Environmental Policy Update 2013:
Missing Players in Environmental Governance

Chapter 1. Local, Regional, and National Forest Management and Policy in Ethiopia: Forest Cover in the Gurage Zone, 1995-2011

Avery Beck & Wyatt McLean

የጥናቱ ዋና ጭብጦች

Environmental Policy Update 2013: Local, Regional and National Forest Management and Policy in Ethiopia: Forest Cover in the Gurage Zone, 1995-2011

የ 2006 የአካባቢ ጥበቃ ፖሊሲ ጥናት የስራ ዉጤት፣ የኢትዮጵያ ህዝባዊ ተቋማት መንግስታዊ ካልሆኑ ድርጅቶች ጋር ያላቸው እንቅስቃሴ አካባቢን የሚመለከቱ ጉዳዮች

Avery Beck & Wyatt McLean
አሊቨያ ከፋቨር

- This chapter examines forest management practices and changes in forest cover from 1995 to 2011 in the Gurage Zone.
- Ethiopia has a history of highly centralized forest governance.
- The 1995 EPRDF constitution encourages the devolution of federal power to the regional and local levels.
- The bulk of Ethiopian land became state-owned under the Land Reform Act of 1975, which discouraged long-term investment in land conservation and management.
- GIS analyses suggest three of five forest cover classes in Gurage experienced declines in vegetation density between 1995 and 2011.
- Local-level institutions present within Gurage may help slow forest decline.
- More research is needed to develop a stronger understanding of how forest-related institutions are engaged in, and could possibly improve, forest management in the Gurage Zone.

- የህዝባዊ ተቋማት መንግስታዊ ካልሆኑ ድርጅቶች ጋር ያላቸው እንቅስቃሴ አካባቢን በተመለከተ ምን ይመስላል?
- ከቃለ መጠየቅ እና ከተለያዩ የጽሑፍ ምንጮች የተገኙ ማስረጃዎች ትንተና
- የአካባቢ ጥበቃ ተቋማት በኢትዮጵያ አዲስ ጅምር እንቅስቃሴዎች ናቸው::
- በኢትዮጵያ የአካባቢ ጥበቃ ፖሊሲ እና ተቋማት ተቋቁመዋል ነገር ግን በመንግስት ዙሪያ ያለው የአፈጻጸም ብቃት በጀት እጥረት ፣ በባለሙያ እጦቶት ፣ በቁሳቁሶች ጉድለት እና በመሳሰሉ ምክንያቶች አሁንም ድክመት ይታይበታል::
- እንደ የአካባቢ ጥበቃ ባለስልጣን የመሳሰሉ የመንግስት አካላት በፕሮግራም እና በፖሊሲ አፈጻጸማቸው ዙሪያ የመንግስታዊ ያልሆኑ ድርጅቶች ድጋፍ አስፈላጊ ነው::
- ምንም ኢንካ የኢትዮጵያ መንግስት ከስባዊ መብት አስጠባቂ ድርጅቶች ጋር ጥሩ ግኑኙነት ባይኖረውም መንግስታዊ ካልሆኑ የአካባቢ ጥበቃ ድርጅቶች ጋር ግን የተሻለ ግኑኙነት አለው::
- ይህም ሆኖ የአገሪቱ የፖለቲካ ሁኔታ የአካባቢን ፖሊሲ ና ህጎች ከማስፈጸም አንጻር አስተማማኝ አይደለም::
- የኢትዮጵያን የአካባቢ ፖሊሲ የአፈጻጸም ችግር ለማሻሻል አለማቀፋዊ የገንዘብ ድጋፍ አስፈላጊ ነው::
- መንግስታዊ ያልሆኑ የአካባቢ ጥበቃ ድርጅቶች የአካባቢን ጥበቃ በሚመለከት ዙሪያ ከፈተኛ ሚና አላቸው::
- መንግስታዊ ና መንስግታዊ ያልሆኑ ድርጅቶችን የፖሊሲ አፈጻጸም ብቃት በሁሉም ደረጃ ለማሻሻል ጥረት ማድረግ ያስፈልጋል::ይህንንም ለማስፈጽም
- መንግስታዊና መንግስታዊ ያልሆኑ ድርጅቶች በጓደኝነት ላይ የተመሰረተ ግንኙነትን በማበረታታት፣ በክልል ለተመሰረቱ መንግስታዊ ያልሆኑ ድርጅቶችን በፖሊሲ ውይይት፣
  - በፕሮጀክት አፈጻጸም ፣
  - በእውቀት ልውውጥ ትኩረት በመስጠት እና አለማቀፋዊ የገንዘብ ድጋፍን በማበረታታት ነው

Chapter 1. Local, Regional and National Forest Management and Policy in Ethiopia: Forest Cover in the Gurage Zone, 1995-2011

By Avery Beck & Wyatt McLean

EXECUTIVE SUMMARY

Forests are essential to the functioning of communities and to rural livelihoods in Ethiopia. They provide a number of ecosystem services, such as reducing soil erosion, providing buffers against pests and disease, and preserving watershed functions, which help mitigate floods and droughts. Today, population growth, fuel wood harvesting, and expanding agriculture, among other factors, threaten forests throughout the country.

This chapter studies forests and forest management in the Gurage Zone, an administrative zone located within the Southern Nations, Nationalities, and Peoples' Region (SNNPR). It employs a review of literature to track cultural, historical, and institutional developments in Ethiopia, to thereby contextualize changes in forest cover and evaluate how federal, regional, and local institutions interact to protect and manage forests in the Gurage Zone. Furthermore, this research uses Geographic Information Systems (GIS) analysis to assess changes in forest cover within the Zone between 1995 and 2011. Land use-land cover classifications and Landsat satellite data show patterns of change in Normalized Difference Vegetation Index (NDVI) values, representative of changes in vegetation density change over time.

A review of historical and institutional developments shows how forest governance in Ethiopia has been moving towards decentralization of land administration, with the intention of shifting land and forest management to regional and local levels. Such shifts in administration, however, have not been linked to positive trends in forest cover and management. Analyses of land cover change show a trend of decreasing vegetation cover for three of five classes of wooded or forested land cover across the Gurage Zone between 1995 and 2011. There are some exceptions to these patterns of forest loss, including in communities with exceptionally strong local forest governance institutions and strong local judicial traditions, as well as on lands surrounding the many Ethiopian Orthodox churches across the Gurage Zone. But overall natural forest cover in the Zone appears to be declining, giving way to agricultural expansion and fuelwood plantations.

One interpretation of these findings is that decentralization has failed to protect forests in the Gurage Zone - however such rash conclusions would ignore the presence of a host of compounding factors driving forest loss. Such factors include, but are not limited to, the high ethnic and linguistic diversity of the Gurage Zone, shifts in modern agricultural practices towards cash crop systems, and population growth in an already densely populated area. As research on forests and the diversity of vegetation in the Gurage Zone progresses, it will be important to continue research on how these factors are altering land use patterns and relationships to land in the Gurage Zone.

Chapter 1. Local, Regional and National Forest Management and Policy in Ethiopia: Forest Cover in the Gurage Zone, 1995-2011

By Avery Beck & Wyatt McLean

1. INTRODUCTION

According to the 2010 United Nations Food and Agriculture Organization Global Forest Resources Assessment, Ethiopia saw an average loss of 141,000 hectares of forest each year between 1990 and 2010 (Global Forest Assessment, 2010; Damte, 2011). Such dramatic declines in forest cover are indicative of the enormous pressures on natural resources in Ethiopia. Forests have traditionally been sources of key products and services such as biomass fuel, timber and non-timber forest products, as well as various ecosystem services, and continue to provide products upon which rural communities in Ethiopia rely (Forum for Environment, 2010). Roughly 85% of Ethiopia's total energy use for household cooking comes from firewood use, and as much as 99% of rural populations' fuel comes from wood and other traditional biomass sources (Beyene & Koch, 2013). Given the high dependence of communities on forest resources, deforestation is a pressing environmental issue in Ethiopia today, and it is of critical importance to identify and monitor trends in forest loss that threaten remaining resources.

The Gurage Zone is a fertile and mountainous administrative zone situated in the northernmost tip of the Southern Nations, Nationalities and People's Region (SNNPR). Known primarily for its linguistic and ethnic diversity, and its unique style of music, the Gurage Zone has had relatively few studies of forests and forest management conducted within its borders. Yet, it is home to approximately 4% of Ethiopia's total population (Teferra, 2009) and the Gurage Mountain Chain represents a diverse mosaic of agriculture, gallery forests, eucalyptus plantations and afro-alpine grasslands, shrublands, and dense forest. At the request of Dr. Sebsebe Demissew of the National Herbarium and Addis Ababa University, a researcher whose recent work has included compiling an atlas on the vegetation of the entire country of Ethiopia, this report compiles existing knowledge of forests, forest cover change, and forest management in the Gurage Zone.

This research seeks to answer the following questions*: How did forest cover change in the Gurage Zone between 1995 and 2011? What is the historical, cultural and institutional context within which these changes have occurred?* Specifically, this research seeks to understand how national and regional institutions interact with local institutions[1] to shape forest outcomes in the Gurage Zone.

2. THE GURAGE ZONE

Located at the base of the Central Plateau of Ethiopia, in the northern stretches of the Southern Nations, Nationalities, and Peoples Region (SNNPR), the Gurage Zone is situated in

[1] Institutions, as understood in this research, are defined broadly as the suite of formal and informal rules and norms that condone and constrain human behavior (North, 1990).

Ethiopia's Western Highlands (Figure 1). Approximately 65% of its area lies in the *woina dega* (mid altitude, 1500-2500 meters above sea level (m.a.s.l.)), and 7% in *kolla* (lowland, 1000-1500 m.a.s.l.) area (Debela, 2009). The topography of Gurage spans high plateau in the *dega* and low plateau in the lower *woina dega* and *kolla* areas, which contribute to the extreme variation in slope across the zone (Woldetsadik, 2003). A series of peaks located at the edge of the Central Rift valley divide the western and central areas of the Gurage Zone from the eastern section.

