Crops or Crafts? Changes in Land Use in the Imbabura Valley of Ecuador

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CROPS OR CRAFTS? CHANGES IN LAND USE
IN THE IMBABURA VALLEY OF ECUADOR

by

Christopher Richard Hair

A Thesis
Submitted to the Graduate School
and the Department of Geography and Geology
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Masters of Science

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May 2016
ABSTRACT
CROPS OR CRAFTS? CHANGES IN LAND USE
IN THE IMBABURA VALLEY OF ECUADOR

by Christopher Richard Hair

May 2016

In rural societies where urbanization and modernization are contributing to rapid growth, changes in land use can both reflect and bring about broader changes within a community. This study seeks to investigate changes in land use in the Imbabura valley of Ecuador from the perspective of the local inhabitants. To accomplish this, three data collection techniques were employed: repeat photography, ethnographic interviews, and archival research. Repeat photography involves re-photographing historic photographs from the original site. A combination of 35 historic photographs taken in the 1950s were re-photographed during the summer of 2015. The resulting repeat photo pairs were used in conjunction with semi-structured ethnographic interviews, which were conducted in participants’ homes, during road-side conversations, and through take-home questionnaires. Information collected through archival research provided additional data that complimented the photo pairs and ethnographic interviews. The combination of repeat photography, ethnographic interviews, and archival research provided a unique window into the perceptions and memories of the local residents and their views of the changing land around them. Urban centers in the Imbabura valley have expanded haphazardly as a result of rural-to-urban migration. This expansion has been detrimental to nearby
agricultural lands and has placed pressure on soils and crop production, as well as agricultural livelihoods in general. Recent inheritance laws have created limitations on the ways land owners can divide land amongst their heirs. This, along with generational differences in land-use priorities have all contributed to changes in land use over the last 65 years.
DEDICATION

This work is dedicated to my wife Janelle and my daughter Hazel. They moved across the country with me so that I could follow my dreams and continue to study in the field of Geography.
ACKNOWLEDGEMENTS

I would like to thank Drs. David Cochran, Joby Bass, and Mark Miller for their advice and guidance over the last two years. Their expertise and patience were invaluable in conducting my research. I have learned a great deal from them and have become a better geographer because of my association with them. I would also like to thank John Anderson at the Louisiana State University Cartographic Information Center for giving me access to the photographs taken by Robert West. I would also like to thank the people of Otavalo and the surrounding area for helping me find the photo sites and especially for taking time from their jobs and their fields to speak with me.
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CHAPTER I

INTRODUCTION

Calle Olmedo is an old dirt road that gently descends from the Loma Negra (Black Hill) into the community of Otavalo, Ecuador. A relic of the late 19th century, Olmedo Street was once a busy gateway for Otavaleños of the surrounding area as they brought their goods to market. If you follow Olmedo towards the top of Loma Negra you will come across arterial roads of various quality as well as seemingly ambiguous folk trails. This network of routes, all converging on Otavalo point to a historic and unbroken connection to this economic center in the heart of the Imbabura Province, located northeast of Quito, the capital of Ecuador.

On a Thursday morning in June of 2015, I stood on Olmedo Street just outside of town. My eyes were glued to the view finder of my camera as I tried to compose the perfect picture. I was so focused on the photograph I wanted to take that I was surprised by a sudden presence beside me. I looked up to see an elderly Quechua woman standing next to me with a quizzical look on her face. As soon as our eyes met, two giant tears began to run down her cheeks. She had a fairly large load on her back, wrapped in a tattered blanket. She wore traditional indigenous clothing and after a couple of seconds I realized that she was barefoot. I tried to speak to her, I even offered her my shoes, but we did not understand one another. Her Spanish was as bad as my Quechua. I showed her the old black and white photograph of Olmedo Street from the 1950s and she
Figure 1. Olmedo Street. Quechua woman walking into town via Olmedo street (Photograph by author).
smiled knowingly. I imagined her traveling this road from the banks of the Laguna San Pablo as a young girl, later as a teenager, and even later than that as an adult. She must have certainly witnessed many changes to the land over the course of her long life. The edges of the city now creep up the Loma Negra gradually eating away at the fields of corn, wheat, quinoa, and beans. Traditional trails and roads have been paved or laid with cobblestone. Cinderblock homes seem to be in a constant state of construction and remodeling. Each day following our initial encounter, I saw this same elderly woman slowly shuffling into town to attend to her daily affairs. I am reminded that although much has changed, there are some things that continue untouched by time.

Historical Setting

Land-use change has a colorful history in Latin America, most particularly in rural areas. Otavalo itself has experienced various historical periods in which economic, cultural, and social developments have shaped, expanded, or altered land use. In the late 1940s, John Collier (1949) conducted a detailed ethnographic study of Otavalo in which he described the indigenous residents of the community and their techniques of agriculture, weaving, and crafts production. In the 1950s, rural indigenous communities around Otavalo were becoming increasingly vulnerable to modernization (Windmeijer 1998). Jeroen Windmeijer, a Dutch cultural anthropologist, examined the traditions and industry of the Otavaleños. He noted that during the 1950s, interest grew within the Ecuadorian government to develop tourism throughout the country. Otavaleños were promoted as wholesome and talented craftsmen, and tourists were invited
to visit their town and its increasingly popular Saturday market. Windmeijer also
detailed the agrarian land reforms of the early 1960s as pivotal moments in the
environmental history of Otavalo. The beginning of the economic shift from
agriculture to craft production in the 1950s occurred around the time that John
Collier and Robert West first visited the area. Photographs taken by both men
coincided with this transition and provide valuable visual evidence of the
conditions of land use during this time.

Study Site

This research focuses on the Imbabura Valley in Northern Ecuador and
specifically the city of Otavalo, its immediate periphery, and settlements along
the eastern shores of the Laguna San Pablo, located west of Otavalo (See map
in Figure 2). Otavalo is a city of approximately 90,000 people located in the
Imbabura Province of the Ecuadorian Highlands. Otavaleños by tradition are
farmers, but in recent years, tourism and modernization have led many to
abandon their traditional practice of farming the rich volcanic soils to pursue other
forms of employment in the growing urban sector. Remnants of colonialism can
be seen in the organization of the smaller towns surrounding Otavalo, each with
their own artisanal niches. The city market has become famous for the variety of
traditional and colorful crafts sold by these local artisans. The market, however,
is not just an attraction for tourists; local residents also benefit from its livestock,
produce, and other common goods available for purchase. The success of the
Figure 2. Otavalo Study Site within Imbabura Province (Map created by the author).
Otavaleños and the subsequent shift to a more production-oriented society has had an effect on the landscape. Changes in land use can affect traditional practices, food production, and the environment. Otavalo, like many Andean towns, provides a scenic view for tourists of indigenous highland peoples and their traditional ways of life. However, the economic success of Otavaleños has surpassed that of surrounding towns and has introduced additional pressures on the region as a result of increased tourism and global market influences. Many Otavaleños have extended their business internationally and some have even relocated to Europe and Asia.

Through my research I hoped to better understand local perceptions of land-use change as well as environmental changes in Otavalo by using a combination of repeat photography, ethnographic interviews, and archival research. This project also examined whether tourism and artisanal crafts production have had any impacts on recent changes to local land use and traditional highland livelihoods. Globalization and modernization have contributed greatly to the rapid expansion of urban areas in South America, parallel declines in traditional agricultural land use, and the overall economic and cultural vitality of the countryside. Otavalo in particular has seen a growth in interest towards local artisanal goods, which has coincided with and fueled growth within the tourism industry. Traditional agricultural land use is likely less important than it was in the 1950s as many residents have divested from it to pursue the more lucrative craft production trade. In communities like Otavalo, land-use policies and practices are greatly influenced by ethnic traditions and
socioeconomic factors. The profitability of cash economies is a likely component in the shift from agricultural land use to artisanal craft production as well as other economic endeavors. Globalization is a veritable force for change and its reach is affecting even the most remote Andean villages and communities. Although Otavalo is a micro case study in land-use change, it involves variables that are transferable to many other settings and scenarios.

Chapter Summary

In Chapter I I briefly introduced the goals of this research and the study site where the research was conducted. Chapter II takes a closer look at some of the academic literature that deals with the characteristics of land-use change. Chapter III outlines the methods that I used to gather data in the field. Repeat photography, ethnographic interviews, and archival research are the three methods that I employed in my research. In Chapter IV, I visually analyze the photo-pairs and incorporate panoramic overlays to better assess change. I also analyze the responses from the ethnographic interviews to identify common themes and trends. In Chapter V, I begin to unpack these data collected and explore some of the drivers behind land-use change in the Imbabura valley. In conclusion, Chapter VI summarizes my research while touching on the main points and methodologies that were used. In an effort to protect the privacy of the research participants that are discussed in this document, I have replaced real names with fictional names throughout.
CHAPTER II
REVIEW OF LITERATURE

The literature regarding land-use change in Latin America is extensive and provides a great deal of insights into the ways Latin Americans are adapting to economic change, climate change, and changes in the priorities of younger generations. My research in Ecuador was meant to build upon the current literature by investigating the local perceptions of land-use change in the Imbabura valley. Understanding changes in land use requires the consideration of many different variables. Although land use has been studied widely throughout Latin America and elsewhere, there has been relatively little work done that directly addresses changes occurring in Otavalo. Changes in land use can be caused by many different things and can take various forms.

Land-use change can lead to negative outcomes such as deforestation and soil degradation or it can correspond to more nuanced transformations such as the implementation of new agricultural practices or the construction of buildings on vacant land. Gray and Bilsborrow (2012) took a close look at the effects of out-migration on agricultural lands in Ecuador and suggested that out-migration from rural areas had a positive effect on agriculture. They explained that land abandonment as a result of out-migration, led to increased remittances, and actually bolstered agricultural land use in the sending communities. In contrast, Radel and Shmook (2008) found that changes in land use contributed to out-migration in the state of Campeche in Mexico. Although migration from
Otavalo is most likely related more directly to the globalization of the craft market, changes in land use might contribute to out-migration as well.

