intensification. Though likely a part of the solution in many places, I argue in

Chapter 4 that the potential for agricultural intensification to reduce rural vulnerability is overstated, especially in the absence of comprehensive efforts address issues of power and access. Successful market-based agricultural intensification depends on a host of factors not limited to market access, reliable and affordable access to inputs and knowledge. Areas of active vulnerability production highlighted in Chapter 2, including exploitation, resource access and political exclusion, suggests that the need for social and political reform may take precedence over market reform in Ethiopia. Chapter 4 also speaks to the potential for programs that propose to replace forest incomes with alternative ones to reduce rural vulnerability. The approaches fail to account for 1) the unique ability of forests to provide marginalized groups with income and 2) the need for economic growth rather than merely income substitution.

The preceding three chapters support assertions by other researchers that programs that restrict "access to forest resources may relegate rural people towards livelihood deprivation" (Babulo et al. 2009, 117) and aggravate income inequalities (Kamanga, Vedeld, and Sjaastad 2009). Together, these chapters paint a detailed picture of how household livelihood dynamics interact with social, political, ecological and economic factors. Next, I draw together unifying concepts, outline policy recommendations and describe ideas for future research.

5.1 Unifying Concepts

The three chapters presented in this dissertation illuminate livelihood-related impacts of historic, contemporary and potential future forest benefit distributions.

As described in Chapters three and four, the natural forest area under study has diminished considerably in terms of extent and quality, but it still remains a forest, with associated material (e.g. fuelwood and fodder), and categorical (e.g. eligibility for payments for ecosystem service programs and reforestation projects) benefits. Chapter

four demonstrates how the repeated calls for smallholder agricultural intensification may not be sufficient to alter the circumstances that produce rural poverty. This research raises fundamental questions about what, and for whom, is a forest. The transition from subsistence-based to global capitalist networks of production transforms social relations as well as basic perceptions of how forests should and can be valued. Associated with these shifts are changing ideas about how to make forests and people's lives "better". What seem like simple interventions are, at closer inspection, often intimately connected to broader economic and political systems that have profound implications on social relations, hierarchies of power and livelihood opportunities at the local scale. Meaningful shifts may only become possible through a reconsideration of what equitable resource management looks like, and with attention to macro and meso scale policies and programs that are not commonly associated with rural household vulnerability. The historic focus of rural development on local-level interventions like improved cropping techniques, livestock fattening and small scale water storage diverts attention away from the macro and meso scale factors that play a large role in creating the conditions that underpin insecure livelihoods in many parts of the world today.

5.2 Policy Recommendations

Policy recommendations are presented next and are organized by scale, including household, bioregion, regional/national and international. While additional recommendations stem from and relate to those listed below, I endeavor to keep the list brief to highlight those most directly related to this research:

5.2.1 Household-level Policy Recommendations

This dissertation addresses the benefits and limitations associated with examining rural poverty through the lens of the household. Households hold diverse capabilities and entitlements, yet policies tend to represent the rural poor as relatively homogenous, masking the social and political realities that shape resource access in practice. While

rural development experts and natural resource managers may endeavor to improve household livelihoods, the conditions that create rural poverty often result from processes that exist well beyond the scale of the household. It is thus necessary to devise conceptual tools for retaining a focus of interest on households while acknowledging and addressing the multiple factors that create vulnerability at regional, national and international scales. Efforts to address household vulnerability will necessarily need to pay attention to macro scale institutions, processes, policies and power relations.

Given the precarious socio-economic position of marginalized groups including women-headed households, livelihood diversification programs should expressly acknowledge the subordinate position of women in decision-making. Since local social and political systems often disfavor women and outsiders, a balance that emphasizes both decentralized approaches and external advocacy is necessary. Equally important is recognition of the fact that in many parts of the world including Ethiopia, rural people may be broadly considered a marginalized group. Their access to information, education, opportunity and capital is limited, and they often have little capacity to improve their lives beyond cultivating hopes for favorable rains. They are often excluded from formal processes to codify access rights, and have limited to no access to channels through which they might express dissenting opinions or oppose the actions of those who are more powerful. These realities speak directly to payment for ecosystem service programs that propose to reduce human impacts on forests through cash payments or ecotourism projects that impose access restrictions in exchange for economic benefits that will accrue to selected households. Existing areas of active vulnerability production including access, exploitation and political marginalization will not disappear through the creating of a new funding mechanism. Other economic diversification programs such as those related to ecotourism and foreign investment mechanisms similarly require understanding of the fact that, unless explicitly addressed in policy and program

development, income diversification programs that increase management intensity will be subject to the same processes that shape vulnerability and poverty among rural households today.

5.2.2 Ecoregion-level Policy Recommendations

While there is a tendency among development organizations and governments to seek broadly-applicable frameworks for program implementation, there is a need for investment in the development of programs that support local forest values and livelihood needs. Researchers will continue to refine valuation protocols for determining the contribution of forests and other natural resources to local livelihoods, but can also accept that they may never be fully understood, and will be subject to continuous change. We can also consider more seriously the need to improve local livelihood security by working with communities to steward the resources that have local economic, cultural, spiritual and political value for them, rather than for carbon sequestration, export or other external values. In some cases, managing forests for local interests may increase the likelihood that forest benefits will be retained for local purposes in the long term, rather than being captured by external elites for their high value timber, carbon payments and ecotourism revenues.