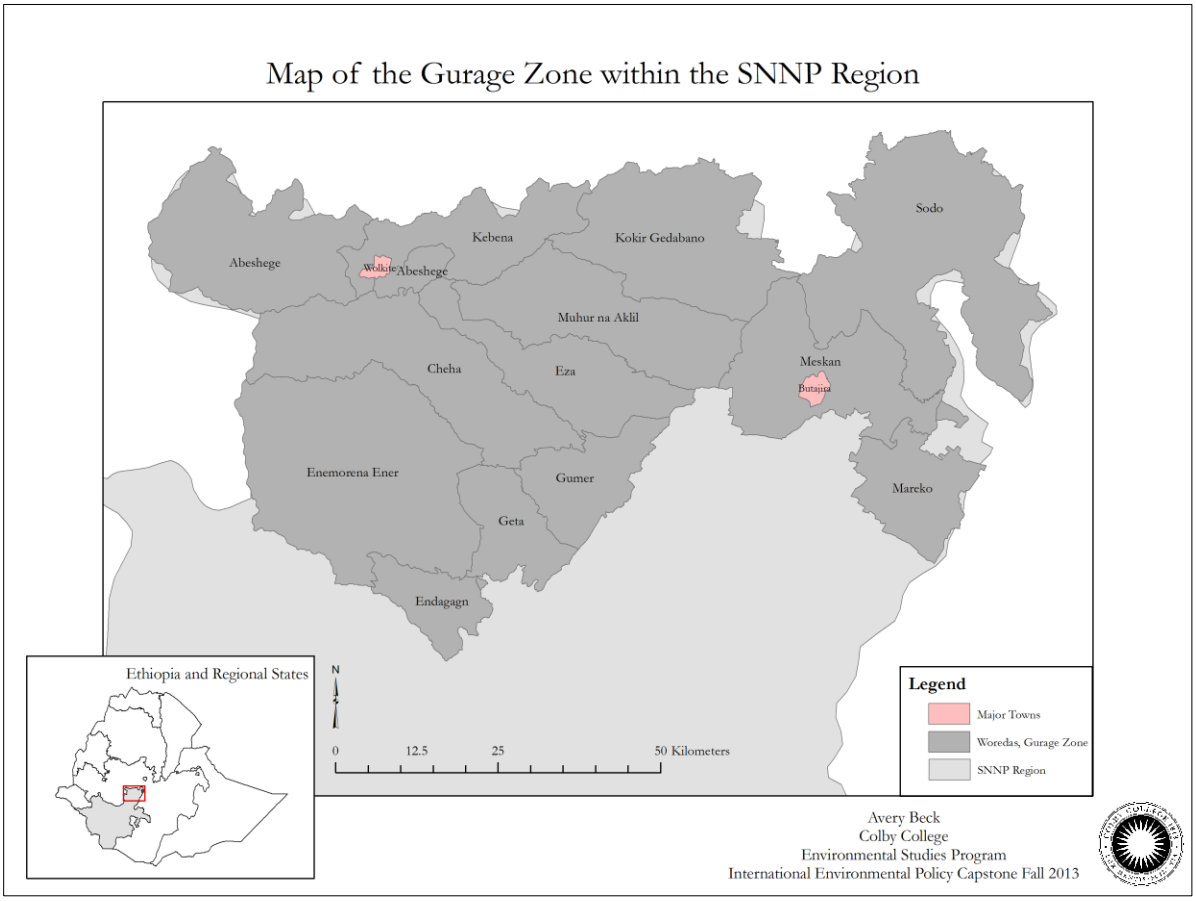


Figure 1. Map of Gurage Zone, located within the Southern Nations, Nationalities, and People's Region (DIVA-GIS, n.d.; Central Statistical Agency of Ethiopia, n.d.).

Researchers in Ethiopia have expressed concern over the extent to which natural vegetation is being converted to agricultural lands all along the Gurage Mountain Chain (Demissew, Sebsebe; Pers. corr.; September 2013). Such land conversion has arisen, in part, due to rapidly growing population pressures in the region. The highlands of Ethiopia are home to 88% of the total human population and 67% of the total livestock population of Ethiopia while covering only 40% of the country's total land area (Population Census Commission, 2007). Population levels within the Gurage Zone reached approximately 1.3 million people in 2007, and figures show population density in Western Gurage increasing from 163.1 people per square kilometer in 1984 to 194.8 people per square kilometer by 1994, and to 234.6 by 2000 (Woldetsadik, 2003).

Overall, the pattern of concentrated settlement in the highlands is largely attributed to differences in environmental conditions between lowlands (below 1500 m.a.s.l.) and highlands in Ethiopia. The lowlands generally have low rainfall, low soil fertility, and higher incidences of tropical diseases, whereas the highlands (above 1500 m.a.s.l.) have more favorable conditions such as substantial rainfalls during the rainy seasons, fertile soils, relatively abundant vegetation, and lower disease incidence rates (Denboba, 2005; Sonneveld and Keyzer, 2003).

The Gurage Zone is as diverse in its ethnic and linguistic composition as it is in its topography. Ethiopia consists of as many as 80 ethnic groups and languages, and SNNPR contains over half of the ethnic groups in the country (more than 45 ethnic groups are recognized). These ethnic groups speak many different languages, broadly categorized into four groups: *Cushitic*, *Omotic*, *Nilotic*, and *Semitic* (Debela, 2009) - with the *Semitic* language group largely predominant in the Gurage Zone. The Zone itself is further subdivided into three areas – Western, Eastern and Northern - of which each is further associated with one of three linguistic sub-groups under the broader Semitic group: the *Sebat-bet Gurage* in the Western part of Gurage, the *Kistane* cluster of northern Gurage, and the *Silte* cluster of eastern Gurage (Gadena, 2009; Zewde, 2002; Leslau, 1952). Ultimately a total of twelve different Ethiopian-Semitic dialects, organized under these groups, have been identified within the Gurage Zone - *Soddo*, *Gogot*, *Muher*, *Mäsqan*, *Chaha*, *Ezha*, *Ennemor*, *Endegen*, *Gyeto*, *Silte*, *Wolane*, and *Zway* - with further linguistic classifications breaking down several of these dialects into even more subgroups (Fellman, 2001; Leslau, 1969). Within each of the three major linguistic groups in the Gurage Zone the dialects are considered mutually intelligible (to varying degrees). Across the three groups, however, there is virtually no mutual intelligibility, a remarkable occurrence in a zone with an area of only approximately 5,000 square kilometers (Fellman, 2001). This linguistic and cultural diversity has complicated how land and resources are governed (Box 1).

Box 1. Ethnic Federalism and *Silte* Independence

The case of the *Silte* people is one example of how ethnic diversity complicates land administration practices in and around Gurage. Previously considered a sub-clan of the Gurage ethnic group, the *Silte* were granted independence from Gurage on the grounds of ethnic self-determination, following a referendum vote in 2001 (Smith, 2005; Gadena, 2009). This move, sanctioned by laws established upon principles of ethnic federalism, led to a redrawing of administrative boundaries along ethnic lines and reshuffling of governance and land administration within the region.

Land use within the Gurage Zone is primarily oriented around subsistence agriculture, though there have been reported increases in the cultivation of eucalyptus forests and plantations, cereals fields, and cash crops such as *chat* (Woldetsadik, 2003).[2] The Gurage people are perhaps best known for their heavy dependence on *enset* (Bekele, 2005). *Ensete ventricosum*, also known as 'false banana' owing to its long, distinctive leaves reminiscent of banana leaves, is a food crop that is most predominant around the southern highlands of Ethiopia (Debela, 2009; Brandt et al., 1997). It has only been domesticated for food production in Ethiopia, but species of *Enset* have been found across other parts of sub-Saharan Africa, Madagascar, and Asia. *Enset*

[2] *Catha edulis*, a perennial cash crop and mild stimulant that is widely used in the Southern and Eastern parts of the country (Abrar et al., 2004).

is a single-stem perennial, herbaceous and fibrous plant. The root (or corm) and pseudostems of *Enset* are sources of large amounts of starchy, carbohydrate-rich food. This foodstuff is scraped from the plant, pulverized and fermented in a covered pit, after which the end product, *kocho*, is used to make bread and porridge. Other parts of the plant can be used for livestock feed, fiber, construction materials, and occasionally fuel (Tsegaye & Struick, 2002; Brandt et al., 1997).

The relative food security of the southern highlands in the past is largely attributed to the extensive cultivation of *enset* in the area. *Enset* is a drought-resistant plant that is cultivated throughout the year, and in its processed form, can be stored for long periods of time (Arts et al., 2012; Tsegaye, 2002; Negash, 2001). Within the five rural livelihood zones identified by USAID that encompass the Gurage Zone, of which three are considered primary *enset*-production areas, there is a substantial level of consumption of home-grown crops (see Appendix II for more detailed livelihood zone profiles). Across these zones, poor households produce around 60% of the food they consume, and middle-income households produce around or above 80% (USAID, 2005). Access to land has thus become a pressing issue for people who are dependent largely upon subsistence agriculture.

As population levels increase in the Gurage Zone, it is becoming increasingly difficult for inhabitants to obtain their own tracts of land, a stated legal right of residents of SNNPR above the age of 18 (Woldetsadik, 2003; Alemu, 2012). There is also an indication of size reductions of available plots: in 1996 a study of the Imdibir Peasant Administration found the mean small-holder farm size was 1.56 *wodero*, or approximately three-quarters of a hectare, compared to average farm size of 3 *wodero* held in the 1930s (Molla et al., 1996). In areas of Western Gurage, declines in plot size due to increasing population pressures have been changing land use and land cultivation practices. In the absence of strict land administration and law enforcement, land pressures, by their nature, pose a threat to highland forests, as they can be exploited for resource harvesting as well as claimed for cultivation. In such circumstances, local and regional land administration institutions' involvement in ensuring that allocation, distribution, and use of lands in the Gurage Zone follows laws and obligations is crucial for sustainable forest management.

3. METHODS

For this study, we collected and analyzed two types of data. A comprehensive literature review provided information on forest management institutions at the national and regional (i.e., within the SNNPR) levels, and additional details on relevant historical and cultural factors that have shaped forest management in Ethiopia and the Gurage Zone. We then used ArcMap 10.1 to analyze Geographic Information Systems (GIS) data and assess forest and vegetation cover change over time at the zonal level (i.e., specific to the Gurage Zone). Finally, an additional literature review of local institutional diversity sought to investigate the degree to which local land-use practices (e.g., cropping and livestock traditions) and local governance institutions (e.g., customary laws) have influenced local forest outcomes in different parts of the Gurage Zone.

3.1. Literature Review Methods

We used article and media databases and scholarly search engines, which included Scopus, JSTOR, ProQuest, Science Direct, Elsevier, Environment Complete, Google Scholar, and Google, to gather published empirical studies, scholarly articles, books, legal documents, and other data sources that provided information on historical context, institutions, and on-the-ground dynamics that might contribute to past and present changes in the state of forests and forest management in Gurage Zone.

3.2. Spatial Analysis Methods

Spatial analyses drew upon U.S. Geological Service (USGS) Landsat satellite data from the years 1995 and 2011. Since the early 1970s, the National Aeronautics and Space Administration (NASA) has sponsored the Landsat program, providing satellite imagery of the earth's surface in 30 meter by 30 meter panels (USGS, 2013). The Landsat program provides openly available data, which is of great value to individuals and institutions studying land cover change over time. We downloaded Landsat scenes covering the Gurage Zone directly from the U.S. Geological Survey (USGS) through the online Global Visualization Viewer (GloVis). To represent vegetation cover across the Gurage Zone we used three scenes of data for each year studied. Within each year, the dates at which the scenes used were captured ranged from February to March. To ensure land cover visibility only Landsat imagery containing less than 30% cloud cover were considered, and available data generally showed less than 10% cloud cover overall.