When studying changes in land use, it is important to consider the effects of human interactions and relationships with the land. Karl Butzer (1990) showed how the reactions of humans to various external stimuli can be linked to land-use changes over time. His study of Aín, a mountain village in eastern Spain, is evidence of the ripple effect that often links humans with changes in land use through time. Young (2009) explains that the humanization of landscapes should be considered when evaluating land use. Innovations in techniques and the introduction of new practices and crops are often important factors of land-use change. Young points out the importance of identifying “landscape legacies” or historically recurring alterations of the environment. These legacies provide evidence of deeper mechanisms driving change. By combining these legacies with current data we can paint a clearer picture of the political, economic, environmental, and social factors contributing to land-use change. Lambin and Mayfroidt (2011) conducted a modern, global study of land-use change and land scarcity in which they describe current struggles of rural areas where economic development infringes on agricultural land. Landowners face additional controversy when they expand into forests and natural habitats protected by conservation efforts. The possibilities of this occurring in Otavalo are quite high in light of a number of conservation initiatives in the areas surrounding the town and the current economic growth from tourism.
Forest Transition Theory

Forest transition theory is a geographical concept that examines the reversal of deforestation trends that have resulted in actual increases of forest cover in regions that historically have been impacted by widespread land clearance (Grainger 1995; Mather 1992). Many researchers have used this theoretical framework to study land use and landscape change. Deforestation is a serious concern throughout much of Latin America and the highland and lowland environments of Ecuador have seen their fair share of deforestation, especially during the 1980s when forests throughout the country experienced widespread alteration and clearance (Rudel et al. 2002). Rapid population growth and modernization caused much of the deforestation as people cleared trees to create more arable land. Rudel et al. (2002) examined forest transitions in tropical Ecuador and found that urbanization and industrialization enticed many rural peasants to leave their land and move to the cities. Land abandonment often allows forests to begin to regenerate. There are different factors involved in forest transition theory and land abandonment is just one of many possible catalysts. Bass (2002) examined vegetation change and reforestation in Honduras and discovered that many processes are at work in forest transition. He found more trees than he had expected and was surprised that many local Honduran’s perceived a general decrease in forest cover.

The high Andean region of the Imbabura valley is climatically different from the tropical regions of Ecuador and the physical landscape creates additional factors to consider with forest transition. Rudel et al. (2002) point out
that rural and rugged terrains often see more significant reforestation following abandonment. They reason that areas where reforestation does not occur rapidly are most likely the more productive lands that are retained by farmers. This could explain reforestation that has occurred on the steeper and less accessible regions of the Imbabura valley where the relics of agricultural lands are now covered with trees and vegetation.

*Rural-to-Urban Migration*

Rural-to-urban migration is an occurrence that has had a remarkable effect on land-use change and land-use practices. Changes in the economy and the liberalization of markets has placed extreme pressures on poor rural peasants throughout Latin America. As a result, many rural inhabitants have been forced to move to the growing urban centers to find work and better wages. Cochran (2008) examined Ladino and indigenous Miskito communities in eastern Honduras and found that many households now divide their time between subsistence farming and cash work. He explained that households who combined subsistence farming with off-farm work were much better off than those who focused strictly on subsistence livelihoods (Cochran 2008, p 75).

Whether they are moving from far away or from the rural periphery, the effects that rural migration has on communities that are being abandoned are substantial. The sustainability of resources in these communities becomes difficult as wage earners leave. Researchers like Rudel (2006) explain that although some efforts to mitigate this are successful, many sustainable development projects fail. The constant outflow of residents reduces the
manpower and support that is necessary to maintain the land. Rudel further concedes that remittances sent home by migrant workers are often spent on new homes or buildings rather than the development of agricultural land or the implementation of sustainable practices (Rudel 2006, p 840).

Sending communities feel the effects of rural-to-urban migration on a daily basis. Fry (2011) uses the term *deagiculturalization* to describe the process of agricultural decline resulting from the outflow of laborers to urban regions. Modernization and economic pull factors contribute heavily to the deagiculturalization of rural regions, but there are other aspects of this phenomenon that are often overlooked. Rigg (2006) points out that cultural and social components should be included in the analysis of land-use change in rural villages. “It is when villages are fragmented by modernity, when village production is undermined by industrialization, and when villagers are extracted from their natal homes that things are perceived to go wrong (Rigg 2006, p 189).” Rural villages are cultural and social communities that are often held together by tradition and familial ties. The loss of younger generations to urban migration can upset the balance and affect traditional land-use practices.
CHAPTER III

METHODOLOGY

Introduction

My intentions with this research were to better understand changes in land use from the perspective of local residents in and around Otavalo, Ecuador. I also wanted to create a finished product that highlighted the current issues regarding land-use change as viewed by the locals, as well as potential solutions associated with the challenge of this change. To accomplish this, I employed a research design that was mostly qualitative in nature. The methodological foundation of my study was repeat photography and the data that were collected were subsequently complimented by ethnographic interviews and archival research.

Repeat Photography

Repeat photography found its footing in the early 1980s as a method for observing the movement of glaciers and it continues to be used today in a variety of different field research contexts (Masiokasa et al. 2008; Kamp et al. 2013; Byers et al. 2013). It has become a particularly valuable method for studying vegetation, landscape, and cultural change. Bass (2010) demonstrated how the process of locating a vantage point to repeat a photograph involves exploration, conversation, and observation. Interacting with local residents while searching for a site makes the process of discovering a vantage point just as important as the re-creation of the photograph. Anthropologist Trudi Smith proposed that, “repeat photography reimagines ethnographic practice and realigns product and
process” (Smith 2007, pg. 196). She explored the use of repeat photography as a vehicle for traversing time in order to better understand human and physical conditions in space and place. By repeating a historical photograph, one not only captures the change that has occurred, but the vision, impressions, and observations of the original photographer as well.

The multifaceted nature of the study of change is conceptualized by Scott Brady as *repeat geography*, which connects singular methods such as repeat photography with the use of maps, statistical data, historical accounts, and past research. Brady demonstrates this in a “repeat geography” study, patterned after a study of the Lenca Indians of Honduras, conducted in the 1950s by Robert West of Louisiana State University (Brady 2009). Using field notes and data collected by West, Brady conducts research of the same area to assess change. By referring to past geographical research while documenting current trends, one can understand and contextualize the changes seen in repeat photography. This was demonstrated in research conducted by Niraula and others (2013) that focused on community forestry programs in Nepal. The investigators were able to analyze through repeated photographs forest changes that were directly related to community-based forest management (Niraula et al., 2013).

In conducting this research, I incorporated the method of repeat photography by selecting a sample of photographs taken by Robert West and John Collier in the 1950s and comparing them to new photos to assess land-use change over the last half century. I juxtaposed data from ethnographic interviews with the photo pairs for in-depth explanations of change. Although located in
close proximity to Quito, the capital of Ecuador, little research has focused specifically on Otavalo. There has been a great deal of research, however, that has utilized a variety of methods to investigate the causes of land-use and landscape change. Bass (2013) examined landscape changes in Honduras using repeat photography and found that cultural transformations coincided with change to vegetation, both of which could be attributed to modernization and transportation infrastructure development. In a repeat photography study conducted in Michoacán, Mexico, Works and Hadley (2000) discovered that throughout their photo sites, vegetation cover had increased in some areas. They attributed this increase largely to changes in agricultural land use and the globalizing economy (Works and Hadley 2000).

Ethnographic Methods

Many different factors contribute to landscape change, although some cannot be readily observed in photographs. In her research of forest transition pathways in Ecuador, Farley (2010) proposes five pathways, with globalization being the primary pathway present in all of her test sites. Globalization is an example of an element of change that may not be obvious or detectable in a photograph. We may see evidence of globalization in a photograph but in order to understand its extent and effects, additional methodologies are necessary. Ethnographic interviews are a valuable tool for understanding change and are very cohesive with repeat photography methods. Ethnography is traditionally defined as the description of people and culture through observation (Spradley 1980). Ethnographic interviews add a participatory element to the methodology
by allowing a semi-structured dialogue with the people being observed (Herbert 2000: 550). Ethnography can provide unique insight into the creation of sociocultural worlds within a spatial context. In many cases, especially with indigenous populations in Latin America, relationships between foreign researchers and local participants can be difficult to navigate. Incorporating ethnographic methods into geographical research can unlock hidden variables that describe previously misunderstood phenomena (Scholl et al. 2014:59). In Tena, Ecuador, a small town along the Río Napo, ethnographic interviews were used to understand indigenous sentiments toward the growing tourism industry and the impending incursion of oil exploration companies. Beahm (2011) was able to embed himself within the community and gain a better perspective through the use of semi-structured ethnographic interviews (Beahm 2011).

Archival Research

The span of 65 years between the West and Collier photographs and my repeated photographs presented a gap which required a more detailed description of events. With any change to a physical landscape, determining the original condition of that landscape can be difficult. The photographs that I used from the 1950s are a great start to understanding land-use change in the Imbabura valley. However, archival research as a compliment to repeat photography provides additional information that allows for a much richer, comprehensive understanding. Although resources for archived information are limited in Otavalo, the University of Otavalo, as well as the city historian have created a useful database of records. Many studies of land-use change have
benefited from archival data. Banister and Widdifield (2014) used historical accounts, documents, and photographs to investigate the effects of modern water projects on the iconic waterways of Xochimilco, Mexico. They were able to trace the spatial distribution of water from the early 1900s as it became less of a public resource and more of a controlled resource. Similarly, Karl Butzer (1990) conducted a study of Aín, Spain using historical data. Butzer’s work developed a narrative of change over time in agricultural land use in the small Spanish town. Although small in scale, his study can have implications for much larger regions experiencing agricultural land-use change. While searching the archives at the University of Otavalo, I focused on books and studies that were completed by local academics and historians.

One of the major components to land-use change in the Imbabura valley has been the development of roadways and the movement of people. As new roads have been built and old ones covered up and forgotten, it becomes important to understand past transportation routes and how they relate to land use. Craig Revels (2015) used archival research to uncover the old Camino Real in Honduras and was able to piece together the history of this forgotten route. His research on the Camino Real did as much to identify towns and land use along the route as it did the actual road itself. Archival research is not only valuable for filling the gap created by the photograph pairs. It is also essential in corroborating the memories of the individuals who participated in interviews for this study. Memories can be quite subjective and are heavily influenced by one’s culture, environment, and upbringing. Archival data therefore, is a useful
template into which the comments and memories of interview participants can be organized and analyzed.

Data Collection

Repeat photography and ethnographic interviews were the two primary methods that I used for this project. Both were closely linked as companion methods and both were augmented by archival research. I used a DSLR (Digital Single Lens Reflex) camera to gather the photographic data and used a loosely structured questionnaire to gather interview data. Prior to entering the field, I was skeptical of the value of the original photographs as tools for gathering data. Once I began to interact with the local residents, I was pleasantly surprised by the ability of the photographs to spark conversations and conjure up memories.