Particularly in the context of foreign investment and payment for ecosystem service programs that involve long-term land use commitments, there is a need to work with communities to explore household and individual aspirations for the future, investigate how they can be achieved, and promote transparency in understanding opportunities and constraints to different livelihood trajectories. Alongside these efforts, attention should be paid towards promoting transparency concerning the terms of engagement for investors and other actors who seek to alter forest management and forest benefit distributions.

5.2.3 Regional/National-level Policy Recommendations

Given the high costs of education relative to rural income, the revisiting of educational fee structures may help re-route farm incomes back to farm-based asset building, which is an important aspect of household vulnerability reduction. One study of 2,000 villages across Ethiopia showed that the average travel time to a secondary school is five hours (Burlando 2009). More investment in the construction of local high schools will help ameliorate the costs borne by households to send children away to high school. Programs that emphasize vocational training and business development may also promote more diversified livelihoods.

Land tenure is a focal issue for many development experts and certainly needs attention at regional and national levels. Instead of simply pointing to the need for more formal land rights, I emphasize the importance of the establishment of a multi-stakeholder process involving local people, zonal, regional and national actors and outsiders. More formalized land tenure systems have the potential to exclude as well as include, and as emphasized in Chapter two, the narratives and histories that have shaped access claims need to be documented so that rural people and advocates can make comprehensive resource rights claims in the face of emerging resource investments.

5.2.4 International-level Policy Recommendations

Simplistic narratives regarding the rural poor and deforestation have proven remarkably resilient, and often serve to promote paternalistic, short-sighted solutions to problems. Given population growth projections, fuelwood demand in rural and urban areas will likely only increase in the absence of comprehensive rural electrification programs. Whether in the form of large energy generation projects or small-scale alternative energy production advances, significant planning and investment is needed to bring stable and affordable sources of electric power to all people.

Large advances can be made in the area of information transparency to help 1) rural people voice their opinions and gain access to information and resources, and 2) outsiders advocate on behalf of rural rights through knowledge of corporate practices and investment flows. For example, research from the Oakland Institute on Land Grabs highlights to role of US-based private equity funds in driving land grabbing in Africa (2011). This kind of research can help investors monitor the impacts of their investments and in the long term inform the development of anticipated rates of return on investments that do not exploit the rural poor.

An independent task force specifically geared towards understanding rural vulnerability in the context of climate change, conservation and food security should be established to monitor funding streams. A global tribunal that would provide a system of recourse in the event of negligence or mis-implementation of programs affecting rural livelihoods and natural resource access would also serve as an important avenue for rural people to voice concerns and seek redress for exploitation and mismanagement.

5.3 Future Research

Following the need for multi-scalar approaches to household vulnerability reduction described earlier in this chapter, the ideas for future research that I propose in this section span a range of scales and institutions.

In the field of forestry, there is a need for additional research to develop protocols for native tree propagation and establishment. Despite the existence of post-harvest reforestation regulations in Ethiopia, there are few examples of successful native projects. One challenge is a limited understanding of how to propagate and establish native highland tree species. Research could focus on developing dependable protocols for native tree and shrub propagation. There is also a need for native tree growth and yield models, particularly as forest-based mitigation program expand in East Africa.

While there are growth and yield models available for common plantation species (e.g. Teshome 1996; Ngugi, Mason, and Whyte 2000) they do not exist for most native tree species. Growth and yield models for smaller stature trees that yield other benefits, such as fodder and medicine, would be helpful for planning pro-poor carbon sequestration projects.

The relationship between land use, livelihoods and food security is a recurrent theme in contemporary research and policy development. Much of this research aims at developing globally applicable indicators. Though important, this approach will likely be inadequate to unearth active case-specific processes of vulnerability generation. Additional case study research detailing relationships between land use, livelihoods and food security could complement quantitative studies and help policymakers better understand the complex relationships between them. Programs such as the Consultative Group on International Agricultural Research's (CGIAR) program on Climate Change, Agriculture and Food Security (CCAFS) and the Center for International Forestry Research's (CIFOR) Poverty Environment Network have called for more rigorous, globally applicable data collection methods to understand rural livelihoods. Parallel research funded by the same programs should be undertaken to investigate how to best generate locally applicable data and explore how it differs from global data collection methods. While large datasets have obvious appeal, the diversity of social, cultural, political, economic and historic realities mean that location-specific research will always be critical to understanding livelihood security and land use change.

More research into the diverse vulnerability implications of economic development and conservation programs should also be a priority. Communities are made up of heterogeneous households with different entitlements and capabilities. These dynamics need to be better understood and accounted for as programs proceed, in order to avoid unintended political and economic exclusion. Researchers have developed strong

models for tracing the webs of relations that facilitate the transfer of economic benefits from producers to outside actors and corporations in export commodity production. However, few models exist to help researchers understand these dynamics in semi-subsistence agricultural contexts. This is an area ripe for research and the development of conceptual models since the majority of the rural poor are engaged in semi-subsistence crop production.