We then used red (RED) and near-infrared (NIR) bands from each Landsat scene to generate Normalized Difference Vegetation Index (NDVI) maps for the Gurage Zone. NDVI is a measurement of the balance between energy received and energy emitted by the earth which, when applied to plant communities, establishes a range of values for the density of vegetation across a given area of study (Meneses-Tovar, 2011). To accomplish this, NDVI combines the energy absorbed by chlorophyll in the red sector of the electromagnetic spectrum (RED) with the opposing energy deflected by the internal structure of leaves in the near-infrared (NIR). NDVI then calculates this difference as an estimate of vegetation "greenness" using the formula:

$$NDVI = (NIR-RED) / (NIR+RED)$$

This calculation yields a range of pixel values from -1 to 1; typically, negative values represent the absence of vegetation and positive values represent vegetation presence (Martinuzzi et al., 2008). Values at or near zero also indicate a lack of vegetation, while values close to +1 (0.8 - 0.9) indicate the highest possible density of green leaves (NASA, 2013). Clouds and water bodies are also represented by NDVI values that are close to zero. For the purposes of exploring vegetation change, therefore, this study looks at NDVI values within the range of zero to positive one (0 to 1). Each individual Landsat scene was processed into an NDVI layer using the open source statistical software RStudio (for an example of an NDVI image generated through RStudio, see Figure 2).

When mapped onto a given area, NDVI values can serve as indicators of the overall extent and density of vegetation, allowing for estimates of how forest has been degraded or intensified in vegetative cover over time.

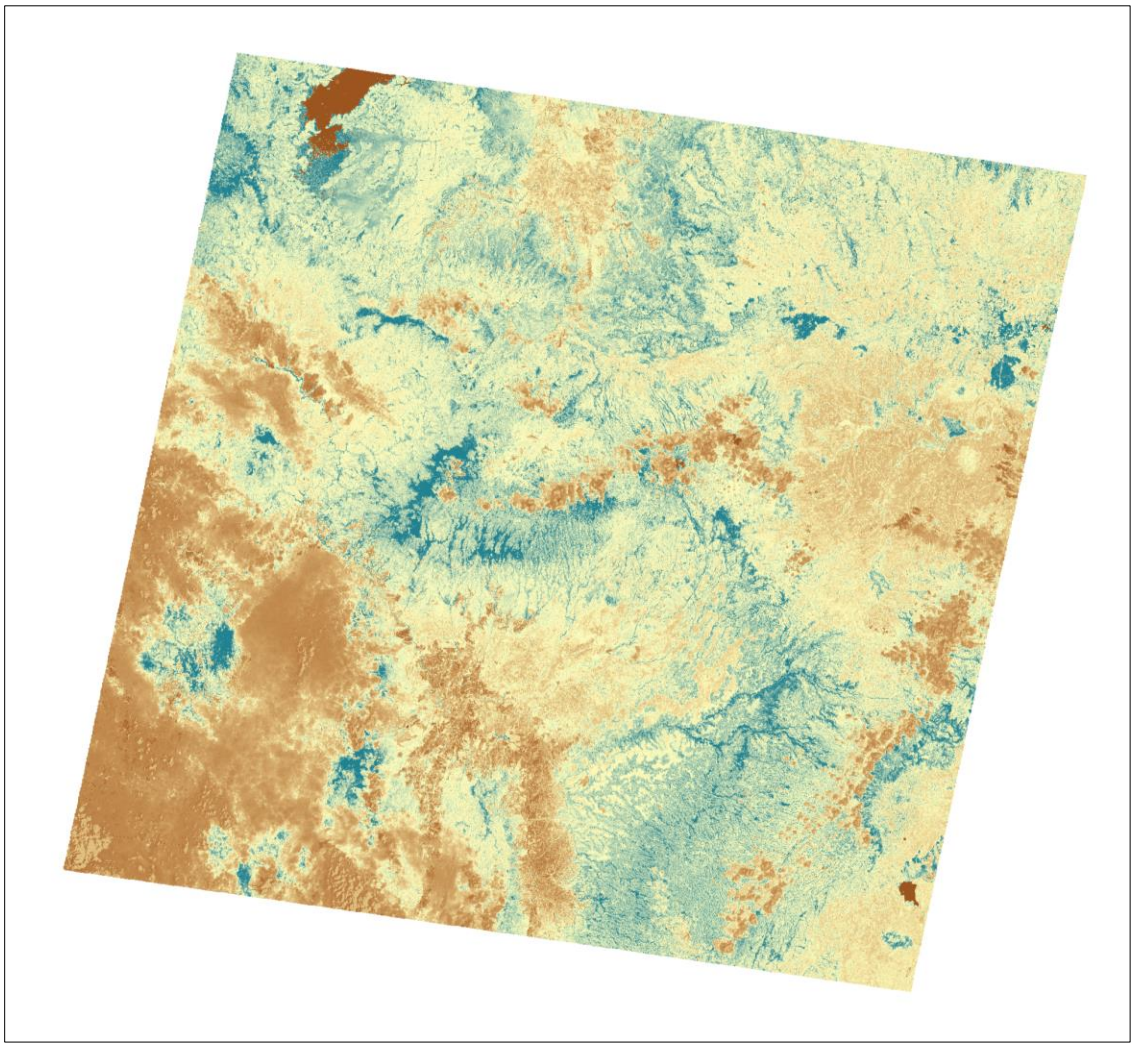


Figure 2. Sample Normalized Difference Vegetation Index (NDVI) image, the values of which represent vegetation density across the area depicted, generated using a Landsat image of the Gurage Zone (identified through the USGS GloVis data portal by the following: WRS-2 Path/Row 169/054, Scene 06-02-1995) (USGS, 2013).

Subsequent analyses used Esri[3] ArcMap 10.1 to project NDVI layers into a WGS 1984 UTM Zone 37N projected coordinate system. In instances where multiple USGS images were available for a given scene and a given time period, NDVI layers were mosaicked[4] to generate new composite NDVI layers and thereby reduce cloud cover and distortions. These images were then analyzed using ArcMap raster subtraction tools (for vegetation cover change over time) and zonal statistics to identify trends in land cover change by land use type within the Gurage Zone.

[3] Esri is an international supplier of Geographic Information System (GIS) software, web GIS and geodatabase management applications.

[4] Mosaicking refers to the merging of two or more raster datasets to create a new raster layer.

Table 1 provides information on additional data sources used in the analysis.

Table 1. Description and sources of GIS data used in spatial analyses.

Data	Description	Source
Land cover satellite imagery	Global land cover raster data for 1995 and 2011. Panels cover WRS-2 Path/Row 168/054, 169/054, and 169/055	USGS (http://glovis.usgs.gov/)
Elevation	SRTM 90-meter resolution elevation data	CGIAR-CSI (http://www.cgiar-csi.org/data/srtm-90m-digital-elevation-database-v4-1)
Woreda and kebele	Administrative boundaries	Mesfin Sahle, Wolkite University (Data from the Central Statistical Agency of Ethiopia)
Land use land cover (LuLc)	Land use and land cover shapefile data for the Gurage Zone	Mesfin Sahle, Wolkite University (Data from and creation financed by the Gurage Development Association; created by the Ethiopian Mapping Agency)
Region	Administrative boundaries	DIVA-GIS (http://www.diva-gis.org/)

Post-processed 3-arc second digital elevation model (DEM) data[5], provided by the National Aeronautics and Space Administration's (NASA) Shuttle Radar Topographic Mission (SRTM), were obtained from the Consortium for Spatial Information (CGIAR-CSI) of the Consultative Group for International Agricultural Research (CGIAR). These data were used to analyze how vegetation and land cover vary across different elevations.

GIS layers available through the Gurage Development Association were obtained through project partners at Wolkite University. These include current *woreda*[6], *kebele*[7], and roads and rivers information for Gurage, as well as a recent land use/land cover map compiled in 2010 by the Ethiopian Mapping Agency and the Gurage Development Association (see Figure 3).

[5] A digital elevation model (DEM) contains "elevations at points arranged in a raster data structure, a regularly spaced x, y grid. Z-values in a DEM represent the height of the terrain, relative to a specific vertical datum and void of vegetation or manmade structures" (Penn State, 2013). USGS DEM data is stored in a format that utilizes three, five, or 30 arc-seconds of longitude and latitude to register cell values. An arc-second represents the distance of latitude or longitude traversed on the earth's surface while traveling one second (1/3600th of a degree) (Esri, 2013).
[6] An administrative subdivision roughly equivalent to "districts."
[7] An administrative subdivision roughly equivalent to "neighborhoods."