Repeat Photography

Repeat photography is a method that can be quite difficult and challenging, yet at the same time, equally rewarding. Physical landmarks surrounding the Imbabura valley made estimating the locations of photo sites much easier. Using Google Earth software, I was able to tentatively locate photo sites based on physical landmarks (mountains, hills, lakes, and rivers) as well as cultural landmarks such as churches, buildings, and major roads. This type of pre-planning greatly reduced the amount of time I spent wandering around in search of photo sites. Each day I would select a few photographs and head out to their pre-determined, approximate location to begin my search. Early on in my fieldwork I came to the conclusion that West and Collier most often composed
Figure 3. Camera and tripod setup at one of the photo sites (Photograph by author).

their photographs either on or close to a road. This conclusion allowed for even greater precision when locating the original photo site. After locating the site, I would set up my tripod and camera and proceed to make minor adjustments until I felt that I was standing as close as possible to the original photo site. Although I located some of the vantage points on my own, more often than not, I was aided by people living close to the site or by involving passersby in the repeat photography process. The depth and intimacy of knowledge that the locals had of the mountains and the physical landscape was invaluable and continually amazed me.
Repeat photography is meant to document visual evidence of change, but it has limitations. Finding the exact location of the original photographs is nearly impossible due to the lack of locational information on the original photographs. However, this limitation is greatly reduced by the modern zoom capabilities of DSLR cameras. Equally difficult is the process of mirroring the composition and lighting of the original photograph. To minimize these limitations, I uploaded the new photographs each day and overlaid them with the originals. This allowed me to determine whether the photographs matched sufficiently or needed to be re-taken. A number of my original compositions did not match the older photographs and I was forced to return to the site and make the necessary adjustments. In an effort to facilitate future repeat photography studies, I tagged the new photographs with detailed information such as geographic location coordinates, date and time, height of camera, and camera settings (Appendix A). This information will be useful for future research using repeat photography and should help to decrease the margin of error. Although repeat photography depicts change through visual images, it lacks the ability to tell the full story of the change and the possible causes of that change. Additional information is therefore necessary to explain the differences that are evident in each photo pair.

Ethnographic Interviews

Ethnographic interviews were used in tandem with repeat photography as a way to give a voice to the photo pairs. These interviews were conducted with local residents who live, work on, or own land in and around the viewsheds of the photographs. The viewshed in this case refers to the area that can be seen
within the borders of a photograph. Finding participants for the ethnographic interviews was initially quite difficult. A combination of my being a foreigner, busy work schedules, and language barriers (many people spoke only Quechua), contributed to a very slow start in the gathering of interview data. At each photo site I would generally canvas the area within the viewshed of the photograph and begin by getting acquainted with the people living there. The original photographs proved to be extremely useful as conversation starters and when people saw them they became instantly excited with memories and nostalgia. In many instances these interactions gave me the opportunity to schedule an appointment for a return visit and interview.

While conducting the interviews I followed a number of parameters for the sampling process. For example, elderly individuals, aged 65 years and up, and residents who owned or worked on agricultural land were prime subjects for interviews. The age of the subject is important because they are more likely to have been alive when the 1950s photographs were taken. The sample, however, was not restricted solely to the above-mentioned criteria. As I anticipated, the process of locating photographic sites often sparked conversation with local residents along the way and was very conducive to a snowball sampling technique with regard to interviews. Although I had a general set of sampling guidelines, in many cases I allowed the sampling process to follow the ebb and flow of my daily encounters. The open-ended nature of this type of sampling fits with grounded theory principles and allowed me to pursue theoretical sampling as I gathered data and began to formulate my own ideas.
about what I was seeing in each photographic pair. This type of sampling is part of the inductive process and can be a useful tool in developing hypotheses as more data is collected. The ideas and questions that emerged during interviews helped guide me in selecting future interview participants. Following these clues informed the process of collecting data and contributing to the development of more robust theories of land-use change as the research progressed.

The questionnaire used for this research consisted of a small number of open-ended questions that I asked each participant in a loosely organized interview setting. The purpose of the questions was to keep the interviews within the scope of the project but also to allow for freedom of conversation. Interviews were typically conducted in a location that was comfortable for the interviewee. Each interview lasted about an hour. Depending on the volume of information provided by a particular informant, as well as his or her willingness to participate, I occasionally scheduled subsequent interviews to gather additional information. Whenever possible I would ask interviewees for referrals in an effort to identify additional participants to be interviewed. The questions that I used can be seen in Figure 5.

I began the interviews with demographic questions and then proceeded to ask a few open-ended questions related to land-use change. This allowed the participant to speak freely from the beginning. Follow-up questions were then used to probe deeper into topics that arose during the interview. I was able to reach my goal of 30 interviews during my time in Ecuador, but there was a great deal of variation in the interviews, in terms of their length and context. Some
Figure 4. Local Collaboration. A) Discussing the geologic history of the heart of Imbabura with local farmers in Compania, Ecuador (Photograph by Tyler Hair). B) Señor Rodriguez translating for an interview with his mother and aunt, both of whom spoke only Quechua (Photograph by the author).
### Interview Questions

1. How long have you lived in Otavalo? In the house where you currently live? Have you lived in other areas of Otavalo?
2. What is your current occupation?
3. (After showing the participant the photo pairs) What kind of changes in land use do you see between these two photos? How do these changes correspond with your own memories or with what others have told you about Otavalo?
4. How has land use changed in Otavalo over the last fifty years, both in terms of what you have seen, as well as what you have heard from others?
5. How do you think agricultural land use has changed?
6. What do you think is the cause of these changes?
7. Can you describe any effects that land-use change has had on the physical environment?
8. What kind of effect do you think tourism has had on land use?
9. Can you describe for me the craft business? Do you have friends or family who work in this industry?

*Figure 5. Interview Questions. These questions were used as a template and guide for each interview conducted.*

were scheduled, sit-down meetings whereas others were road-side conversations. A few informants even took the questionnaires home to fill them out and then returned them to me later. Due to my limited time in Ecuador, I was unable to spend as much time as I would have liked reviewing take-home questionnaires and discussing the answers with the participants. A stronger focus on interviews early on in the research as well as more time would have allowed me to conduct a larger number of face-to-face interviews. Regardless of
these constraints, I was still able to reach my goal of 30 interviews while also collecting 35 photo pairs for analysis.

Archival Research

The final method I used in my data collection was archival research. Statistical data such as census data, economic data, and land policy data are difficult to find via online sources, so it was necessary to conduct archival research in Ecuador through local government archives and records. I focused my archival research at the Universidad de Otavalo, the Otavalo Tourism office, and the archives of the city of Otavalo. The Universidad de Otavalo contained a number of scholarly books and articles dealing with the history of Otavalo and the surrounding region. Data and information gathered from these archives helped to fill in the 65-year gap present in the photo pairs and were useful in creating a historical narrative of land use, tourism, and urban development.

Overview and Weekly Schedule

The structure of my day-to-day activities in Ecuador revolved around locating the sites of the original photographs. Each night I would research and investigate an old photograph and attempt to determine the general location where it was taken. The next day I would set out to find the spot and re-take the photograph. Along the way I always encountered people with whom I could share the old photographs and ask questions about changes that had occurred. I often encountered people who were willing to participate in an interview but could not do so until a later date. In these cases, I scheduled appointments to return
and conduct the interview at a future time. Each week I scheduled a day to focus on archival research as well as organizing the data I had collected thus far.
CHAPTER IV
ANALYSIS AND RESULTS

Introduction

Between May and July of 2015, I spent six weeks gathering data in the Imbabura valley of Ecuador. I used photographs taken by Robert West and John Collier in the 1950s, paired with repeat photographs I took to study changes in land use over the last 65 years. The photo-pairs that I created by using the method of repeat photography provided visual images for detecting change and were a valuable visual aid for discussing land-use change with local residents.

The very essence of studying change over time means that places have changed, sometimes beyond recognition. As such, determining photo sites after 65 years proved difficult in some cases. However, with the help of Google Earth and many local contacts I was able to locate the sites of 35 of the original photographs taken by West and Collier. Along with repeat photography, I conducted ethnographic interviews with local residents and explored local archives for information regarding land-use change. I began to analyze the data as it was collected in the field in Ecuador and continued my analysis after returning to the United States. The purpose behind this analytical process was to begin developing theories and concepts early in my research and while still in Ecuador so that I could better utilize input from the local residents. One of the guiding principles of my research project was to try to examine land-use change as much as possible from the perspective of local residents. Including their perspectives early in the analysis allowed me to learn and incorporate their views.
and opinions along with my own insights. The 65-year span between the original photographs and my new photographs created a gap of time which could not be analyzed visually. While in Ecuador I conducted archival research to gather information that could assist in filling in the 65-year gap as well as create a better narrative of land-use change. To maintain the anonymity of the participants involved in this research I substituted real names with fictional names.

Photo Pairs

The analysis of the photo pairs that I collected was an organic and somewhat subjective process. Although the detection of change in satellite imagery is a common part of image processing, there are no widely-accepted digital techniques for analyzing pairs of historic and contemporary photographs. The analysis of photo pairs is therefore most commonly a subjective and qualitatively visual process that relies heavily on the eyes of the interpreter. While in Otavalo, in an attempt to broaden the subjectivity inherent in the interpretation of repeat photography, I showed many of my photo pairs to residents who lived close to each photograph site, and engaged in discussions with them about the changes they perceived between the photos from the 1950s and those that I took. During these conversations I kept careful notes that I later used to guide my subsequent analysis of the photo pairs.

The thoughts and insights of local residents, combined with my own personal interpretations, made themes and trends much easier to identify in the photo pairs. I quickly found that many common themes of land-use change emerged from my own analysis of the photo pairs as well as those of local
residents. I used two methods to compare photo pairs. The first and most basic method was to place them alongside each other and visually analyze the differences that could be seen. I extended this method by taking a number of panoramic photos of current sites and stitching the corresponding photograph from the 1950s into the scene (Figure 8). With the photographs side by side I was able to identify noticeable changes within the immediate frame of the photograph. In contrast, the panoramic photograph provides an extended perspective of the current scene to the left and right of the original photograph. This is very useful for interpolating the analysis of change beyond the immediate frame of the photo pairs. Changes that have occurred outside the frame of view of the photo pairs may also serve as indicators for the causes of change within. The real value of using panoramic photographs in the analysis is to extend the frame of reference as much as possible. Individual oblique photographs are limited to what can be seen within the immediate image. By adding the perspective of a panoramic photograph, you can evaluate the extent of the landscape change at a much greater scale.