The ideas mentioned in this section revolve around the need for increased attention to 1) the diversity of households in rural communities and 2) the connections between rural vulnerability and larger social, political and economic processes.

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APPENDICES

Appendix A: Supplemental Interview Information

Table A.1: Interview details

#	Code	Position	Location	Language	Translator*
1	101	Retired forest guard	Gambo FE	Oromiffa	A
2	102	Forest Enterprise Staff	Ashoka	English	
3	103	Forest Enterprise Staff	Gambo FE	English	
4	104	Forest Enterprise Staff	Gambo FE	English	
5	105	Forest Enterprise Staff	Gambo FE	English	
6	106	Forest Enterprise Staff	Gambo FE	English	
7	107	Forest Enterprise Staff	Gambo FE	English	
8	108	Forest Enterprise Staff	Gambo FE	English	
9	109	Fuelwood Collector	Ashoka	Oromiffa	B
10	110	Fuelwood Collector	Ashoka	Oromiffa	B
11	111	Fuelwood Collector	Ashoka	Oromiffa	B
12	112	Fuelwood Collector	Ashoka	Oromiffa	B
13	113	Agricultural Development Agent	Ashoka	Oromiffa/English	C
14	114	Agricultural Development Agent	Ashoka	Oromiffa	C
15	115	Agricultural Development Agent	Ashoka	Oromiffa	C
16	116	Community Elder	Ashoka	Oromiffa	C
17	117	Community Elder	Ashoka	Oromiffa	C
18	118	Forest Guard	Gambo FE	Oromiffa	A

19	119	Agricultural Development Agent	Regi	English/Oromiffa	D
20	120	Community Elder	Regi	Oromiffa	D
21	121	Community Elder	Regi	Oromiffa	D
22	122	Community Elder	Regi	Oromiffa	D
23	123	Community Elder	Regi	Oromiffa	D
24	124	Kebele Leader	Regi	English/Oromiffa	D
25	125	Kebele Leader	Ashoka	Oromiffa	B
26	126	Community Youth	Ashoka	Oromiffa	B
27	127	Community Youth	Ashoka	Oromiffa	B
28	128	Community Youth	Ashoka	Oromiffa	B
29	129	Forest Investor	Addis Ababa	English	
30	130	Catholic Priest	Meki	English	
31	131	Catholic Priest	Ashoka	English	
32	132	Forest Guard	Ashoka	Oromiffa	B
33	133	Forest Guard	Ashoka	Oromiffa	B
34	134	Community Member/Farmer	Ashoka	Oromiffa	B
35	135	Community Member/Farmer	Ashoka	Oromiffa	B
36	136	Community Member/Farmer	Ashoka	Oromiffa	B
37	137	Community Member/Farmer	Ashoka	Oromiffa	
38	138	Community Member/housewife	Ashoka	Oromiffa	B

39	139	Community Member/housewife	Ashoka	Oromiffa	B
40	140	Scientist	Addis Ababa	English	
41	141	Government Official	Addis Ababa	English	
42	142	FE Manager	Arsi Negele	English	
43	143	NGO worker	Arsi Negele	English	
44	144	Arake brewer	Arsi Negele	Oromiffa	E

*Notes on Translators:

Translator A was a male college educated Forest Enterprise employee and friend in his mid-thirties who helped me on occasion. He was selected by the forest guards to serve as a translator for our interviews. He was an Amhara evangelical Christian.

Translator B was my primary translator, Shukuri, who was also a male college educated Forest Enterprise employee in his mid-forties. He was a local Oromo Muslim.

Translator C was my first translator, a male college educated nurse's assistant in his mid-twenties. He worked at the Catholic hospital and was a local Oromo evangelical Christian. After working with him for a few weeks I found that I needed an older established community member to help me with translation.

Translator D was a male college educated Forest Enterprise community liaison in his late fifties. He was a local Oromo Muslim.

Translator E was a male college educated NGO worker from Arsi Negele in his mid thirties.

Appendix B: Household Livelihoods Survey Instrument

Interviewee Number (s) and Gender(s) (*dhi / dub*):_____
Location *(bakka*):_____
Time (*sa'aatii)*:_____
Language *(afaan):* _____
Ethnicity: (*kan gosaa*)_____
Religion: (*amantii)*_____
GPS Point # (*lakkobsa kaartaa*):_____
People present (*ummatota asi*):

People
# of people in HH *(lakkoobsa uummata mana):* _____
People dependent upon HH for food and clothing: _____
Initials of HH Head: _____
Age *(woga*) of HH Head: _____
Length of time at current residence:_____
HH Head Place of Birth (biyya):_____
Age/Gender of Children (place "x" next to name if in school):

Other wives *(kan biraa niiti):*

Age & gender of children of other wives (place "x" next to name if in school):

Notes:

Food Summary *(nyaata xumura)*: total (%)
Crops (*midhaan*)
livestock products *(oomisha looni)*
payment in kind *(daldaluu)*
Purchase *(bituu)*
gifts, other *(kennaa, kan biraa)*
Income *(galii xumuraa)* Summary: total (per year)
crop sales *(midhaan gurguruu)*
livestock product sales *(oomisha looni gurguruu)*
livestock sales *(loon gurguruu)*
employment (e.g. labor) *(hojii)*
Remittances *(gargarsaa)*

self-employment (e.g. fuelwood)
petty trade or safety nets
Other *(kan biraa)*
Expenditure *(kan maallaqaa xumuraa)* Summary: total (cash per year)
staple food *(nyaata)*
non-staple food *(nyaata)*
HH items (*bishaan woraabde*)
Water *(bishani)*
Inputs *(dikke)*
Education *(barumsa)*
Clothes *(ufata)*
Tax *(kafalti)*
Gifts *(kennaa)*
Celebrations:
Transportation:
Other *(kan biira)*
staple/total* Income *(galii)
Income *(galii) minus expenditure*
Wealth characteristics
Land owned *(lafa)* (tikmat)
Land cultivated *(lafa qonna)*(tikmat)
Land cultivated with food crops *(lafa qonna nyaata)* (tikmat)
Land cultivated with cash crops *(lafa qonna midhaan gurgurta'aa)* (tikmat)
Land for grazing *(lafa dheeduu)* (tikmat)
Cattle # owned *(lakoobsa saa'a)*
Ox # owned *(lakoobsa qotiyyoo)*
Goat # owned *(lakoobsa ree'e)*
Sheep # owned *(lakoobsa hoola)*
Donkey # owned *(lakoobsa haree)*
Hen # owned *(lakoobsa lukkuu)*
Eucalyptus tree *(bahir zaaf)* (tikmat)
Beehives *(lakoobsa gaagura)*
Other *(kan biraa)*
Other *(kan biraa)*
Other *(kan biraa)*

Cows' milk *(anaan saa'a)*
no. milking animals
season 1: lactation period (days)
daily milk production per animal (liters)
total production (liters)
sold/exchanged *(gurguruu/geddaruu)* (liters)
price *(gatii)* in Birr
Income *(galii)* in Birr
type of milk sold/other use *(gosa gurguruu/kan biraa fayidaa)* (skim=0, whole=1)
other use *(kan biraa fayidaa)* (liters)
season 2: lactation period (days)
daily milk production per animal (liters)
total *(dimshaasha)* production (liters)
sold/exchanged *(gurguruu/geddaruu)* (liters)
price *(gatii)*
Income *(galii)*
type of milk sold/other use *(gosa gurguruu/kan biraa fayidaa)* (skim=0, whole=1)
other use *(kan biraa fayidaa)* (liters)
% cows' milk sold
butter production (*dhadhaa*) (kg)
butter (*dhadhaa*) (other use)
butter sales (*dhadhaa gurguruu*): kg sold
butter price(*dhadhaa gatii)*
butter (*dhadhaa*) Income *(galii)* in Birr
% cows' butter (*dhadhaa*) sold: ref year
Cow meat: # animals slaughtered (own use)
carcass weight (kg) *(ulfina gulfa)*
Sheep meat: # animals slaughtered (own use)
carcass weight (kg) *(ulfina gulfa)*
Goat meat: # animals slaughtered (own use)
carcass weight (kg) *(ulfina gulfa)*
Fattened Ox sales: # sold
purchase price *(gatii)*
sales price *(gatii)*
Income *(galii)*

Location where sold
Cattle sales - export: # sold
price *(gatii)*
Income *(galii)*
Location where sold
Cattle sales - local: # sold
price *(gatii)*
Income *(galii)*
cattle offtake (% sold/slaughtered)
Location where sold
Sheep sales - export: # sold
price (gatii*)*
Income *(galii)*
Location where sold
Sheep sales - local: # sold
price (*gatii)*
Income *(galii)*
sheep offtake (% sold/slaughtered)
Location where sold
Chicken sales: # sold
price *(gatii)*
Income *(galii)*
Egg sales *(hanqaaquu)* : # sold
price *(gatii)* in Birr
Income *(galii)*
Location where sold
Skins: # sold
price (*gatii)* in Birr
Income *(galii)*
Location where sold
Donkey hiring *(haree gurguruu*): # days
price *(gatii)* (per day)
Income *(galii)*
What months used *(ji'a)*
GRAZING *(dheeduu)*
Access to community grazing land? (Y / N)
Forest grazing *(dheeduu bosona)*? (Y / N)
# of days per week *(guyyaa)*

Month *(ji'a)* per year
CROP PRODUCTION *(oomisha)***:**
Green cons - Belg: # of month *(ji'a)*s
Green cons - Meher: # of month *(ji'a)*s
Green maize *(boqqolloo)* sold: quantity
price (gatii*)* in Birr
Income *(galii)* in Birr
Where sold *(eesa)*
Barley *(garbuu)*- Meher: kg produced *(oomisha)*
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Where sold *(eesa)*
Wheat (*qammadi*)- Meher: kg produced *(oomisha)*
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Where sold *(eesa)*
Teff - Meher: kg produced *(oomisha)*
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Where sold *(eesa)*
High value cereal - Meher: kg produced *(oomisha)*
sold/exchanged *(gurguruu/geddaruu)*
price (*gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Where sold *(eesa)*
Lentils (*messr)*: kg produced *(oomisha)*
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Field peas: kg produced *(oomisha)*