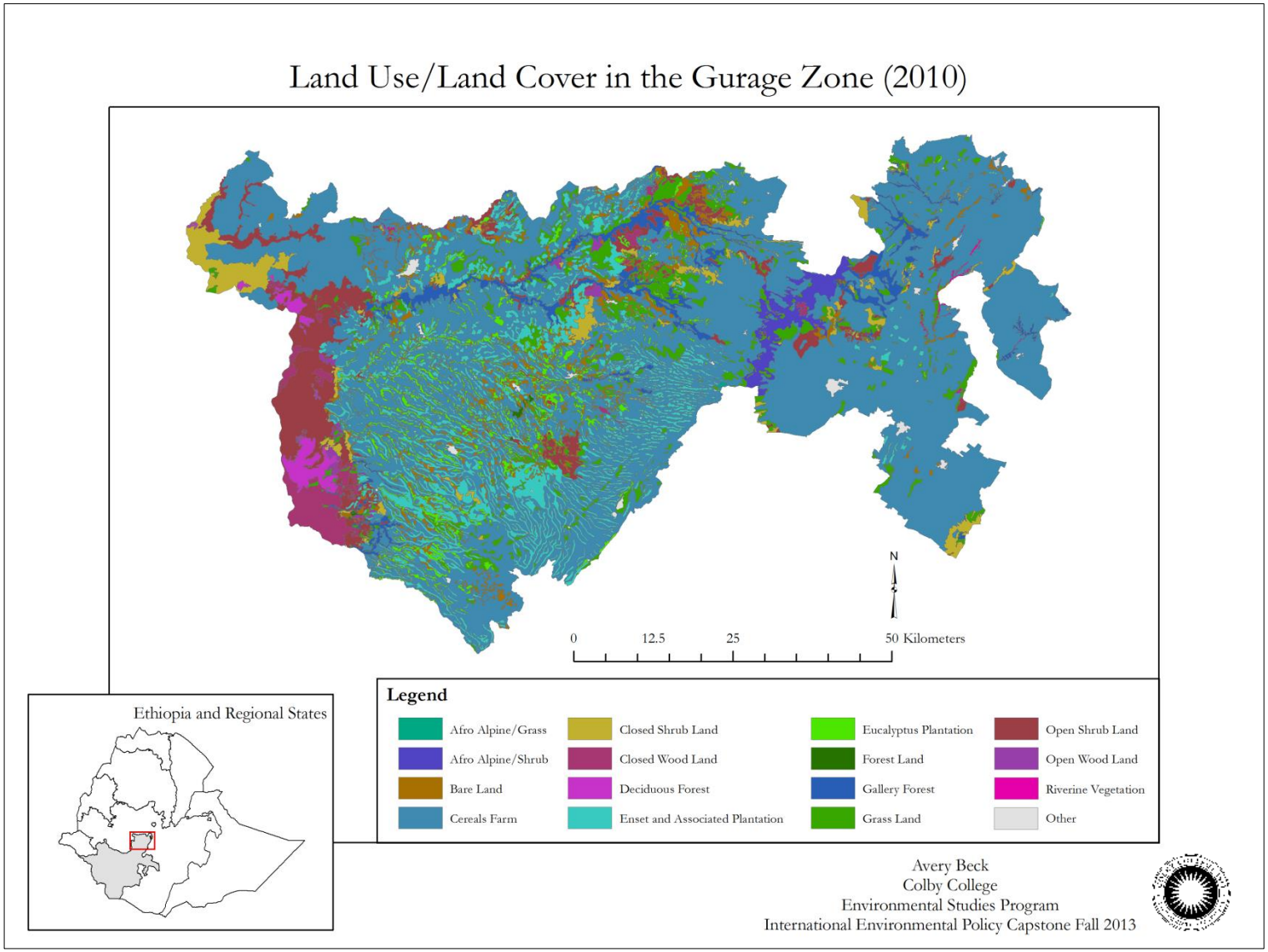


Figure 3. Land use-land cover classification layer (DIVA-GIS, n.d.; Gurage Development Association, 2010).

4. HISTORICAL CONTEXT

4.1. National Forest Policy Regimes

To understand the context within which forest and land management in Gurage has developed, it is necessary to look at the history of governance and forest policy development in Ethiopia. Table 2 provides a summary of historical trends in forest policy and governance.

In 1936, Italian armed forces under Benito Mussolini invaded and annexed Ethiopia, establishing a period of Italian rule that lasted from 1936 to 1941. During this time, Ethiopian infrastructure was vastly improved (Bekele, 2012), and the Italian government introduced forest laws and regulations, as well as the first structured forest administration in the country (Ayana, Arts, & Wiersum, 2012). However, following Emperor Haile Selassie's return from exile in 1941 and the reestablishment of Imperial rule, emphasis was placed on modernizing and expanding the agricultural sector, while forest policy was largely neglected (Bekele, 2012; Bane, 2008). It was not until 1965 that the first forest policies created by an Ethiopian government were instituted, which sought to classify types of land ownership in the country (Bane, 2008). During this period of imperial rule, agricultural lands were worked according to the *gult* system, which has been defined as a landlord-tenant land ownership system and was based upon feudal characteristics (Stellmacher, 2013). While undemocratic, this system promoted sustainable land use and, most importantly, long-term investments in the land, such as the planting of trees (Ashenafi, 2005).

Revolutionary groups motivated by ideas of ethnic self-determinism and democracy, and comprised largely of students, overthrew the Selassie Imperial government in the early 1970s. These revolutionaries, however, were unable to fill the void left by the Emperor (Stellmacher, 2007), and in 1974, a Marxist military group, commonly known as the Derg and headed by Mengistu Haile Mariam, came to power. In an effort to reduce rates of deforestation, the Derg regime placed renewed emphasis on policy development as a means of managing land and forest resources (Ayana, Arts, & Wiersum, 2012; Hoben, 1995). In 1975, the regime issued the radical Land Reform Act (Bane, 2008; Jemma, 2004). This proclamation nationalized all rural lands and subsequently redistributed them to rural inhabitants ('peasants'), who were granted communal land tenure rights through newly formed Peasant Associations.

Contrary to the many efforts of the Derg regime to improve land and forest resource management across Ethiopia, the Land Reform Act of 1975 in many ways served to exacerbate these problems. Land tenure rights were withdrawn and reallocated on short notice and farmers were poorly compensated. This created a sense of land instability and ultimately discouraged long-term investment in land conservation and management (Stellmacher, 2013; Bane, 2008). The unwillingness of the Derg regime to take a less centralized approach to governance ultimately led to its downfall. In 1991, new revolutionary forces, again in pursuit of a more democratic government, removed the socialist government from power.

Following a transitional period, the Ethiopian People's Revolutionary Democratic Front (EPRDF) established a new government in Ethiopia. In its constitution, enacted in 1995, the EPRDF included the ideals of democracy and self-determinism that were lacking in previous Ethiopian governments. The EPRDF Constitution called for the creation of an ethnic federalism system, declaring, "States shall be delimited on the basis of the settlement patterns, language, identity and consent of the people concerned" (Article 46, Constitution). The EPRDF Constitution went so far as to give ethnic groups a legal right to self-determination through secession. Article 39 states, "Every Nation, Nationality and People shall have the unrestricted right to self-determination up to secession." (Article 39, Constitution). This constitutionally-validated right to self-determination has led to recent divisions within designated ethnic regions, including in the Gurage Zone.

Table 2. Description of forest policy changes in Ethiopia across historical periods, from 1941 to the present.

Policy dimensions	**Historical Periods**			
	Imperial era (1941–1974)	**Early socialist era (1975–1985)**	**Late socialist era and the transition period (1986–1994)**	**Federal republic (1995- up to present)**
Dominant discourse coalition	Agricultural modernization: Imperial ruling elites (the landed class and the nobility)	Production forestry: classical foresters, FAO, UNDP, and SIDA	Environmental conservation: ecologists, soil scientists, agro-foresters, and biologists	Agricultural intensification: ruling party, private sector, and World Bank
Competing discourse coalition	Forest protection: forestry professionals (mostly expatriates)	Multi-functional forestry: ecologists and conservation biologists	Production forestry: classical foresters, SIDA, and FAO	Economic forestry: forestry professionals
Power configuration	'Absolute' power in the hand of the Emperor and the nobilities who owned most of the forest lands	Highly centralized power arrangement. Top-down flows of command and little or no room for open competition between different views	Authoritative power with the center, some room for competition between different discourse coalitions	Decentralized democratic system, continuation of the past authoritarian tradition
Rules	The five years Imperial Government Plans, the 1965 Forest Law, geared towards exploitation of resources and modernization	The 1975 Land Reform, State ownership of land and all natural resources including forests	The 1994 Ethiopian Forestry Action Program (EFAP), the 1994 forest law, overemphasis to the environmental role of forests, recognition of regional State forests (first time)	The 1995 constitution, the 2001 Rural Development policy and strategy, and the 2007 Forest Policy, continuation of the State ownership of land and forests

Adapted from: Ayana, Arts, & Wiersum, 2012.

The EPRDF's pledge to devolve power to ethnic groups has serious implications for forests in Ethiopia (Kebede, 2002). Given that the Ethiopian government has historically remained centralized

despite its relative lack of funds and infrastructure, the devolution of power may greatly increase the country's ability to manage its forests and increase forest cover. However, literature findings suggest that the EPRDF, to date, has retained national ownership of rural lands, and has not transferred considerable power to the lower administrative levels (Ayele, 2011; Smith, 2007; Zewde, 2002; Keeley, 2000).

5. CONTEMPORARY FOREST GOVERNANCE INSTITUTIONS IN ETHIOPIA

5.1. Federal Institutions

Since its establishment in 1994, the Ethiopian Environmental Protection Authority (EPA) has been the premier federal institution involved with environmental regulation and monitoring in Ethiopia. Recently, it was expanded to become the Ministry of Environmental Protection and Forestry (Woldegebriel, 2013).

A number of ministries are charged with overseeing forest-related issues, including the Federal Ministry of Agriculture and Rural Development (MoARD), the Federal Ministry of Water Resources (MoWR), and the Federal Ministry of Mines and Energy (MoME). Of these ministries, MoARD plays the most significant role in forest policy development and implementation. Some of the areas that MoARD departments and institutes focus on are forestry research, forest biodiversity conservation, and increasing the contribution of forests to Ethiopian economic development (Beyene, 2013; Bane, 2008). MoARD also facilitates the cooperation of forestry-oriented federal and regional bodies (Homeier, 2011).

In 2005, MoARD issued the Rural Administration and Land Use Proclamation. This proclamation is important in that it urges all administrative levels to work together with regard to land management. Article 17 states, "Regions shall establish institutions at all levels that shall implement rural land administration and Land use systems, and shall strengthen the institutions already established." This implicitly acknowledges that local institutions are not barriers to federal forest policies, but rather potential partners with higher administrative levels in forest management.

Another key proclamation, proposed by MoARD, is The Forest Development, Conservation and Utilization Proclamation (2007). This proclamation, like the Rural Administration and Land Use Proclamation, vests more power in regional states than the federal state concerning forest administration. The rationale behind this devolution of power is that "regional states can better take care of the environment than the Federal State, if they build their capacity, as they are nearer to the people, land, forests, water, etc." (Forum for Environment, 2010).

5.2. Regional Institutions (SNNPR)

As land administration practices have been decentralized in Ethiopia, much of the regulatory authority has, on paper, been transferred to the regional governments within the country. The SNNPR Rural Land Administration and Use Proclamation No 110/2007 is one of the more

substantial regional land proclamations. This proclamation urges farmers to maintain their land so that it may be used by successive generations. It includes environmental protection obligations, like making sure that key water sources are not exhausted and land is sufficiently protected (Forum for the Environment, 2011). However, some critics of the policy assert that current regional policies do too little to address key drivers of deforestation such as agricultural expansion. As one source comments: "[This proclamation] does not deal with forestlands at all; it is principally concerned with the use of wetlands and sloping lands. Simply stated, there is no regional law that deals with deforestation or clearing of forests for settlements or farming" (Mariam, 2012).

Ultimately, the task of implementing regional natural resource management policies falls upon the Bureau of Agriculture and Rural Development, the regional outlet for MoARD. The Bureau has a number of forest-related functions including protection of natural resources, wildlife, biodiversity and parks (Forum for the Environment, 2010).

5.3. Local Institutions (Gurage)

At the local level, a number of institutions deal directly and indirectly with the management of forests. Research findings show ethnic-based common property systems, traditional judicial systems, and the Ethiopian Orthodox Church engaging in various approaches to land and forest management.

Within Gurage, common property systems vest responsibility for land ownership and allocation in the hands of local groups or individuals. In areas where they operate, such systems are considered essential in preserving biodiversity and managing forests (Zelealem, 2005). In Muhur na Aklil, a woreda within Gurage, the Muhur term *serege* is used to denote "common property systems, particularly referring to communally held pasture and natural forest areas" (Debela, 2009). These systems account for roughly 20% of the total land in Muhur. Given the current land shortages and high population density in Ethiopia, this is a considerable percentage. A natural resource management leader enforces the common property rules. This prosecutor, or *Yegegn quwami,* is "selected based on skills of litigation, argumentation and outspoken personality in terms of speaking out issues *(sic)* without fear" (Debela, 2009).