The photographs taken by Robert West and John Collier had limited information regarding their exact location. As a result, my study area evolved as I searched for and discovered each original site. The photograph sites however, maintained a fairly consistent dispersal pattern with the Loma Negra (Figure 6) at the center. The Loma Negra is a medium-sized hill that sits between Otavalo and Laguna San Pablo. In the 1950s and 1960s, indigenous residents who lived along the banks of Laguna San Pablo traveled daily, back and forth, over Loma
Negra to the markets in Otavalo. In order to better organize the analysis of the photo pairs I divided them into two categories: 1) Photo pairs located east of the summit of Loma Negra; and 2) Photo pairs located west of the summit of Loma Negra. The photographs to the east include Laguna San Pablo, Imbabura volcano, and a number of small lake towns. The photographs to the west include mostly the city of Otavalo and a small, nearby hill named Yambiro. In the following sections, I begin by analyzing the photo pairs located east of Loma Negra and then proceed to analyze the photo pairs located to the west.

East of Loma Negra

This first section focuses on the photo pairs located east of Loma Negra. Figure 6 displays a map of this area and indicates the geographic positions of Loma Negra, Laguna San Pablo, and Imbabura Volcano. I will use these geographic features as points of reference while analyzing the photo pairs.

Bridge in La Compania

Figure 7 looks across an old bridge in La Compania towards the Imbabura volcano. The bridge has in recent years been widened to accommodate a two lane paved road. The development of this road can be seen more accurately in Figure 8. Although the bridge expansion is a result of increased automobile traffic, Figure 7B demonstrates that foot traffic continues to be a common form of human movement in this area. Figure 7B also shows the development of a municipal electrical grid in the form of power lines that cut across the field of view in the photo. If you follow the powerlines into the distance you can vaguely make out the town of La Compania at the foot of Imbabura. In Figure 7A you can see
Figure 6. Photo sites located East of Loma Negra. This map indicates the georeferenced locations of the photo sites around Laguna San Pablo. The orange line roughly depicts the ridge of Loma Negra.
Figure 7. Bridge in Compania, Ecuador.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 8. Compania Bridge Panoramic. Panoramic overlay of John Collier’s photograph of the Compania bridge (1949) and the author’s photograph at the same location (2015).
the grove of trees that has disappeared to urban development of the town in the later photograph. Farther up slope, scruffy tree cover has become overgrown and has descended into the upper limits of what was originally agricultural land. A final observation is the land on the opposite side of the bridge. Figure 7A depicts a relatively open agricultural field that by 2015 had been divided and developed with home sites and smaller plots of land.

Road to Imbabura

East of the Compania bridge lies Loma Negra, a small rise that separates Otavalo from Laguna San Pablo. Figure 9 contains pictures of an old road that connects the two regions. Since 1949, the road has been lined with cobblestone to facilitate traffic between the lake towns and the city center. Although difficult to see, there are a number of narrow folk trails that crisscross the fields on either side of the road. These are most often used by indigenous residents for foot traffic that is still quite prevalent in the region. One noticeable change in the agricultural land is the manner in which the fields are now divided. Earthen walls and makeshift hedgerows indicate multiple owners and the division of inherited land. On the right-hand side of Figure 9B a field of corn is waiting to be cleared and in the upper right hand corner a Eucalyptus tree invades the indigenous soil.

Muelle San Pablo

The next two photographs were taken in the town of Eujenio Espejo along the western shores of Laguna San Pablo. The owner of the building in Figure 11A is no longer living but his son still owns and runs the small restaurant and
Figure 9. Old road over Loma Negra. This road has been an important route for the indigenous community as they travel to the market in Otavalo.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 10. Panoramic Overlay: Road to Imbabura – Black and white photograph by John Collier (1949) and color photograph by the author (2015)
Figure 11. Old Muelle on Laguna San Pablo.
A. Photograph by Robert West (1949)
B. Photograph by the author (2015)
Figure 12. Panorama of the muelle (pier).
Figure 13. Panoramic overlay of the old *muelle* (pier) on Laguna San Pablo. Black and white photograph by John Collier (1949) and color photograph by the author (2015)
marina. Much of the shoreline has been backfilled in preparation for a
development project that is still in the planning stages. On the right hand side of
Figure 11B you can see the edges of a thick stand of Totora reed. Recent
regulations and conservation laws have begun to protect Totora from over-use.
The presence of more trees on the slopes of Imbabura is evidence of a decrease
in agriculture and the subsequent abandonment of plots of land at higher
elevations. Although it is difficult to be sure, the heart-shaped hole on the side of
Imbabura appears to have much more vegetation in Figure 11B than in Figure
11A. This is another indication of the decrease of activity at higher elevations. In
the foreground of both pictures you can see the remnants of agricultural fields.
These most likely have been abandoned in preparation for future construction.
The shoreline of Laguna San Pablo has become quite popular for homes,
businesses, and tourist resorts. In Figure 12 you can see buildings and
structures that have been built, extending the outskirts of town closer to the
muelle and the lake.

After collecting the photographs of the old muelle, I walked west up onto
the hill that overlooks the lake. Figures 14 & 15 were taken from the same
location but from different angles. These four pictures show more clearly the
growth and expansion of the town along the shores of the lake. In Figure 15A
you can see the muelle in the distance along the lake. One of the first changes
apparent in these two photographs is the urban growth in the form of residential
cinder block housing. In these pictures like those before, pockets of trees can be
seen growing in areas where agricultural production no longer takes
Figure 14. Overlooking Espejo. These photographs were taken from La Loma Negra and overlook the northern border of Espejo.
A. Photograph by Robert West (1950)
B. Photograph by the author (2015)
Figure 15. Second angle of Espejo from the west. The circled area in photograph A is the old *muelle*.
A. Photograph by Robert West (1950)
B. Photograph by the author (2015)
place. The housing that appears in Figure 15B is very typical in terms of its design and materials. It is interesting to point out that most of the homes have retained a small portion of land on which to grow staple crops and to maintain small animals such as chickens, pigs, sheep, and guinea pigs. It is also apparent on the slopes of Imbabura that the small towns are gradually expanding up the slopes of the old volcano into the traditional farm lands.

View from the Lechero Tree

To the northwest of the location overlooking Laguna San Pablo is a trail that leads to the top of Loma Negra, and there you find the Lechero tree (Euphorbia Laurifolia - Figure 16). Just below the tree facing northeast, I found the location for the next set of photographs. This view looks over a portion of the Loma Negra towards La Compania with Imbabura in the background. In the immediate foreground of the pictures it seems that not much has changed in terms of land use. Agricultural land dominates most of Loma Negra with a few houses among the fields appearing after the 1950s photos. In Figure 17B, fields of corn and wheat can be seen as well as evidence of recently tilled fields ready for planting. On the Loma Negra the use of hedgerows and earthen walls are apparent in both the old and new photographs indicating the longevity of these types of property division methods. A stand of eucalyptus trees (Eucalyptus obliqua) has grown up among the fields in Figure 17B. Eucalyptus is not native to Ecuador and is considered by many to be an invasive species. In some cases, it is a sign of abandonment, but many people also cultivate patches of eucalyptus to use as firewood and
Figure 16. The Lechero tree as seen from the top of Loma Negra. The Lechero is a very old and mythical tree that has become a popular destination for tourists and locals alike. It sits atop the Loma Negra (Black Hill).
Figure 17. Imbabura from the Lechero. These photographs were taken from the Lechero (Figure 16) looking north towards Imbabura. The arrow in photograph B points to a mass wasting zone caused by runoff from the heart of Imbabura.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 18. Panorama looking north from the Lechero tree.
Figure 19. Panoramic overlay of Figure 18A and 18B. View from the Lechero tree.
building materials. The angle of the photographs in Figure 18 provides additional insight into changes that have occurred on the Imbabura volcano. There is a noticeable delineation between where the agricultural fields end and wild trees and vegetation continue up the mountain. Over the last 65 years it seems like the upper limits of the agricultural fields have descended in elevation while the edges of La Compania have gradually extended farther up the slopes. This is in part due to the dis-intensification of agriculture resulting from shifts from subsistence farming to a combination of agriculture and off-farm work.

The Heart of Imbabura

John Collier took a number of photographs of the heart of Imbabura. Figures 20, 21, and 22, which include his originals and my repeat photographs, provide a detailed view of some of the changes that have occurred in the last 65 years. As with some of the previous photographs, Figure 20 clearly shows that the upper limit of agricultural activity has descended to lower elevations since the 1940s. Many of the fields seem overgrown and show signs of abandonment or limited use. Recent laws passed by the Ecuadorian government have placed restrictions on the elevations at which agriculture is permitted. I had a number of conversations about the heart of Imbabura with residents who live at the base of the mountain. Most of these people spoke about the history of the heart-shaped valley as well as the landslides and runoff that are created by the funnel at the bottom of the heart. In Figures 17A and B there is clear evidence of a previous landslide and there is a notable absence of houses and agricultural fields.

Although many changes have occurred along the base of Imbabura, residents of
Figure 20. A close up view of the heart of Imbabura.
A. Photograph by John Collier (1949)
B. Photograph by author (2015)
Figure 21. Panorama of the heart of Imbabura.
Figure 22. Panoramic overlay of the heart of Imbabura. Black and white photograph by John Collier (1949) and color photograph by the author (2015).
this area have continued to avoid the path of the mass wasting that is present on this part of the slope of the volcano. The panoramic view in Figures 21 & 22 provide a wider angle of the heart of Imbabura and the rolling agricultural fields that run along the base of the mountain. As with most of the photographs, the pervasive eucalyptus trees are present in the most recent photographs but are noticeably absent in Collier’s 1949 photograph.