sold/exchanged *(gurguruu/geddaruu)*
price (*gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Sorghum *(caabbii*)- Meher: kg produced *(oomisha)*
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Other cereal *(calla, midhaan*): kg produced
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Other cereal *(calla, midhaan*: kg produced
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Enset *(workii)* : # local meas.
name of measure
wt of measure
Kg
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Potatoes *(dinicha)* - Meher:
name of measure *(maqaa--)*
wt of measure
Kg
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Where sold
Potatoes *(dinicha)* - Meher:
name of measure

wt of measure
Kg
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Gommen (*shaanaa*) # local meas
name of measure
wt of measure
Kg
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Other crop *(midhaan kan biraa)*:
name of measure
wt of measure
Kg
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Other crop *(midhaan kan biraa)*:
# of measures
name of measure
wt of measure
Kg
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Other crop *(midhaan kan biraa)*:
no. of measures
name of measure
wt of measure
Kg
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr

Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Other crop *(midhaan kan biraa)*: type
name of measure
wt of measure
kg produced
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Other crop *(midhaan kan biraa)* : type
name of measure
wt of measure
kg produced
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Honey *(damma)* # of measure
name of measure
wt of measure
kg produced
sold/exchanged *(gurguruu/geddaruu)*
price *(gatii)* in Birr
Income *(galii)* in Birr
other use *(kan biraa fayidaa)* (kg)
Straw *(citaa)*: quantity sold
price *(gatii)* in Birr
Income *(galii)* in Birr
Where sold
Trees (*muka*): quantity sold
price *(gatii)* in Birr
Income *(galii)* in Birr
Where sold
Other cash crop: type
kg sold
price *(gatii)* in Birr
Income *(galii)* in Birr

Where sold
Other cash crop: type
kg sold
price *(gatii)* in Birr
Income *(galii)* in Birr
Where sold
FOOD PURCHASE:
Main staple cereal: name of meas.
wt of measure
# meas per month *(ji'a)*
$ month *(ji'a)*s
Kg
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Other staple: name of meas.
wt of measure
meas per month *(ji'a)*
month *(lakoobsa ji'a)*
Kg
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Other staple: name of meas.
wt of measure
meas per month *(ji'a)*
month *(lakoobsa ji'a)*
Kg
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Lentils: name of meas
wt of measure
meas per month *(ji'a)*
month *(lakoobsa ji'a)*
Kg
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Other pulse: name of meas
wt of measure
meas per month *(ji'a)*

month *(lakoobsa ji'a)*
Kg
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Sugar purchase *(sukkara bituu)*: kg
times per year *(bara ganna)*
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Meat *(foon bituu)* purchase: quantity (kg)
times per year *(bara ganna)*
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Oil *(zayitii bituu)* purchase: quantity (kg)
times per year *(bara ganna)*
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Milk *(anaan bituu)* purchase: (kg)
times per year *(bara ganna)*
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Other purchase: Vegetables *(kuduraa bituu)*
quantity *(baay'ina)* (kg)
times per year *(bara ganna)*
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
Other purchase: item
quantity *(baay'ina)* (kg)
times per year *(bara ganna)*
price *(gatii)* (per kg)
Expenditure *(kan maallaqaa)*
PAYMENT IN KIND
Labor: type
people per HH (*uummata)*
times per month *(ji'a)*
month *(ji'a)*
payment in kg per time (grain)
Labor: type
people per HH (*uummata)*

times per month *(ji'a)*
month *(ji'a)*
payment in kg per time (grain)
Labor: type
people per HH (*uummata)*
times per month *(ji'a)*
month *(ji'a)*
payment in kg per time (grain)
Labor migration: no. people per HH
no. month *(ji'a)*
GIFTS:
Source
quantity *(baay'ina)* (kg)
times per year
Other food *(nyaata)*:: type
quantity *(baay'ina)* (kg)
times per year
Other food *(nyaata):* type
quantity *(baay'ina)* (kg)
times per year
OTHER CASH INCOME *(GALII)*:
Labor: Weeding (*guru)*
people per HH (*uummata mana)*
times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit
Income *(galii)*
Labor: Harvesting *(kassabuu)*
people per HH
times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit
Income *(galii)*
Labor: Construction *(ijaarsa)*
people per HH
times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit

Income *(galii)*
Labor: Forestry *(bosona)*
people per HH (*uummata)*
times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit
Income *(galii)*
Labor migration: # people per HH
Location:
month *(ji'a)*
savings/remittance per month *(ji'a)*
Income *(galii)*
Remittances: # times per year
Amount *(baay'ina)*
Income *(galii)*
Firewood *(isat)*: # people per HH
times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit
Income *(galii)*
Where sold:
Transport cost:
Charcoal *(kasala):* # people per HH
times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit
Income *(galii)*
Where sold:
Transport cost:
Lumber /Poles:
times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit
Income *(galii)*
Where Sold:
Transport cost:
Other self-employment: type
people per HH (*uummata)*