Local traditional judicial systems are also involved in forest management in the Gurage Zone. The primary purpose of such systems is the resolution of legal disputes between parties through the enforcement of customary law. In Muhur, this system is called *shimaglewoch;* similar judicial systems exist across the western and eastern Gurage groups (Teferra, 2008). The *Sabat-set* system in western Gurage is called the *Yajoka Quicha,* while the *Kestane* system in the east is *Gordanna Sera* (Gadena, 2009; Debela, 2009). Both the *Sabat-set* and *Yajoka Quicha* systems have been in place for hundreds of years, and are generally organized around a chief and a council of elders, operating at regional, village, and clan or tribal governance levels. Both of these systems mediate legal disputes concerning land, particularly the commons and roads (Zewde, 2002).

The enforcement methods of these community level institutions differ considerably from those of national and regional policies. Whereas national and regional institutions enforce their policies through fines, the community judicial systems enforce their rules largely through public shaming. Under the *Kestane* system, for example, transgressors of minor infractions are made to host a number of "guests" at the transgressor's expense. The number of guests, and thereby the cost, increases with the number and weight of infractions, and for more extreme infractions, the transgressor may be ostracized from the community (Zewde, 2002).

Finally, church institutions play a role in the management of forests in Gurage. The Ethiopian Orthodox Church considers forests surrounding churches to be a part of the church itself - invoking the spiritual authority of saints to curse those who illegally remove trees from its sphere. There are some 60 church forests in Muhur, each of which has dense forest coverage (Debela, 2009). Additional preliminary visual surveys of land cover images for the Gurage Zone have found that over 140 church forests of varying sizes are present across the zone.

5.4. Land Cover

To visualize land use change and pressure on forests in Gurage, we first look at changes in Normalized Vegetation Difference Index (NDVI) values between 1995 and 2011. To determine changes in vegetation density between these years, we conducted raster subtractions, through which NDVI values generated for the Gurage Zone in 1995 were subtracted from NDVI values generated for the same area in 2011, providing the difference, or changes seen in NDVI values across the zone. The values generated by the raster subtraction were then mapped using ArcMap 10.1 software, to visually represent vegetation change across the Gurage Zone between the years of study. Figure 4 and Figure 5 show mosaicked NDVI images of Gurage, generated for the years 1995 and 2011, respectively. Figure 6 shows the calculated change in NDVI values between these two time periods. Areas represented in shades of red for this figure indicate areas where calculations show a relative decrease in NDVI values, while shades of green indicate relative increases in NDVI values, and yellow shades indicate minimal to no change. Decreases in NDVI value indicate a decrease in the vegetation density for these areas, and increases in NDVI values indicate an increase in vegetation density. Change in NDVI values was then averaged for each land use/land cover class identified within the Gurage Zone, to assess change in the mean vegetation density of forest and agricultural lands. Afro-alpine shrub and afro-alpine grass land use/land cover classes were excluded from consideration due to the fact that mosaicking of NDVI images was unable to remove cloud cover from the highland areas where these classes are primarily located. Despite efforts to eliminate cloud cover from the NDVI images generated for 1995 by means of mosaicking images from that year, cloud cover is still seen across sections of southern-central Gurage Zone and the Gurage Mountain Chain. The areas obscured by these clouds in the 1995 imagery, for which low NDVI values were calculated during analysis, are not so obscured in 2011, and are therefore represented as positive mean change in NDVI values (Figure 6).

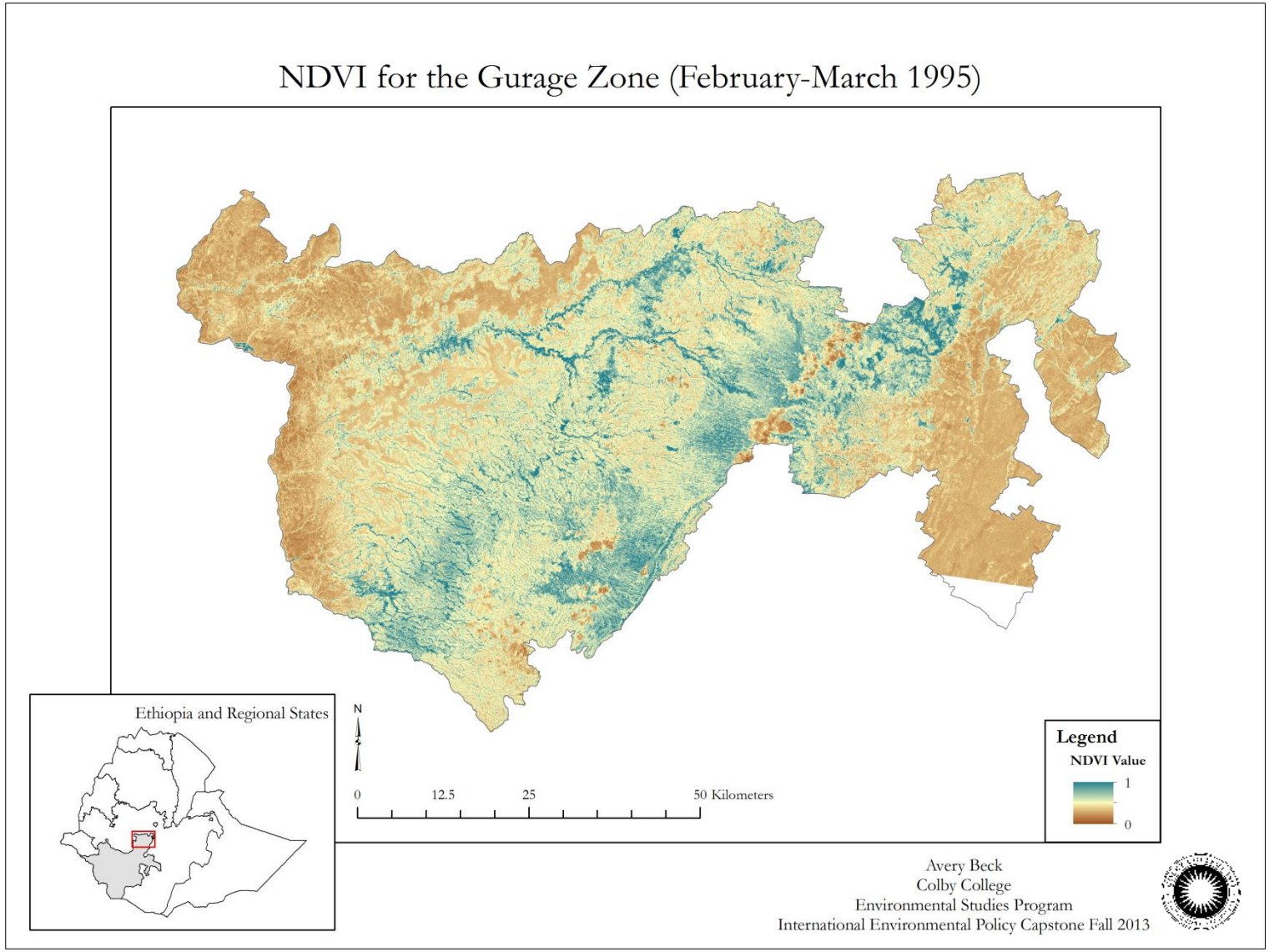


Figure 4. Normalized Difference Vegetation Index (NDVI) for the Gurage Zone during the months of February-March, 1995. Values close to zero (0) indicate minimal presence of vegetation; values close to one (1) represent high vegetation density (Gurage Development Association, 2013; USGS, 2013).

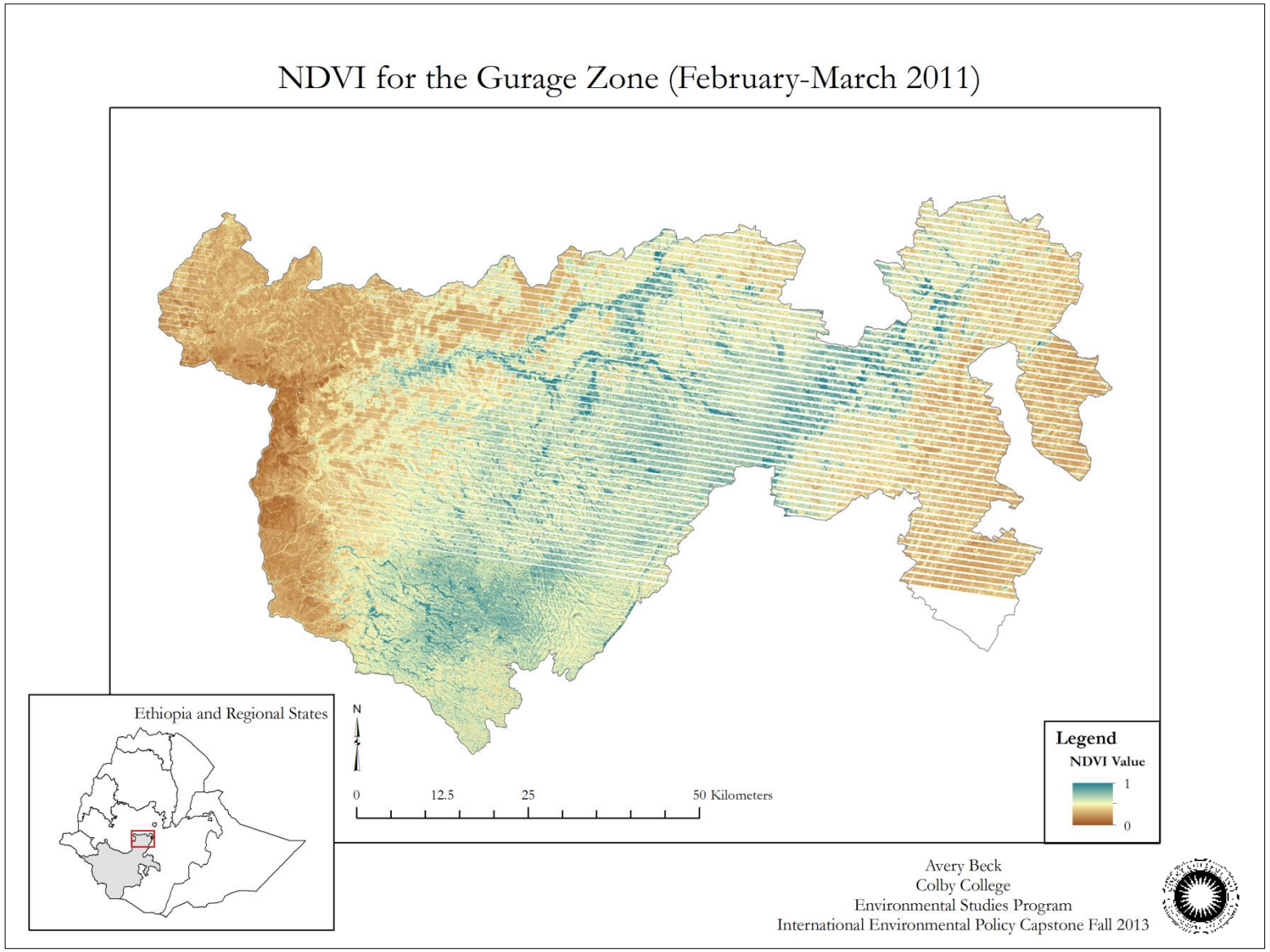


Figure 5. Normalized Difference Vegetation Index (NDVI) values calculated for the Gurage Zone during the months of February-March, 2011 (Central Statistical Agency of Ethiopia, n.d.; USGS, 2013).