*Laguna San Pablo and Imbabura from the Pan American Highway*

From the heart of Imbabura, we now move directly across the Laguna San Pablo to the Pan American Highway. The next two photographs were taken from the highway looking north towards Imbabura. These are the last photo pairs that will be analyzed for the east side of Loma Negra. The first change that I should point out is the scarcity of trees in 1949 as compared to the small pockets of eucalyptus and other species visible in the current photograph. These pockets are visible in both foreground and background (Imbabura) of Figure 23B. It is interesting to note that in Figure 23A, there seem to be a few palm trees close to the shoreline that no longer exist in Figure 23B. In Figure 23A the agricultural fields are divided in neat squares and it looks like they extend all the way to the shoreline. In Figure 23B however, it is much more difficult to delineate the different fields due to overgrowth and the agricultural fields no longer extend to the shoreline. Marshy reeds have been allowed to grow up along the shore where cultivation once took place. The panoramic overlay in Figure 25 gives us an additional perspective of the surrounding area and we can see some of the
Figure 23. Laguna San Pablo and Imbabura. These photographs were taken from the Pan American highway looking north towards Laguna San Pablo and Imbabura volcano.
A. Photograph taken by John Collier (1949)
B. Photograph taken by the author (2015)
Figure 24. Panorama looking north from the Pan American Highway.
Figure 25. Panoramic overlay of Laguna San Pablo and Imbabura as seen from the Pan American Highway. The black and white photograph was taken by John Collier (1949) and the color photograph was taken by the author (2015).
homes that have been built as well as one that is still under construction in the distance. Here along the shoreline, just like the other side of Laguna San Pablo, many people are beginning to convert traditional agricultural land for homes and businesses.

**West of Loma Negra: Otavalo and Yambiro**

Unlike the eastern side of Loma Negra, the photo pairs on the western slopes of the hill deal more with land-use changes in the urban environment of Otavalo. There are many changes that have occurred in this region with urbanization and expansion being two of the most notable. The map in Figure 26 provides some geographic perspective of the west side of Loma Negra. The photo sites in this area were located on Yambiro, within the city limits of Otavalo, and on the west side of Loma Negra.

*Ibáñez Overlook from Calle García Moreno*

Figures 27, 28, and 29 were taken from the lower slopes of Loma Negra overlooking Otavalo. The street in the bottom left hand corner of Figure 27A is García Moreno. The city of Otavalo has experienced dramatic vertical and horizontal growth. Many of the buildings in Figure 27A have become taller in Figure 27B. Much contemporary construction in the Imbabura valley is designed with future additions in mind. Along with its vertical growth, the city has expanded horizontally into the agricultural periphery. In Figure 27A, Yambiro is visible in the background as well as the early outskirts of Otavalo. Since the 1950s, Otavalo has expanded onto the lower slopes of Yambiro. Land that was previously cleared on the slopes of Yambiro is now covered with eucalyptus
Figure 26. Map of Otavalo and Yambiro. This map indicates the geographic locations of the photo sites within Otavalo and in the immediate periphery on Yambiro hill (Created by the author).
Figure 27. Photographs overlooking Otavalo.
A. Photograph by Robert West (1950)
B. Photograph by author (2015)
Figure 28. Panorama of Otavalo from the slopes of Loma Negra.
Figure 29. Panoramic overlay looking west over Otavalo. Black and white photograph by West (1950) and color photograph by the author (2015).
trees. If we widen our view of this scene by looking at the panoramic image in Figure 28 we can see how the outskirts of Otavalo have actually crept up the slopes of Yambiro. The pressures of population growth have forced people out of Otavalo and up onto the peripheral hills. This change is clearly illustrated by the appearance of a road in Figure 27B where there was once a field. The road curves its way up the slopes of Loma Negra through hundreds of concrete homes built precariously on the hillside. Two features in the town of Otavalo are important to point out. The first is the Plaza Bolivar in front of the old Catholic church. In Figure 27A, there is barely any evidence of vegetation in the plaza. In Figure 27B, it is clear that trees have been planted and have matured in the plaza to provide a central green space for the social activities of Otavaleños. The second feature is the large indoor market that is under construction. The building is blue and orange and can be seen in Figure 27B. Otavalo has a thriving street market that has outgrown the availability of open streets. There are so many vendors, especially on the weekends that the streets become congested and impassible. The city of Otavalo decided to fix this by creating a large centralized indoor market. This is a clear example of changing land-use practices in an urban environment.

*Otavalo Overlook from the Top of Olmedo Street*

The next two photographs were taken a few blocks south of those in Figure 27. The photo site was located a short distance up the slope of Loma Negra. These photographs provide another viewpoint of the northern edge of
Figure 30. View of Otavalo from the lower slopes of Loma Negra. Cotacachi volcano in the background.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Yambiro and highlight again the growth of a large stand of trees where there previously had been none. In Figure 30B, we get a closer look at some of the dwellings that have spread up the slopes of Loma Negra. The typical block construction is crisscrossed by electrical lines as the city continues to update its infrastructure. In the foreground of Figure 30A, we can again see an agricultural field that has been replaced by the urban growth of Otavalo.

*Calle Olmedo*

Olmedo Street has long been used as a gateway into Otavalo by indigenous Otavaleños traveling to market. John Collier included three different photographs of Calle Olmedo in his book “The Awakening Valley”. Calle Olmedo runs east out of Otavalo, traveling up over Loma Negra towards the town of Espejo on the shores of Laguna San Pablo. The photographs were taken at different locations along the street but always face Otavalo. I arranged the photographs from the highest to the lowest in terms of elevation. These photographs of Calle Olmedo provide some interesting insights into changes that have occurred on the outskirts of Otavalo over the last 65 years as well as aspects which have stayed the same. Beginning with Figure 31 there are a number of things that stand out after conducting a closer visual analysis. The steep embankments on either side of the road in Figure 31A appear to have been cut into the lower slopes of Loma Negra as it makes its way into Otavalo. In Figure 31B the dirt road has been widened and the right-side embankment has been populated by houses. Homeowners along Olmedo Street confirmed that
Figure 31. Photograph of Olmedo Street looking into Otavalo.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 32. Photograph of Olmedo Street looking into Otavalo.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 33. Photographs of the lower portion of Olmedo street as it runs into downtown Otavalo.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 34. Cantina Buenos Aires. This old cantina sits just above the photographs in Figure 33. It has since been converted to a family residence and the outline of the second doorway is still visible. Many of the residents who live in the homes featured in Figure 33 remember fondly the music, food, and traditional chicha (fermented drink made from maize) could be found at the old cantina.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
agriculture previously dominated land use on either side of the street. The embankment on the left in Figure 31B has been altered by vegetation and possible erosion. The narrow rock-filled ruts and rivulets that cut through the road in Figure 31B are further indications of erosion and the past flow of water following a rainstorm. The trees along Calle Olmedo in Figure 31A are noticeably absent while Yambiro in the distance is much more heavily forested now than it was in the past. Figure 32B provides a clearer look at Yambiro and the western outskirts of Otavalo. The houses that now reside on the slopes are all adjoined with smaller plots of agricultural land. In many cases these peripheral communities are created as family owned land is divided between heirs to accommodate growing families. Remarkably, the white house at the end of the road in figures 31 and 32 has survived to the present. Calle Olmedo actually curves around this house and continues on into Otavalo.

The photographs in Figure 33 were taken from the lowest section of Calle Olmedo. There are clear differences between each section of the street, especially as you draw closer to the city level. In Figure 33A, the road is paved with cobblestones possibly indicating the limits of the public works department in the 1950s. In Figure 33B, the street has been converted to colorful tile and vehicular access has been blocked by the construction of steps. This is an interesting change because it is unique to this particular section of Calle Olmedo. During my time in Otavalo I did not see another street conversion like this one. It is now a very appealing walkway with a grass filled median and well-maintained houses that have survived on either side. Many of the homes along this portion
Figure 35. Panorama of Otavalo from the top of Olmedo street looking west.
Figure 36. Panoramic overlay from the top of Olmedo street. Black and white photograph by John Collier (1949) and color photograph by the author (2015).
of Calle Olmedo have been updated and most of the owners have lived here since the 1950s.

One last look from the top of Calle Olmedo (Figure 35) offers a wider view of its placement at the periphery of Otavalo. Many of the indigenous residents that I spoke to commented on the placement of roads and their origins. Olmedo is a characteristic indigenous road, in that its path goes straight up over the top of Loma Negra. In contrast the road in Figure 35 that runs parallel to the hill follows a much more circuitous route and is a vestige of colonialism.

*Iglesia San Fransisco and the Indigenous Cemetery*

Moving from Olmedo Street into the city and then west to the cemetery, the next photo pairs depict some of the changes that have transformed the religious landscapes of the study area. The photographs in Figure 37 were taken in front of the San Francisco Church. This church is traditionally considered an indigenous church and funerals often begin here and are followed by a walking procession to the cemetery. While I was in Otavalo I tried numerous times to photograph this church when the doors were closed. I checked at all different hours but the doors were never closed. On the second to last day of my trip a commented in passing to a man I had met, that I wasn’t satisfied with my photographs of the church because the doors were never closed. It just so happened that he knew the caretaker of the church and we walked right over and he shut the doors for me so I could get the shot. I wanted a picture of the doors because they were one of the main features on the church that had changed.
Figure 37. Front doors of the Iglesia San Francisco.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 38. Entrance to the indigenous cemetery, Otavalo. Vendors often line this street selling flowers and other tokens that can be offered at the graves of family members. The graffiti on the wall in photograph B reads, “Seré breve…usted me enamoró.” Roughly translated this phrase means, “I will be brief…you made me fall in love with you”. This could be an homage to a deceased resident of the cemetery or simply a teenager’s profession of love.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 39. Old cross in the indigenous cemetery, Otavalo.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Another noticeable change is the wider sidewalk and the replacement of the cobblestone road with paver stones. The man walking in Figure 37A is carrying the casket of a child and the road he is on leads directly to the cemetery in Figures 38 and 39.

The entrance to the cemetery has changed a great deal since the 1950s. The indigenous community of Otavalo, particularly the artisans, have been extremely successful over the years with their crafts and textiles businesses. I feel that this is reflected in the ornate design and architecture of the new entrance in seen in Figure 38B. The paved road makes the cemetery much more accessible for arriving processions and the traditional hard-packed earthen walls have been replaced with a more modern white-washed cinderblock barrier. The physical boundaries of the cemetery have not been altered since the 1950s and you can see in Figure 39B that mausoleums have been built as a vertical solution to over-crowding. This vertical construction occurred within Otavalo as well indicating that the method is used for both the living and the dead.