times per month *(ji'a)*
month *(ji'a)*
price *(gatii)* per unit
Income *(galii)*
Other self-employment: type
people per HH (*uummata)*
times per month *(ji'a)*
month *(ji'a)*
Income *(galii)*
Petty trade or Safety Nets: no. people per HH
times per month *(ji'a)*
month *(ji'a)*
Income *(galii)*
Gifts/social support/zakaa: type
times per month *(ji'a)*
month *(ji'a)*
Other Income *(galii)*: Credit
times per month *(ji'a)*
month *(ji'a)*
OTHER PURCHASE:
Tea/coffee *(bunna/shayee)*
Salt & Red pepper *(soogidda & berbere)*
Soap *(samuna)*
Kerosene
Grinding *(daakuu)*
Water for humans: name of local meas.
meas per month *(ji'a)*
month *(ji'a)*
cost per measure
Expenditure *(kan maallaqaa)*
Firewood *(muqa ibida)*
Utensils
Animal drugs *(qoricha neefkaa*)
Salt for animals *(soogidda neefkaa)*
Water for animals*: (bishani neefkaa)*
meas per month *(ji'a)*
month *(ji'a)*
cost per measure

Expenditure *(kan maallaqaa)*
Ploughing *(qotuu)*
Seeds *(sanyii)*
Fertilizer (DAP-*hormata*)
Pesticides *(qoricha)*
Labor
Livestock restocking
Other essential inputs (*soyiraa kan harkatii)*
Other inputs (tools) *(kan harkatii qabatan)*
School *(mana barumsa)*
Medicine *(qoricha)*
Clothing
Tax
Gifts
Other essential items
Other items *(kan biraa)*
CREDIT AND SAVINGS GROUPS:
Edir (30+):
Member since*(miseensa):*
Monthly *(waaji ji'a)* contributions:
Use:
Ekub (5-25):
Member since*(miseensa):*
Monthly *(waaji ji'a)* contributions:
Use:
Wijo (1-10 women):
Member since *(miseensa):*
Monthly *(waaji ji'a)* contributions:
Use:
Other savings/loan groups
Member since *(miseensa):*
Monthly *(waaji ji'a)* contributions:
Use:
EXTENSION (uumama qonna)
times visited by extension agent in last year *(ji'a)*:

Reason(s):	
3 years:	5 years:
# of trainings attended in the last year *(ji'a)*:	
3 years #_____ (topics) (*mata duree*):	
5 years #_____ (topics) (*mata duree)*:	
House Construction *(mana)*	
Type *(akakuu):*	
Roof type *(akakuu diikkaa):*	
Age:	
Food Storage *(gotara):*	
Where obtain construction materials:	
Poles	
Lumber	
Fencing *(ater)*	
Other forest uses:	
Medicine (type, frequency) ***(qoricha)***	
Beehives *(gaagura*)(#)	
Fodder *(hookaa)* (type, frequency)	
Water:	
Location:	
Months:	

Appendix C: Forest Measurement Protocols

I measured the diameter at breast height (dbh) using standard measurement protocols. I identified to the species level all trees measured in quadrats with the assistance of two local forest guards who assisted with data collection. They each have extensive knowledge of local flora and provided local names for unknown species, which I then used to in referring to other texts and asking experts.

The sampling unit I used for this study is the 25 x 25 meter quadrat. Within each quadrat I identified species present, stem number and diameter of trees larger than 3 cm dbh.

Confidence Levels and Intervals

I set my confidence intervals and levels for my ecological objectives using data from Didha's 2009 study (Table A-2) and based upon commonly used confidence levels in vegetation science.

Table A.2: Confidence intervals and levels for ecological objectives

Study Objective	Required Confidence Level	Required Confidence Interval
Species Distribution	95%	4.0 (± 2 species per ha)
Stem Number	95%	20.0 (± 10 stems per ha)
Tree Diameter	95%	5.0 (± 2.5 m^2/ha)

Sampling Design

I used simple random sampling without replacement, and Stein's two-stage sampling to calculate the required sample size. Under Stein's two-stage sampling, the expected population variability is estimated through data collected in a pilot study and then used in the equation $n=(ts/d)^2$ where n is the required sample size, t is the tabulated value from a t-table, s is the expected variability, and d is the half-width of the confidence interval.

I used data collected in 2007 and 2008 by Didha (2008) at a site located within the Arsi Forest approximately 12 kilometers north of the center of my research site as a substitute for a pilot study. Didha's site (Table A-3) is appropriate for comparison because his study had similar ecological characteristics including elevational range and species composition, and the forest areas are subject to similar patterns of anthropogenic use.

Table A.3: Didha's (2008) plot data collected in 50x50 meter quadrats in Arsi Forest

Ecological Objective	Sample Size (N)	Mean	Standard Deviation	Standard Error	95% Confidence Interval		Minimum	Maximum
					Lower Limit	Upper Limit		
Species #	24	9.7	2.6	0.5	9.5	9.9	6.0	19.0
Stem #	24	48.4	16.6	3.4	47.0	49.8	14.0	80.0
Basal area	24	8.6	4.0	0.8	8.3	8.9	2.6	18.1

To calculate sample size, I inserted relevant data from Didha's study into the equation $n=(ts/d)^2$ (see Table 3). Any figures in the 'Sum' column having a number greater than zero in the tenth decimal place are rounded up to the next whole number. Since quadrats used by Didha are 50 x 50 meters in size and my quadrats are 25 x 25 meters in size, I multiplied the figures in the 'sum rounded up' column by four to adjust for the area difference. It is expected that variance among plots will increase as plot size decreases. To ensure an adequate sample size, I calculated confidence intervals after all plots were measured.