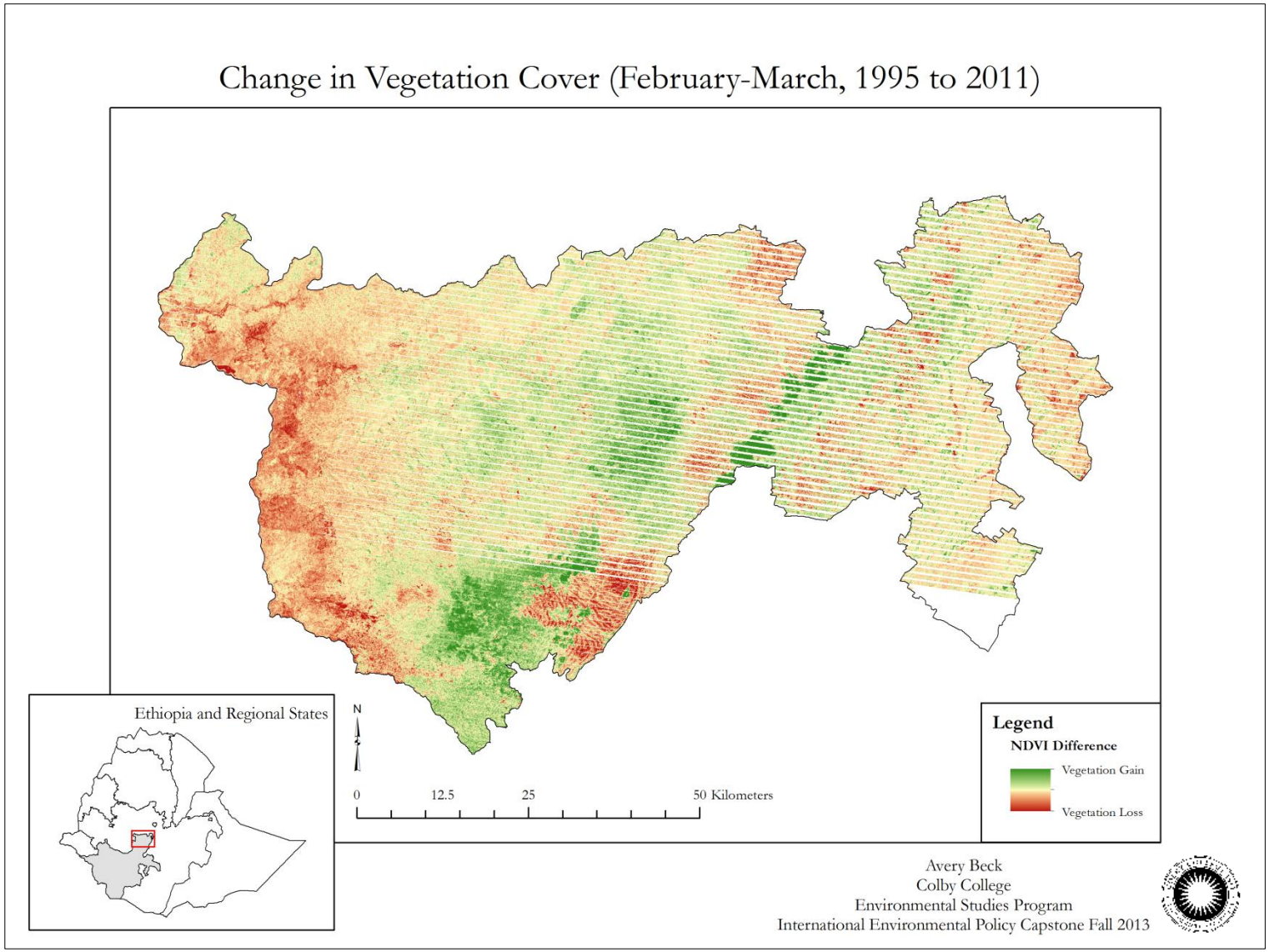


Figure 6. Changes in NDVI values across the Gurage Zone between 1995 and 2011, and the changes in vegetation associated with such shifts in NDVI values (Central Statistical Agency of Ethiopia, n.d.; USGS, 2013).

In 1995, high NDVI values are seen in the central southeastern highlands of Gurage, which constitute the upper reaches of the *woina dega* and *dega* elevation zones (elevations more than 2,000 m.a.s.l.). In 2011, NDVI values show lower vegetation densities in the western areas of Gurage, along the western and eastern edges of the Gurage Mountain Chain, and along the southern central edge of the zone. Geographically, some of the highest NDVI values for 1995 and 2011 are in narrow, meandering strips along the northern central lands of Gurage. These areas of high NDVI values roughly follow the path of rivers; the land cover class gallery forest[8], as identified by the land use-land cover classification layer produced by the Gurage Development Association, corresponds to these swaths of high NDVI values.

Analysis of change in NDVI values between 1995 and 2011 by associated land cover (Figure 7; for symbolization of land cover data, see Figure 3) shows mean increases in vegetation density for most non-forest land use/land cover classes identified within the Gurage Zone (Figure 7). But between those same years, gallery forest was the only forested land use/land cover classification to exhibit a mean positive change in NDVI value between 1995 and 2011 ($\bar{x} = 0.047$, $\sigma = 0.076$). Other forested land use/land cover classifications (closed wood land, deciduous forest, and forest land), as well as areas classified as open shrub land, exhibit mean negative changes in NDVI ($\bar{x}_{\text{closed wood land}} = -0.014$, $\sigma_{\text{closed wood land}} = 0.065$; $\bar{x}_{\text{deciduous}} = -0.013$, $\sigma_{\text{deciduous}} = 0.042$; $\bar{x}_{\text{forest land}} = -0.027$, $\sigma_{\text{forest land}} = 0.092$; $\bar{x}_{\text{open shrub land}} = -0.006$; $\sigma_{\text{open shrub land}} = 0.067$).

The highest positive mean NDVI change values in areas under consideration is seen for bare land, grassland, and agricultural areas such as cereals farms, enset and associated plantations, and eucalyptus plantations. Such positive increases in vegetation density in agricultural areas are believed to indicate the intensification of existing farming and eucalyptus plantations, which is corroborated by literature findings (Debela, 2009; Woldetsadik, 2003; Zewde, 2002).

[8] Gallery forests are generally understood as forest corridors that develop along stream and river basins, and that have greater nutrient and water availability than the savannas that they are typically associated with (Silva et al., 2008; Ribeiro & Walter, 1998; Furley, 1992; Haridasan, 1998).

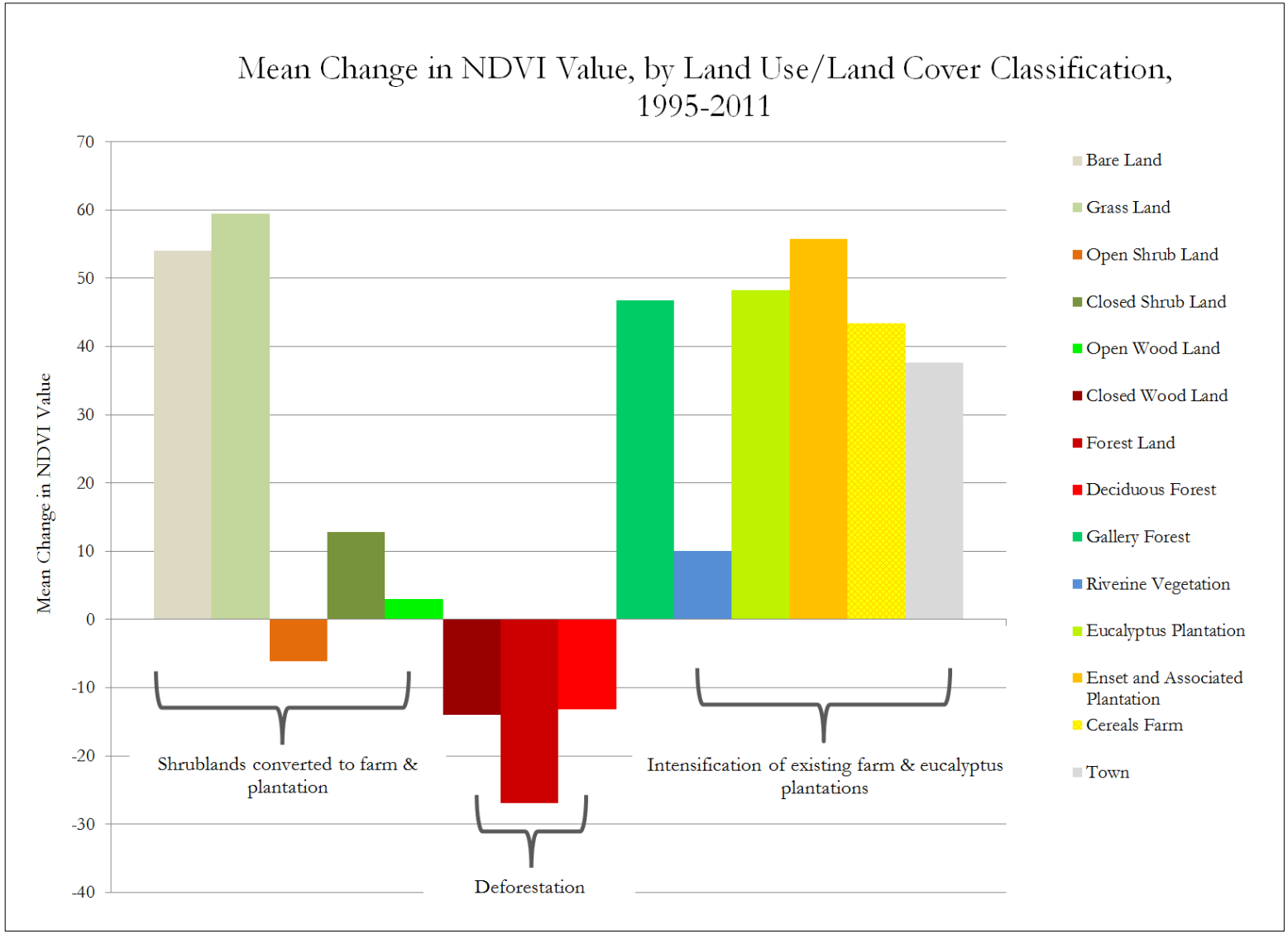


Figure 7. Mean change in NDVI values, by land use type, between 1995 and 2011. (Central Statistical Agency of Ethiopia, n.d.; Gurage Development Association, 2013; USGS, 2013).