*Otavalo from the Top of Yambiro*

From the indigenous cemetery of Otavalo, a short distance northward on the Pan American highway leads to the main road to the top of Yambiro. Yambiro is a small mountain that borders Otavalo to the west. Many of the previous photographs have shown parts of this little mountain and the changes it has experienced. The next two photo pairs (Figures 40 and 43) have switched sides and are now looking back over Otavalo from the top of Yambiro. From this angle you can see the extensive growth of trees both in the foreground on
Figure 40. Overlooking Otavalo from the top of Yambiro.
A. Photograph by Robert West (1950)
B. Photograph by the author (1949)
Figure 41. Panorama of Otavalo from Yambiro looking northeast.
Figure 42. Panoramic overlay of Otavalo as seen from the top of Yambiro. Black and white photograph by Robert West (1950) and color photograph taken by the author (2015).
Yambiro and in the background on Loma Negra. Figure 40A has a healthy number of Maguey (*Agave Americana*) plants near the bottom and although they still exist on this portion of Yambiro, Figure 40B illustrates that they are now dwarfed by stands of eucalyptus trees. From this angle on top of Yambiro there is a good view of the expansion of Otavalo up onto the lower slopes of Loma Negra. Figure 40A contains evidence of erosion on the slopes that has since been populated by trees (Figure 40B). This land may have been unmanageable for farmers due to erosion and was therefore abandoned or repurposed for trees. Towards the top of Loma Negra there is a fire burning (Figure 40B). Burn techniques are still used to clear small pieces of land. Previously I have pointed to abandonment of land as a reason for tree growth. This may be true in many cases but it does not mean that agriculture has ceased completely in these areas. In Figure 42 there are corn fields dispersed among the eucalyptus trees on the slopes of Yambiro.

*From Yambiro Looking North*

I took the next photographs close to the site of those shown in Figure 40. These however, are looking north towards the northern reaches of Otavalo. Figure 43A shows severe scarring on the slopes of the small hill in the background. The clear signs of erosion might have been caused by past agricultural mismanagement as well as natural processes. Figure 43B shows a moderate amount of agriculture that has continued to the present with a large portion of the hill now covered by dense forest. The dense forest cover in the
Figure 43. View from Yambiro looking over Northern Otavalo.
A. Photograph by Robert West (1950)
B. Photograph by the author (2015)
Figure 44. Panorama looking north from Yambiro over Otavalo.
Figure 45. Panoramic overlay of Northern Otavalo as seen from the top of Yambiro. Black and white photograph by Robert West (2015) and color photograph by the author (2015).
contemporary photograph strongly suggests that this area of the hill was abandoned at least in part due to the pronounced erosion visible in the historic photograph. As with many areas in the Imbabura valley, local farmers demonstrate remarkable ingenuity in the ways they fit agricultural fields into open spaces and on steep slopes. In the panoramic photograph (Figure 44) the photo site is located in a corn field nestled into a clearing amongst the eucalyptus trees. This is characteristic of many of the small clearings that can be found throughout the slopes of Yambiro.

*Downtown Otavalo, Plaza 24, and the Old Meeting Place*

Photographs of downtown Otavalo contain evidence of a number of landscape changes that have relevance to this study. Otavalo is an old city with strong indigenous roots and equally historic colonial architecture. Many of the buildings have been remodeled, repurposed, or expanded. Others have been replaced by modern structures. In the 1950s, the daily life of many residents of the Imbabura valley consisted of waking before sunrise and beginning the journey by foot into Otavalo. Once there, they sold their goods and purchased the things they needed. Figure 46A is a photograph taken by John Collier in 1949 of the plaza where the market was set up each day. The surrounding buildings have not changed much but the interior of the courtyard has been greatly altered. With population growth and urban development, this is now one of a number of local markets in Otavalo. The Plaza 24 serves as the primary food market and has been converted into an open air structure with semi-permanent stalls for vendors (Figure 46B). The panoramic photographs in Figure
Figure 46. Plaza 24. This was the traditional market place where everyone from the surrounding regions came to sell their wares.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 47. Panorama of Plaza 24 in Otavalo.
Figure 48. Panoramic overlay of Plaza 24. Black and white photograph by John Collier (1949) and color photograph by the author (2015).
47 and 48 provide a wider angle of the plaza. The location where I stood to take the picture was previously a school and has since been converted into a police station. After concluding their business in the Plaza 24, many of the vendors and travelers would visit one of the local cantinas to drink some *chicha* (beer made from maize) and catch up with friends and family. Figure 49 is a photo pair of an old cantina in downtown Otavalo. Had I not been lucky enough to meet a man who grew up next door to this old cantina, I would have never found it. The home (Figure 49B) has been altered with more doors and windows but the family still owns many of the liquor shelves and other decorations that adorned the old cantina in the 1950s. Cantinas and restaurants were popular meeting places for the indigenous people before they began the journey home.

Aside from the cantinas there was one particular meeting place that was well-known among the indigenous populations. This old meeting place was a dirt clearing in front of a hacienda on the Western outskirts of Otavalo. Some would go straight there after visiting the market and others would meet there later. Here families conducted social business, gossiped, and shared news from the smaller villages. The photo pairs in Figure 50 show some of the changes that have occurred to this old meeting place. The point of reference that I used when re-taking this photograph was the set of gates in the upper right hand corner. I was able to confirm with a number of sources that the gates in Figure 50B are at the very least in the same location as the old gates in Figure 50A. One man claimed that the old gate was still standing as a piece of the newer gate. Although it is impossible to tell, this same man noted that the palm tree pictured
Figure 49. Old cantina in downtown Otavalo. This old haunt has now been converted into a private residence.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 50. Old indigenous meeting place on the northwestern outskirts of Otavalo.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
Figure 51. Panorama of the old meeting place in Otavalo.
Figure 52. Panoramic overlay of the old indigenous meeting place. Black and white photograph by John Collier (1949) and color photograph by the author (2015).
in Figure 50A is amongst those still standing in the photograph that I took. In the foreground of Figure 50B evidences of modern transportation infrastructure can be seen in the form of a neatly paved road and a railroad track. The road is now a major thoroughfare and the railroad track continues north, connecting Otavalo with many of the cities and towns along the Ecuador/Colombia border. In the background of Figure 50B is a local school that has been built on the rear section of the old meeting place. The panoramic photographs in Figures 51 and 52 provide an extended view of the road that now traverses the old dusty space that was once an indigenous meeting place. The changes that have occurred in this old indigenous meeting place are very telling of the alterations to the indigenous landscapes, particularly by the mestizo population. The development and growth of Otavalo has followed a pattern of modernity into which traditional indigenous spaces may no longer fit.

**Ethnographic Interviews**

As part of my field work, I conducted a series of ethnographic interviews as a way to include local residents in my interpretation of the photo pairs and for me to learn as much as I could about their memories of life in Otavalo since the mid-20th century. The interviews consisted of a number of open-ended questions that allowed participants to speak freely on the topic of land-use change and their perceptions of it (Refer back to Figure 5). I was able to meet my goal of 30 interviews, but due to time constraints, I was not able to conduct all of these interviews in person. For those who were not able to participate in a one-on-one visit, I provided them with a printed handout of the questions. I translated the
questions into Spanish for the handout and conducted all of the face-to-face interviews in Spanish. Some of the interview participants primarily spoke Quechua so I enlisted the help of their family members to translate during the interviews. During my face-to-face interviews, I was able to ask follow-up questions to clarify or further explore a response. The handouts presented certain limitations due to the fact that I wasn’t present to discuss the responses with the participants. After collecting all of my notes from the face-to-face interviews as well as the printed handouts, I began the analysis of the interview data. In order to analyze the data provided by the participant’s answers, I systematically reviewed the responses to each question and made notes of similar responses as well as singular responses. Here I will lay out each question along with the common themes that emerged from the responses.

Question 1: Demographics

This question was designed to provide a demographic baseline of the interview participants. By asking this question I was able to get a better sense for a participant’s life history and knowledge of the Imbabura valley. It also allowed me to adjust later questions so they were more pertinent to the experience of the participant. Only two participants were born outside of the Imbabura valley. All of the participants had lived in Otavalo for at least 20 years with a few spending a year or two in the nearby city of Ibarra or in Quito, the national capital.

Question 2: Occupation
This question was also demographic in nature and was designed to collect information about what the participants did for a living. This information was helpful to gauge each participant’s level of involvement with land use in the Imbabura Valley. Some of the occupations I documented were: artisans, heavy machinery operator, flower farm supervisor, farmers, and small business owners. Each participant’s view of land-use change was often a reflection of their occupation.

Question 3: Photo Pair Analysis

After collecting demographic information, I asked questions dealing specifically with land-use change. For Question 3, I showed the participants a photo pair and asked them to describe the changes that they saw between the two photographs. There were three main themes that emerged from this question: the existence of more trees in the present than the past; the construction of more houses and buildings; and the decrease in overall agricultural land and fields. These three themes were consistently pointed out by all of the participants. These were some of the observations that I made as well during my visual analysis of the photo pairs.

Question 4: Land-Use Change

After discussing the photographs, I asked the participants to describe in more detail the changes in land use they had seen or heard about in the last 50 years. This question was useful in helping me organize a narrative of change during the gap between the 1950s photographs and my photographs in 2015. This question offered a number of interesting insights into land-use change.
Urban growth was a concern of many of the participants, particularly unregulated residential construction. In the Imbabura valley there is little oversight on residential construction and many home and land owners build houses or additions on their own. I spent 3 days working with a family and a crew of their friends as they added a second level on their one-story home. In Ecuador, they call a construction foreman “maestro” and on this job it seemed like everyone was the maestro. Participants pointed out that this kind of un-planned construction had damaged and polluted many rivers and natural springs as well as reduced the number of trees in some areas. With little regulation on construction, permits are easily obtained or sidestepped, and urbanization has progressed rapidly beyond its mid-twentieth century borders. Trash and contamination of natural areas are the unfortunate side effect of this kind of haphazard construction.

A number of participants referred to the land as “madre tierra” or “mother earth” and spoke of the traditional and spiritual connection to the land. In the past, most people lived off the land and their harvests, but extensive planting and over-use of chemical fertilizers has made the land less responsive to cultivation. Many of the participants felt that global warming and climate change were two of the biggest culprits of land-use change, specifically causing a decrease in annual rain fall.

Question 5: Agricultural Land-Use Change

After getting a feel for the participant’s views of land-use change in general, I focused this next question on specific changes in agricultural land use.
that had occurred in the last 65 years. The Imbabura valley has an agricultural tradition that is as rich as its volcanic soils, and there have been many changes in the ways local residents use the land for cultivation. Similar to the previous question, all of the participants spoke about the use of chemical fertilizers as opposed to organic fertilizers produced from animal waste. One participant used the metaphor of a woman who continually dyes her hair until the follicles are essentially dead. He explained that crops no longer grow as big or as tall as they used to.