Table A.4: Sample size calculations using Stein's two-stage sampling and quadrat size correction

Ecological objective	t (.05 and 23 dof)	s standard deviation	d half-width of confidence interval	Sum	Sum rounded	Plot size correction (sum rounded * 4)
Species #	2.1	2.6	2.0	7.2	8	32
Stem #	2.1	16.6	10.0	11.8	12	48
Basal area	2.1	4.0	2.5	11.0	11	44

To offset the chance of and inaccurate estimate, I applied a method derived by Wilson (2008) from Kupper and Hafner (1989), in which the calculated sample size is increased by 20 percent plus five (Table A.5). As in the previous calculations, any figures in the 'Sum of sample size and offset' column having a number greater than zero in the tenth decimal place are rounded up to the next whole number.

Table A.5: Sample size calculations with Stein's two-stage sampling and offset calculations

Ecological objective	Calculated sample size	Offset (20% + 5)	Sum of sample size and offset	Sample size rounded up
Species #	32	11.4	43.4	44
Stem #	48	14.6	62.6	63
Basal area	44	13.8	57.8	58

Sample Area

The sample size calculations indicated that a minimum of 44 quadrats for species area, 63 quadrats for stem number and 58 quadrats for basal area would satisfy the confidence levels and intervals that I have set. I collected data on each of the three ecological objectives for all 63 quadrats so that I could move through the site systematically rather than needing to follow the random points as they were selected. The land area measured within the 66 25 x 25 meter quadrats is equivalent to 4.1 hectares, or 0.3 percent of the total study area.

Random Point Generation

I used a Garmin eTrex HC Series personal Global Positioning System (GPS) to mark the boundaries of the Ashoka natural forest area. I accomplished this in one field day on horseback with the assistance of two forest guards who have worked in the area for 17 and 20 years, respectively, and are familiar with the boundaries. I used the Minnesota DNR Garmin Version 5.04.01 to convert the .gpx waypoint files to a shapefile and I uploaded the shapefile into Quantum Geographic Information System (QGIS) version 1.3.0 Mimas. I generated 70 random points using the random point selection research tool in Quantum GIS and uploaded them into my GPS unit (see Map 2). There are a few areas within the site that are too dangerous to sample, such as the steep canyons surrounding the Lepis waterfall. I will discard any points that fall within such locations or that put portions of the quadrat beyond the edge of the study area. I will stop sampling when I have sampled the required 63 quadrats. To ensure interspersion, I determined before sampling that I would accept a sampling arrangement only if it had at least two points in all four quarters of the study area. The first random point selection that I generated met this criterion.

I used a compass, the GPS unit and proximity alarms to locate the points in the field. In the event of drift with the GPS unit, I stopped the first time the GPS unit says that I have

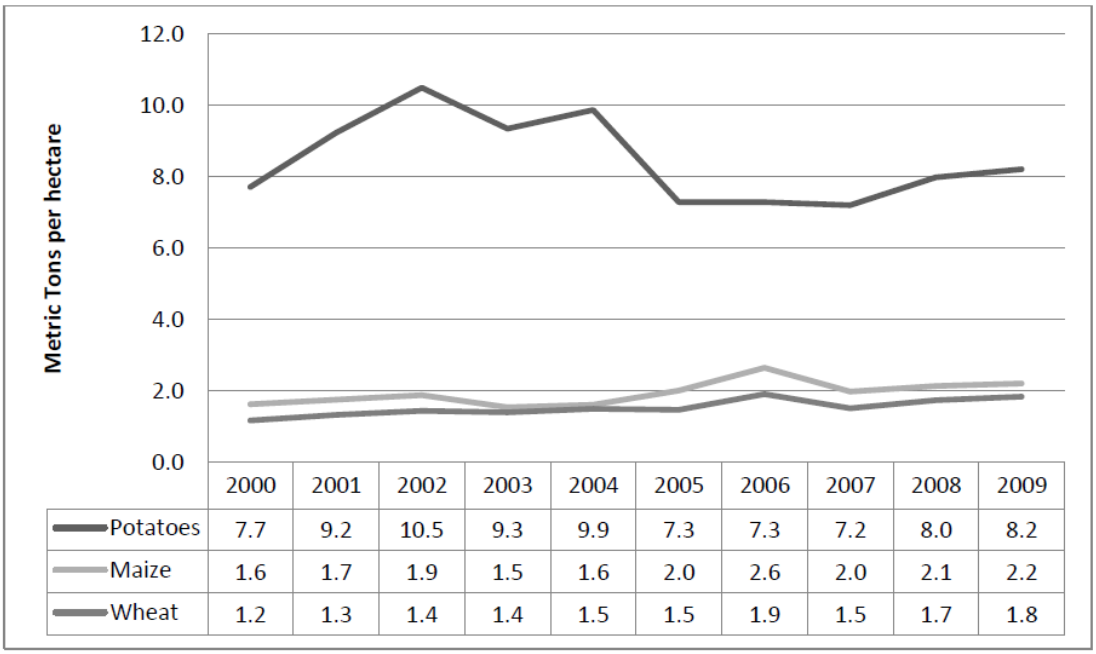
reached my destination (Wilson 2008). I used the mid-point between the toes of my boots to locate the point. The point marked the southwest corner of each quadrat. I used a compass and meter tape to delineate the four sides of the quadrat and marked each corner with flagging tape.