6. DISCUSSION AND CONCLUSIONS

This research looked at change in forest cover between 1995 and 2011 within the Gurage Zone in order to understand factors that may be considered drivers of such change. To identify potential factors, our research examined institutions involved in forest management and relevant historical and cultural elements.

Changing land tenure has been a key factor in land cover change in the Gurage Zone over the past two decades. The Derg regime, through policies that encouraged nationalization of lands, created a system of land management under which land tenure was relatively insecure. The EPRDF has since introduced a government structure that is meant to devolve administrative power to ethnic regional states. With this shift, many of the proclamations passed have called for increased regional responsibility and involvement in local and region-wide land administration and management (Kebede, 2002). At the regional level, such policies are expected to yield a more locally focused, effective land administration structure. The policies aim to address and manage issues of population pressures, loss of access to land, and subsequent pressures upon surrounding public resources, such as grazing commons and forests.

Literature suggests that the decentralized system of land outlined in the EPRDF Constitution has not been fully realized, as substantial control over regional states' affairs is still held by the federal government (Chanie, 2007; Keller & Smith, 2005). Analysis of land cover change also provides evidence to support concerns that declines in forest-based vegetation are still occurring in spite of decentralization policies. Analysis using NDVI shows declines in most forest cover classes across the Gurage Zone since 1995. As an important caveat to this finding, the standard deviations of the mean changes across most classification categories are generally large - suggesting such aggregate statistics may not fully represent the extent to which vegetation density, and by association forest cover, have changed in the Gurage Zone over time. That said, it is noteworthy that between 1995-2011 NDVI values show positive vegetation change for most non-forest land cover classifications (including agricultural land and plantations), further supporting the conclusion that the Gurage Zone's remaining forests may be dwindling.

While the federal government retains significant control over forest management in the Gurage Zone and elsewhere, local institutions continue to be relevant parties to forest management at the local level. Local institutions engage with local communities to arbitrate on land disputes, and in some areas, specifically manage local forest resources. In Muhur, Gurage, there are common property systems, a judicial system, and churches that all help manage forestlands to some extent (Debela, 2009). These systems have been in place for centuries, even while Ethiopia as a country has undergone drastic shifts in national governance (Zewde, 2002). In a time of intense population growth, however, the potential of these local institutions to manage land use and forests in Gurage has not been widely recognized, and may in fact be compromised by federal and regional policies that inadvertently exacerbate factors driving land disputes today (including tenure insecurity and land scarcity) - challenges which local institutions have historically been able to mitigate to varying degrees.

7. RECOMMENDATIONS FOR FUTURE RESEARCH

This research provides a foundation for future research in the Gurage Zone. However, there remains a need for additional studies to expand upon the two main components of this research - the mapping of forest cover change in the Gurage Zone, and complementary research into the cultural, historical and, particularly, the institutional context for this change.

Forest cover change in the Gurage Zone is clearly linked to increasing population pressures, yet the dynamics between land use change, population growth, and other factors is complex and remains relatively unexplored. To better understand how forests and land use have changed in the Gurage Zone over time, our findings lead us to recommend that future research include vegetation studies that gather and incorporate data from on-the-ground assessments as well as spatial surveys for a more extended period of time. Remote studies of land cover change offer an opportunity to track large-scale trends in forest cover change, and more extensive analyses would provide additional findings on forest cover and land use change trends. This information, in turn, could be valuable to decision-making and prioritization in forest resource management.

Where possible, we also recommend that future research further investigate factors known or believed to affect land use patterns and deforestation at local and regional levels, and how such factors may be interacting. Factors may include, but are not necessarily limited to cropping practices and requirements; access to markets and economic incentives that may drive prioritization of land use for agriculture and cash crop cultivation; the ecological and natural resource cycles connected to the sustainability of land use; and the availability of land resources.

Findings also indicate that local institutions play a role in resolving land disputes and, in some cases, managing forest resources. To fully understand and assess the extent to which they are affecting forest management in Gurage, however, additional research is needed at the community level into the roles and responsibilities of local institutions. Future studies should also continue to explore the extent to which these institutions interact and work with local communities and regional land management institutions, as decentralization shifts the burden and opportunities for land and forest management to more localized levels of administration. Observed changes in land cover indicate that regional land administration, in its presence as well as in its absence, is relevant to understanding and shaping forest conservation efforts, particularly in an administrative area as ethnically and sometimes agriculturally diverse as Gurage.

Understanding how people use and manage land at the local level can help researchers develop more comprehensive models within which observed declines in forest cover can be evaluated. The more successfully researchers can incorporate local socioeconomic and agroecological factors into forest research, the more confident and specific they can be in their conclusions and recommendations for policy action. If human activity at the local level is the primary factor in deforestation and land use change, as has been suggested by the literature, understanding the motivations or factors driving forest loss, and how they interact and function within the scope of existing management institutions will have major implications for ongoing efforts to reduce forest loss in the Gurage Zone and across the country.

8. REFERENCES

Aalen, L. (2006). Ethnic Federalism and Self-Determination for Nationalities in a Semi-Authoritarian State: the Case of Ethiopia. *International Journal on Minority and Group Rights*, *13*(2), 243–261.

Adenew, B., & Abdi, F. (2005). *Research Report 3 Land Registration in Amhara Region, Ethiopia*. Addis, Ababa.

Alemu, G. (2011). *Rural Land Policy , Rural Transformation and Recent Trends in Large-scale Rural Land Acquisitions in Ethiopia*.

Ashenafi, Z. T., & Leader-Williams, N. (2005). Indigenous Common Property Resource Management in the Central Highlands of Ethiopia. *Human Ecology*, *33*(4), 539–563.

Ayana, A. N., Arts, B., & Wiersum, K. F. (2013). Historical Development of Forest Policy in Ethiopia: Trends of Institutionalization and Deinstitutionalization. *Land Use Policy*, *32*, 186–196.

Ayele, Z. (2011). Local Government in Ethiopia: Still an Apparatus of Control? *Law Democracy and Development*, *15*, 133–159.

Bane, J., Nune, S., Mekonnen, A., & Bluffstone, R. (2008). Policies to Increase Forest Cover in Ethiopia. In *Policy Workshop*. Addis Ababa.

Bardhan, P. (2002). Decentralization of Governance and Development. *The Journal of Economic Perspectives*, *16*(4), 185–205.

Beyene, A. D., & Koch, S. F. (2013). Forest Policy and Economics Property Rights, Institutions and Choice of Fuelwood Source in Rural Ethiopia, *30*, 30–38.

Bishaw, B. (2001). Deforestation and Land Degradation in the Ethiopian Highlands: A Strategy for Physical Recovery. *Northeast African Studies*, *8*(1), 7–25.

Central Statistical Agency of Ethiopia. (n.d.). Obtained courtesy of Mesfin Sahle, Lecturer at Wolkite University, Gurage Zone, Ethiopia.

Chanie, P. (2007). Clientelism and Ethiopia's post-1991 decentralisation. *The Journal of Modern African Studies*, *45*(3), 355–384.

Consultative Group for International Agricultural Research (CGIAR) Consortium for Spatial Information (CGIAR-CSI). (2003). Retrieved from http://www.cgiar-csi.org/data/srtm-90m-digital-elevation-database-v4-1.

Damte, A., & Koch, S. F. (2011). Coping with Fuel Wood Scarcity: Household Responses in Rural Ethiopia.

Debela, M. (2009). *Institutional Practices, Natural Resource Management and Livelihood Strategies in Muhur, Southwest Ethiopia*. Syracuse University.

Denboba, M. (2005). *Forest Conservation, Soil Degradation. Farmers' Perception Nexus: Implications for Sustainable Land Use in the Southwest of Ethiopia*.

Demissew, Sebsebe. *Pers. Corr.* September 13, 2013.

DIVA-GIS. (n.d.). Retrieved from http://www.diva-gis.org/.

Edwards, S. (2010). Ethiopian Environment Review No. 1. *Forum for Environment, Addis Ababa. Ethiopia Southern Nations, Nationalities and Peoples Region (SNNPR) Overview of Livelihood Profiles*. (2005).

Gadena, G. A. (2009). Legal institutional hierarchies, justice and social order in Gurage area of Ethiopia. In *Proceedings of the 16th International Conference of Ethiopian Studies* (pp. 617–626).

Gessesse, D., & Christiansson, C. (2008). Forest Decline and Its Causes in the South-Central Rift Valley of Ethiopia: Human Impact over a One Hundred Year Perspective. *Ambio*, *37*(4), 263–271.

Global Forest Resources Assessment. (2010). Rome.

Gurage Development Association. (n.d.). Obtained courtesy of Mesfin Sahle, Lecturer at Wolkite University, Gurage Zone, Ethiopia.

Hoben, A. (1995). Paradigms and politics: The cultural construction of environmental policy in Ethiopia. *World Development*, *23*(6), 1007–1021.

Homeier, D. (2011). *Chapter 2 Evaluation of Forest Cover Change between 2005 and 2009 in four Regional States of Ethiopia Environmental Policy Review 2011: Evaluation of Forest Cover Change between 2005 and 2009 in four Regional States of Ethiopia*. Colby College.

Jemma, H. (2004). *The Politics of Land Tenure in Ethiopian History*. Norway.

Kebede, B. (2002). Land Tenure and Common Pool Resources in Rural Ethiopia: A Study Based on Fifteen Sites. *African Development Review*, *14*(1), 113–149.

Keller, E., & Smith, L. (2005). Obstacles to Implementing Territorial Decentralization: The First Decade of Ethiopian Federalism. In P. Roeder & D. Rothchild (Eds.), *Sustainable Peace: Power and Democracy After Civil Wars* (pp. 265–293). Cornell University Press.

Martinuzzi, S., Gould, W. A., Ramos Gonzalez, O. M., Martinez Robles, A., Calle Maldonado, P., Pérez-Buitrago, N., & Fumero Caban, J. J. (2008). Mapping tropical dry forest habitats integrating Landsat NDVI, Ikonos imagery, and topographic information in the Caribbean island of Mona. *Revista de Biología Tropical*, *56*(2), 625–39.

Molla, B., Feleke, D., Kebede, B., & Ahmed, S. (1996). *Ethiopian Village Studies: Imdibir Haya Gasha, Gurage*.

NASA Earth Observatory. (2013). Retrieved from http://earthobservatory.nasa.gov/Features/MeasuringVegetation/measuring_vegetation_2.php.

Population Census Commission. (2007). *The 2007 Population and Housing Census of Ethiopia: Statistical Report for Southern Nations, Nationalities, and Peoples' Region; Part I: Population Size and Characteristics*.