Modern technology like tractors and harvesting equipment have replaced the traditional plow and hoe. Along with the introduction of chemical fertilizers, the use of tractors was one of the most common responses during my interviews. Participants pointed to the fact that tractors allowed for much quicker plowing, but they also made the soil vulnerable to erosion by plowing too deep. The use of tractors corresponds with the new focus on crops with high market value such as corn, strawberries, tomatillo, and grape variations, among others. With the shift from traditional techniques to modern technology, participants also explained that urban areas had expanded into much of the peripheral agricultural lands. This is interesting because many participants also pointed out that rural-to-urban migration was adding to the urban growth. In other words, rural farmers have abandoned agricultural land to move to the urban centers, and the increase in population due to this migration has forced the urban boundaries to subsequently encroach on the agricultural lands. Modern technologies have also participated in a shift of focus from the multitude of traditional crops to a smaller number of
designer crops with high market values. Monoculture practices have replaced more subsistence based agriculture.

*Question 6: Causes of Land-Use Change*

The causes of agricultural land-use change are quite evident when we consider the changes spoken of in question 6. Participants agreed that generational differences have played a large role in agricultural changes. The younger generations have distanced themselves from traditional agriculture by abandoning family land or by developing it into homes and businesses. In many cases, the natural growth of a family leads to the eventual division of land amongst the children, slowly decreasing the amount of land available for agriculture. Those of younger generations who do continue farming seek to earn more money by growing cash crops and employing modern technology. This form of agriculture is focused on maintaining consistent quantity from the harvest every year. Rotation practices which allow fields to rest and recuperate have been largely ignored, to make way for faster and more frequent production.

*Question 7: Environmental Consequences of Change*

Local perceptions of land-use change are quite extensive, but up to this point in the questionnaire, few residents mentioned environmental consequences. In order to gain a clearer perspective of the environmental effects of land-use change in the area I asked participants to describe the positive and negative effects they had noticed resulting from land-use changes. Many participants again focused on the decline of the soils. Over-use of soils and chemical fertilizers have depleted the nutrients. Although many of the photo
pairs showed tree growth in the area, most of the participants spoke of excessive deforestation leading to less oxygen, more dust, and more wind. Trees are quickly felled to produce firewood and construction materials. It is interesting to note that eucalyptus trees use a tremendous amount of water from the soil, so even the ones left standing have detrimental effects on agricultural land. Along with these particular concerns many participants spoke of changes in the climate as well as the widespread contamination of the land and its natural resources.

The owner of the hostel where I stayed spoke specifically of the two rivers that run through the town of Otavalo. Much of the rivers have been covered up by concrete and are filled with trash and waste. Many people, he said, don’t even realize the rivers exist.

Question 8 and 9: Tourism and the Artisan Industry

The final two questions of the questionnaire are related to tourism so I decided to combine them for analysis. One of my interests in studying land-use change in the Imbabura Valley was to investigate the possible effects that tourism growth may have had on land use. This valley is well known for its textiles. The weekend artisan market in Otavalo is visited by thousands of tourists each year. I asked participants to explain briefly the artisan industry and to tell me whether or not they had friends or family involved in producing or selling crafts. All of the participants agreed that the industry was a large part of the local economy and that every one of them had a friend or family member involved in the industry. I also asked the participants about tourism in general and whether or not it has had an effect on the way people use the land in the
Imbabura valley. Many see tourism as a positive thing because of the economic benefits. However, many also consider tourism as a force behind land-use change. Hostels, hotels, and resorts have sprung up all over the area displacing agricultural land and natural resources. Like most construction projects, many hospitality businesses neglect building regulations and sustainable practices. Tourism has played a part in driving the trend of shifting occupations from farming and land tenure to selling crafts, food, and services. Three of the participants that I interviewed were well-traveled vendors who had spent years abroad selling crafts and textiles. All three had grown up on farms and worked the land in their youth. Upon realizing the money available in the artisan industry they transitioned away from agriculture to the tourism sector. These three men were interesting because each of them had inherited family land and had held onto it for the past 15 or 20 years. They have all recently given up the international trade business and plan to begin farming again. Each of them have purchased a stand in the newly constructed food market in Otavalo.

Archival Research

The repeat photographs and ethnographic interviews provided me with a wealth of data that was enhanced by information that I retrieved from the archives and older books published in Ecuador. Throughout this study I have maintained that the gap between the 1950s photographs and my own photographic reproductions is quite large. Many different cycles of change may have occurred in the last 65 years which makes archival data important in bolstering the narrative of the Imbabura Valley. The University of Otavalo in
conjunction with the Anthropological Institute of Otavalo contained the best selection of archived books regarding the history of land use in the Imbabura valley. I was able to acquire three books and two academic journals that focused specifically on the the Imbabura valley. The books provided me with a valuable perspective on the history and development of the region, and the academic journals contained a selection of peer-reviewed articles dealing with land-use traditions and the textile industry. With the interview data in hand, I reviewed the materials from the archives and looked for indications of land use practices and land-use change. With this information I was then able to better organize the responses of the participants in the timeline between the 1950s and the present. I was also able to look for changes in land use that may have occurred in the past but have since been obscured by new changes. The addition of archival data helps to inform past and current trends in land-use change and the possible solutions to negative changes.

Conclusion

Repeat photography, ethnographic interviews, and archival research, formed the methodological basis for my research, and I used a number of techniques to simultaneously analyze these data. It was important to me that the interview participants took part in analyzing the photo pairs so that I could incorporate their perspectives with my own analysis. The photo pairs were an important tool for visualizing changes in land use that have occurred over the last 65 years. By placing the photo pairs side by side I was able to assess changes in the way local residents use the land. I enhanced this form of analysis by
taking a panoramic photograph from the photo site and stitching the historical photograph into the present scene. By doing this I was able to expand the viewshed of the photograph so that I could see the physical landscape that exists outside the frame of the historical photograph.

With this visual data in hand I was then able to analyze the responses from the ethnographic interviews and uncover some of the underlying changes in land use that were not clearly visible in the photo pairs. I did this by comparing the responses from each individual interview question to pinpoint common themes and trends in land-use change. I wrapped up the data analysis with archival data that I gathered from past publications in Otavalo. There are some very noteworthy academics residing in Otavalo who have published monographs, research articles, and narratives which highlight the geography and history of Otavalo. This information was extremely useful in connecting the time periods of the photo-pairs and was a nice compliment to the rest of these data I collected.
CHAPTER V
DISCUSSION

After analyzing the photo pairs and interview data, I was able to pinpoint some of the land-use changes that have occurred over the last 65 years in the Imbabura valley. With these results in hand I tried to better understand the reasons for the changes and what may have caused them. One of the difficulties in uncovering the driving forces behind change was the 65-year gap between the photo pairs. Bass (2002) refers to this weakness in repeat photography as hidden time. Hidden time is the time between the original photograph and the newly composed photograph. It is considered hidden because the photographs cannot explain with complete certainty the changes that occurred during the gap because of a lack of visual evidence. A period of 5 or 10 years between photographs leaves less to the imagination than 65 years. It is possible that multiple changes have occurred, but the photographs depict only two specific points in time. For this reason, a time series of multiple photographs from the same location is the ideal data set for repeat photography. This is not to say that a pair of photographs cannot yield valuable results regarding land-use change, but when other sources of information are combined with them, interpretation becomes more certain. I was able to address the concern of hidden time by conducting ethnographic interviews as well as archival research. These data collected from the interviews and archives helped to fill in the narrative of the 65-year gap and explain some of the changes that are apparent in the photo-pairs.
The photo-pairs and interview data identified a number of changes that have occurred in land use in the Imbabura Valley, and these changes were further confirmed by archival data. It was apparent in the photographs that urbanization and urban expansion are two events that have effected great change in this region. Both have had an integral role in changing the landscape, and both urbanization and urban expansion have contributed to diminishing agricultural lands. Much of the urban growth can be attributed to rural-to-urban migration. The mass exodus of rural peasants to urban hubs has caused many urban regions to expand haphazardly. Changes in farming techniques and practices have created additional pressures on the land and soils, and these pressures have been magnified by changes in generational perspectives and priorities. Modernization has altered the traditional cultural-ecological symbiosis that local farmers have had with the land for centuries. Shifts in the economy and a very successful textile and artisanal market have encouraged many to abandon their land-based livelihoods for jobs in secondary and tertiary markets.

Urbanization and Expansion

In the patriotic historical narrative “Lugar Natal/Otavalo”, César Chicaiza describes a rapid urban expansion in all cardinal directions in the city of Otavalo (Chicaiza 2006, p 35). Chicaiza (2006) points out that this expansion created numerous peripheral communities and residential sectors on the outskirts of Otavalo. This has been a common trend throughout most of the towns and cities in the Imbabura Valley. If you zoom out from the valley you will see that Latin American cities as a whole are expanding at a rapid pace creating
Figure 53. Homes built precariously on the slopes of Loma Negra on the southeastern outskirts of Otavalo.
environmental, health, and demographic challenges (UN Habitat 2012). The built environment that emerges from urban expansion is often haphazard and takes a toll on agricultural land situated along the periphery. This is certainly the case in Otavalo and its sister cities. Each new block added to the urban areas slowly alters the previous landscape. In Otavalo and the towns along Laguna San Pablo, residential communities have extended up the slopes of Loma Negra, Imbabura, and Yambiro as well as into previously cultivated crop land (Figure 53).

These peripheral settlements are unlike the ubiquitous shanty towns of Rio de Janeiro in scale, but they are similar in that they consist of rapidly built structures of cinder block, wood, and tin. Many homes are built wherever the cheapest land can be found and with little planning or forethought. These buildings seem to be in a constant state of construction with re-bar jutting out of the roof and unfinished second or third stories (Figure 54). This form of concrete construction is quite different from the traditional *tapial* (packed earth) methods that were used in the 1950s and 60’s (Figure 55). In most of the rural regions of the Imbabura valley you see a mixture of *tapial* and cinder block construction indicating a gradual modernization of construction methods (Figure 55). The different methods used for construction can affect land use in a variety of ways. *Tapial* construction required only hard work and the natural resources available on one’s own land. Cinder block materials however, have to be purchased and then transported to a construction site. This requires money and roads that are suitable for large trucks. As the transportation infrastructure continues to develop
Figure 54. *Cinder block homes along the Pan American Highway.*
Figure 55. Tapial Construction. Photographs A and B show a *tapial* wall upon which was later added a cinder block extension. Photograph C is of Etzel Lopez explaining to Tyler Hair (field assistant) how packed dirt and straw were used to build *tapial* buildings.
in the Imbabura Valley, cinder block materials in construction become much more prevalent. Urbanization has played a major role in land-use change in the Imbabura valley but it is important to understand some of the underlying drivers for urbanization and expansion in this region. Rural-to-urban migration is one of those drivers.