Appendix D: Species List, 2010 Arsi Forest Plots

Latin name	Family	Local name
Allophylus abyssinicus	Spindaceae	Hirqammuu
Apodytes dimdiata	Icacinaceae	Arrab-dottessaa
Arundunaria alpina	Bambusaceae	Lemana
Bersama abyssinica	Melianthceae	Koraqqaa
Buddleja polystachya	Buddlejaceae	Bulchaanaa
Cassipurea malosana	Hizophoraceae	Xilloo
Celtis africana	Ulmaceae	Amallaqa
Croton macrostachyus	Euphorbiaceae	Bakkanisa
Dombiya torrida	Sterculiaceae	Dannisa
Ekebergia capensis	Meliaceae	Somboo
Erythrococca abyssinica	Euphorbiaceae	Gaalloo dhalaa
Fagaropsis angolensis	Rutaceae	Sisaa
Ficus sur	Moraceae	Harbuu
Galiniera saxifraga	Rubiaceae	Koralla
Hagenia abyssinica	Rosaceae	Koosoo
Juniperus excels	Cupressaceae	Hi'essa
Maesa lanceolata	Myrsinaceae	Abbayyii
Maytenus undata	Celastraceae	Kombolcha
Milletia ferruginea	Fabaceae	Dhaadhatuu
Myrica salicifolia	Myricaceae	Radjii
Myrsine melanophloes	Myrsinaceae	Tula
Nuxia congesta	Loganiaceae	Bixxannaa
Ochna holstii	Ochnaceae	Baabbee
Olea europaea	Oleaceae	Ejersa
Pittosporum mannii	Pittosporaceae	Amshika
Podocarpus falcatus	Podocarpaceae	Birbirsa
Pouteria adolfi-friederici	Sapotaceae	Suduba
Prunus africana	Rosaceae	Sukkee
Spathodia nalotica	Bignoniaceae	
Syzygium guineense	Myrtaceae	Baddeessaa
Teclia nobilis	Rutaceae	Hadheessaa

Sources: Didha (2008); Author's fieldwork

Appendix E: Production and Pricing Figures for Potatoes, Maize and Wheat



	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Potatoes	7.7	9.2	10.5	9.3	9.9	7.3	7.3	7.2	8.0	8.2
Maize	1.6	1.7	1.9	1.5	1.6	2.0	2.6	2.0	2.1	2.2
Wheat	1.2	1.3	1.4	1.4	1.5	1.5	1.9	1.5	1.7	1.8

Figure A.1: Annual Production of Potatoes, Maize and Wheat (2000-2009)
Source: FAOSTAT 2011b

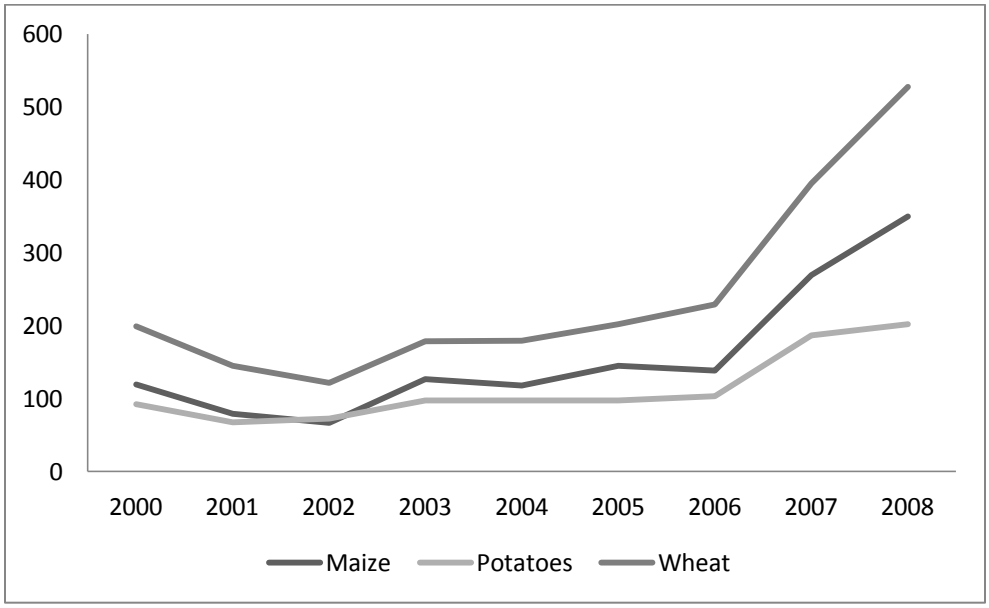


Figure A.2: Annual Crop Prices of Potatoes, Maize and Wheat (2000-2008)
Source: FAOSTAT 2011a