Silva, L. C. R., Sternberg, L., Haridasan, M., Hoffmann, W. A., Miralles-Wilhelm, F., & Franco, A. C. (2008). Expansion of gallery forests into central Brazilian savannas. *Global Change Biology*, *14*, 2108–2118.

Smith, L. (2007). Voting for an ethnic identity: procedural and institutional responses to ethnic conflict in Ethiopia. *The Journal of Modern African Studies*, *45*(04).

Stellmacher, T. (2007). The Historical Development of Local Forest Governance in Ethiopia - from Imperial Times to the Military Regime of the Derg. *Africa Spectrum*, *42*(3), 519–530.

Stellmacher, T. (2013). Local Forest Governance in Ethiopia: Between Legal Pluralism and Livelihood Realities. Bonn, Germany. Retrieved from http://www.zef.de/fileadmin/webfiles/downloads/zef_wp/wp110.pdf.

Teferra, D. (2008). *Lessons of Peace and Development: Gurage Entrepreneurship in Ethiopia*. Lanham, MD: University Press of America.

The Federal Democratic Republic of Ethiopia Environmental Protection Authority GEF Portfolio Identification Document. (2011). Addis, Ababa.

Tibebu, T. (1995). *The Making of Modern Ethiopia: 1896-1974*. Lawrenceville, NJ: The Red Sea Press, Inc.

United States Agency for International Development (USAID). (2005). *Ethiopia Southern Nations, Nationalities and Peoples Region (SNNPR) Overview of Livelihood Profiles*.

United States Geological Survey (USGS). (2013). Landsat. Retrieved from http://glovis.usgs.gov/index.php.

Waktola, A. (1999). *Exploratory Study of Two Regions in Ethiopia to Identify Target Areas and Partners for Intervention*.

Woldetsadik, M. (2003). *Impacts of population pressure on land use/land cover change, agricultural system and income diversification in West Gurageland, Ethiopia*. University of Trondheim.

Worku, N. (2000). Ethnohistorical Notes on the Gurage Urban Migration in Ethiopia. *Journal of African Studies*, *28*(2), 43–73.

Young, J. (1998). Regionalism and Democracy in Ethiopia. *Third World Quarterly*, *19*(2), 191–204.

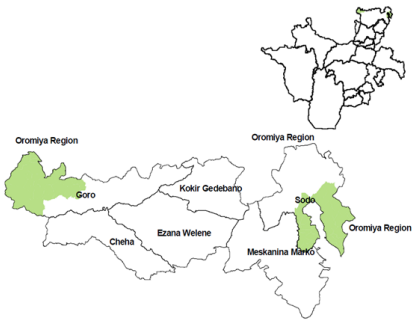
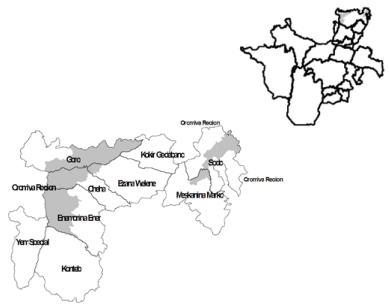
Zewde, B., & Pausewang, S. (2002). Systems of Local Governance among the Gurage. In *Ethiopia: The Challenge of Democracy from Below*. Stockholm: Elanders Gotab.

9. CHAPTER 1 APPENDICES

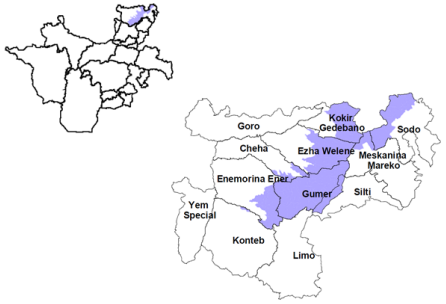
Appendix I: Summary of relevant studies on forest management and related institutions in Gurage Zone.

Study in Gurage Zone	Description
Teferra, D. (2009) *Lessons of Peace and Development: Gurage Entrepreneurship in Ethiopia*.	This book explores the characteristics and motivations of the Gurage people. It is includes a section on the historical background of Gurage.
Gadena, G. A. (2009). *Legal institutional hierarchies, justice and social order in Gurage area of Ethiopia*.	This article examines traditional legal institutions in the Gurage Zone. It also looks at the implications of plural legal orders (formal national/regional institutions atop traditional local institutions).
Melese, M., Alemayehu, W. et al. (2013). Low vision and blindness in adults in Gurage Zone, Ethiopia. *British Journal of Ophthalmology*, 87(6), 677-680.	This article includes a study of low vision and blindness in the Gurage Zone. Included is some background information on the Gurage, including basic statistics on its three agroecological zones: *dega, woina dega,* and *kolla*.
African Development Bank. (2002). Land Tenure and Common Pool Resources in Rural Ethiopia: A Study Based on Fifteen Sites.	This study looks at land tenure and common pool resource management in Ethiopia, based upon information obtained from 15 study sites around Ethiopia. One of the 15 study sites is Imdibir, located within the Gurage Zone.
Markakis, J. (Ed.). (1998). The Politics of identity – the case of the Gurage in Ethiopia. In Salin, M.A. Mohamed & Markakis, J. (Eds.), *Ethnicity and the State in Eastern Africa.*	This chapter of *Ethnicity and the state in Eastern Africa* examines ethnic identity in the Gurage Zone. It includes information on the Gurage Zone's economy, religions and a general history of the zone.

Appendix II: USAID Rural Livelihood Zones for the Gurage Zone and surrounding areas.

Gurage Lowland Maize and Teff Livelihood Zone		
	Split between the eastern and western lowlands of Gurage Administrative Zone, and between the Rift Valley and Omo Valley drainage systems respectively, this livelihood zone is relatively food secure and has not been targeted for food aid. Land holdings are relatively high, with poor households possessing at least a hectare, and better-off households up to five hectares. Even poor households normally grow upwards of 80% of the staple food they consume. Maize, sorghum and pulses are produced as food crops and teff is the main cash crop, but maize, wheat and peppers are sold as well, altogether bringing 60-80% of cash earnings. There are also some fruits and sugar cane. Livestock sales bring 10-20% of cash earnings; but there is a major problem of trypanosomiasis in the western part. There is no labor out-migration, but poorer farmers depend on working locally for others for part of their annual income.	**Main Food, Crops & Livestock** Maize, teff, wheat Cattle Goats & sheep **Main Income Sources** Sale of: Cereals, livestock Local casual employment
Alaba-Mareko Lowland Pepper Livelihood Zone		
	This relatively food secure zone has a valuable cash crop industry that attracts migrant laborers from other zones. The population is relatively sparse and land-holdings are large enough to allow even poor households to grow nearly 60% of their food needs as well as gaining more than 60% of their cash earnings from sale of peppers, as do middle and better-off households. In addition teff and other crops are sold. Livestock production, especially cattle, is important for middle and better-off households, where sales amount to some 20% of annual cash earnings. Even poor households make around one-tenth of their income from selling butter. There is no irrigated production, and rain failure has affected production in recent years; but floods from the neighboring highlands are also a frequent problem, although at the same time as causing damage they deposit fertile silt.	**Main Food, Crops & Livestock** Maize, wheat, sorghum Cattle Goats & sheep **Main Income Sources** Sale of: Peppers, other crops, livestock & livestock products
Gurage-Siltie Enset and Teff Livelihood Zone		
	This is a fertile midland/upper lowland zone, but until recently the increasing population has been unable to cultivate a large part due to government set-aside for the resettlement program and to trypanosomiasis, which severely inhibits local oxen production and encourages today some use of tractors to open the new land. Elsewhere both hand-hoes and ox-plows are used to cultivate, the latter especially for teff and Niger seed (the oilseed noug), which are the principal cash crops (together with some chat, coffee and onions) reaching the capital via the Jimma-Addis Ababa highway, as do livestock sold for annual festivals. Enset is the main staple food, together with maize (mostly eaten 'green'), sorghum and chickpeas, as well as some annual root crops: yams and taro. Erratic spring or main summer rains can be particularly damaging to production given the high moisture requirement in this relatively hot area, and the long cycle cereals (maize, sorghum) need both rains. In good years especially, better-off households rely on the local seasonal labor offered by poorer farmers.	**Main Food, Crops & Livestock** Enset, maize Cattle Goats **Main Income Sources** Sale of: Teff, oilseeds, livestock & livestock products Local laboring Remittances

Source: USAID, 2005.

Gurage-Siltie Midland Enset and Chat Livelihood Zone		
	This zone supports a particularly dense population, producing a wide variety of crops as well as the main staple, enset, and the main cash-crop, *chat*. There have not been serious climatic problems. Even the poorer households produce an unusually high proportion of their basic food requirement – around 70%; but unlike the middle and better-off groups they sell rather few crops and depend heavily for cash on casual work locally and in urban centers, including Addis Ababa. Middle and better-off households get up to 40% of their cash from livestock and livestock product sales. All groups receive significant remittances from family members working long-term in Addis Ababa: for the better-off people this provides upwards of 25% of their overall cash earnings. However this long-standing source of income is under some threat as competition for work in the capital has intensified with migrants from many other areas and there are official restraints on street vending. The official tax on *chat* entering Addis has reduced its local offtake and price. Pest attacks on enset and coffee berry disease have been recent constraints to production. This has been a food secure zone, but it has been under some economic stress.	**Main Food, Crops & Livestock** Enset, mixture of cereals Cattle Sheep & goats **Main Income Sources** Sale of: Chat, other crops, livestock & livestock products Rural/urban work Remittances
Gurage-Siltie Highland Enset and Barley Livelihood Zone		
	This highland (dega) zone has historically been self-sufficient in crop production, and households remain generally food secure, with even poor households growing as much as 70% of their staple food requirement. But the pressure of an increasing population on a limited space of arable land puts the future in question, and already there is major work out-migration of young men as far as Nazareth, Addis Ababa and even Dire Dawa, although men from poorer households tend more to look for local employment, which brings in nearly 40% of their annual cash earnings. Apart from enset the main food crops of the zone are those typical of highland elevations in Ethiopia: barley, pulses, Irish potato, kale (*gomen*). Space for pasture is so limited that it is difficult to graze oxen and even some better-off households have only one ox, and must share with neighbors to put together a plow-team. Nevertheless middle and better-off households depend upon selling livestock for up to one-third of their annual cash income. Apart from food crops, land is used for eucalyptus plantations where trees for a single household often number in the hundreds: not only does this provide firewood for domestic purposes, but after two years poles are a potentially valuable item for sale as far as Addis Ababa especially for scaffolding for the burgeoning construction industry.	**Main Food, Crops & Livestock** Enset, barley, pulses, potato Cattle Sheep & goats **Main Income Sources** Sale of: Chat, other crops, livestock & livestock products Rural/urban work Remittances

Source: USAID, 2005.