**Rural-to-Urban Migration**

Rural-to-urban migration is generally used in the context of distance migration from rural areas to large cities such as Quito, Guayaquil, or Ibarra. For the purposes of this study I use rural-to-urban migration to indicate short distance relocations within the Imbabura Valley to the larger towns and cities. Many of the participants that I interviewed grew up in rural agricultural communities. Most of these communities are located within a 50 to 60-mile radius of Otavalo and the other larger towns. Due to various factors, rural farmers have moved in large numbers to the urban centers to find work and better wages. The impoverished origins of these migrants compels most of them to relocate to the more affordable periphery of the urban areas. Those who do not land in the periphery find nooks and crannies within the cities themselves. There are a number of effects that this migration has had on land use. For the urban peripheries, the increase in population often exceeds the capacity of a town, requiring the rapid construction of homes and shelters. This haphazard construction ends up displacing agricultural land as the urban area expands under demographic pressures. I found in many of the peripheral subdivisions of Otavalo that residents kept a small plot of land open for personal cultivation and artisanal animal husbandry.
For many rural migrants it is cheaper to harvest their own corn, beans, and vegetables for personal consumption. Surplus crops and small farm animals like pigs, chickens, and guinea pigs can then be sold for supplemental income.

The downside to this type of urban subsistence farming is the pressure placed on the land. The entrepreneurial rural migrants use every square inch of their little garden plots and cultivate throughout the year as much as possible. On the slopes of Loma Negra, Imbabura, and Yambiro, this intensive turning of the soil makes it susceptible to erosion and expends much needed nutrients. The necessity for food and income leaves little respite for the life-giving layer of topsoil. As families grow these small urban garden plots are eventually filled in with new homes and structures.

Farming Techniques and Generational Change

Shifting gears to the regions where rural migrants come from we can begin to understand some of the push and pull factors that cause them to migrate, as well as the changes in land use that are occurring in their home communities. Advancements in technology are a key factor in the changing agricultural landscapes of the Imbabura Valley. The use of tractors and other harvesting machinery have induced land-use change on various levels. The first change is a result of the restrictive access for tractors and machinery on the steep slopes at the higher elevations. Rural peasants have traditionally utilized multiple altitudinal zones for farming and were able to do so using manual techniques and the assistance of animals. However, the exodus of agricultural labor and the adoption of new farming technology has brought many people
down from the slopes and into the lower elevations. The upper slopes as a result have become overgrown after abandonment. The second factor that has played a part in agricultural land-use change is the shift towards high volume, cash crop style production. The introduction of tractors especially, has allowed farmers to plow and prepare a field much quicker than the traditional methods. In these cases, we see a similar effect on the soils to that of the urban subsistence plots. Farmers are able to cultivate crops in higher volume throughout the year and they give the land little time to rest. Mechanized tractors, which were unavailable to farmers when Collier and West visited the Imbabura Valley, are now commonplace. Their capability to penetrate much deeper into the subsurface layers under the topsoil than traditional tilling methods has undoubtedly led to a weakening of the soil and a greater susceptibility to erosion.

Many of the interview participants commented on the large quantities of chemical fertilizer that are used on crops in the Imbabura Valley. One participant reminisced during our interview of the tall stalks and the large ears of corn that the land used to produce. She claimed that the size and heartiness of crops in the Imbabura Valley has been greatly reduced by over-use of chemical fertilizers. Land-use change in these rural sectors are part of a chain of events and the use of chemical fertilizer is at the end of that chain. Advanced agricultural technologies and a shifting economy motivate farmers to squeeze a higher output from the land which in turn depletes the nutrients at a faster rate. The nutrient leached soils then need the assistance of chemical fertilizers to be productive. The use of chemicals in farming is for the most part ubiquitous
throughout the Imbabura Valley but there are some small scale farmers, mostly from the older generations, that are experimenting with methods that require little to no chemical fertilizers. Roberto Espinoza is one such farmer and I was able to spend a few days participating in his hybrid form of fertilizing.

Roberto admits that the soils are no longer as robust as they used to be and he accepts the fact that some chemicals are needed. Roberto has been experimenting recently with a highly diluted mixture of chemical fertilizers, animal waste, and water. His methods are labor intensive and directly target the roots of the crops rather than a widespread spraying of the entire plot of land. His process involves three steps and I was able to help with the 1st and 3rd steps. The first step was to dig a six- to eight-inch hole right next to each individual plant (in this case corn, and fava beans). As each hole was dug, Roberto would follow along and pour a measured portion of the fertilizer mixture into the hole. This was step two and its purpose was to get the fertilizer in direct contact with the roots. Step three was to simply cover each hole, trapping the nutrient rich mixture in the soil and allowing it to nourish the crops. This method is certainly labor intensive and in a quickly modernizing agricultural economy it may seem less then effective. It is, however, one of the more sustainable methods of agricultural land-use that I saw during my time in Ecuador.

Early farmers in the Imbabura Valley used dried animal waste for fertilizer, which they spread across their fields during the growing season. This was less effective for two reasons: First, the dried fertilizer dust easily blew away and second, much of the fertilizer would land on bare soils where they did not
Figure 56. Roberto Espinoza's maize field; fertilizing tools; quinoa ready for harvest; and his trusty companion Oso.
contribute to the growing crops. Along with his fertilizing methods Roberto has literally gone “against the grain” by choosing to orient his crop rows perpendicular to the slopes of Imbabura rather than parallel. Farmers have traditionally oriented rows parallel to the slope to allow rain water to flow down the rows. Roberto noticed that much of the topsoil was washing up at the bottom of the fields leaving the field itself bare. With perpendicular rows, Roberto feels that the water flows at a slower and much less abrasive manner across his fields, preserving to some degree the important top soils.

Roberto is part of an older generation that is holding on to traditional land-use practices while younger generations gradually pursue non-farm livelihoods. As families grow, adult children often seek employment in urban areas in an effort to diversify the family’s income. Various researchers have examined the shift from agricultural work to off-farm work (Fry 2008; Fry 2011; Rigg 2006). Fry (2011) explains that the process of deagriculturalization in rural communities causes households to split between farm and non-farm occupations. This is certainly the case in the Imbabura valley. The Lopez family is a good example of the changing trends in generational priorities and the effects they have had on land use. Etzel and his brother Jose have inherited equal portions of their father’s property in Cocha Loma, just up the hill from San Pablo, yet neither son has continued to farm full time. Etzel (Figure 60A) works as a supervisor at a flower farm in Cayambe and has moved his family down the mountain into San Pablo. Etzel’s brother Jose however, has taken his portion of the inheritance and now lives next door to his childhood home with his own family. One of Jose’s
uvilla (grape) fields can be seen in Figure 60B. Jose spends most of the week operating heavy machinery for the city of Ibarra and spends his weekends farming. The parents of the Lopez brothers are still alive today and when they pass, Etzel will take control of his half of the inherited land.

Inheritance Laws

Generational changes in land-use practices are affecting family properties all over the Imbabura Valley. Peri-urban development has been met with a number of obstacles, particularly zoning and subdivision laws related to inherited land. As better roads and telecommunication infrastructure reaches the rural regions of the valley, the residents of these areas begin to feel the restrictions of city and county ordinances. Although peri-urban development is often unorganized and does not always obey local laws, there are ordinances in place that are meant to provide some sense of order and structure to local development.

In the case of the Lopez’s and other families looking to divide their land between heirs, these ordinances place restrictions on the way they can use the land. Articles 96 and 97 of the Ordenanzas Cantonales (county ordinances) specify that homes built on subdivided land must be perpendicular to roads and have a space of no less than 600 meters between the road and the house. Furthermore, Article 98a outlines the requirements for subdividing inherited land. This article states that upon subdivision a property exceeding 2,500 square meters (just under 1 acre), must set aside 15% as a green area. (Appendix B) The term green area is not specified in the ordinances but it essentially speaks
Figure 57. Life on the farm. From left to right: Señor Chuta carrying firewood from the fields and Etzel Lopez Sr. harvesting pumpkin seeds.
Figure 58. Farm tools and grapes. From left to right: Etzel Lopez Jr. standing next to an arado (plow) used by his father; and an uvilla (grape) field planted by Etzel's brother Jose.
for itself. Although land-based occupations are dwindling amongst the younger generation, income derived from land-based practices is far from extinct. Green areas provide limited options for creating income, which hobbles the land-use possibilities of Otavaleños inheriting land. This is an intriguing development in land-use change in the Imbabura Valley. Etzel Lopez, who stands to inherit a large piece of land when his parents die, is particularly concerned about losing 15% of his inherited land. The subdivision ordinances are indicators of the stresses placed on rural residents by the convergence of rural and urban development.

Eucalyptus Trees: Invasive or Not?

The process of deagriculturalization has many components and they have all been involved in the shift away from agricultural land-use in the Imbabura Valley. Much of the land is re-purposed for housing or businesses but a large portion of the land is simply abandoned. What happens with the abandoned land? By analyzing the photo pairs and through my conversations with local residents I was able to identify eucalyptus trees as one of the primary species that has taken the place of consumable crops on these lands. Eucalyptus trees are considered by most as an invasive species. They were originally imported to Ecuador in the 19th century by President Garcia Moreno to combat erosion. They have since populated many regions within Ecuador. Eucalyptus trees are a hardwood tree that is useful for construction and firewood, and some land owners in the Imbabura valley have dedicated portions of their land to the cultivation of the Eucalyptus. However, a common concern with this particular
tree is its excessive consumption of water. Researchers have studied extensively the water consumption of Eucalyptus and most agree that it can be detrimental to water availability for crops and human consumption (Albaugh et al. 2013). Drawing from forest transition theory, I was able to see many areas in the Imbabura Valley that have experienced a reforestation of eucalyptus resulting from land abandonment. It seems to occur most often in regions where agriculture may have been difficult to begin with, such as the steeper slopes of Imbabura, Loma Negra, and Yambiro, many of which showed signs of erosion in the photographs by Collier and West. As I walked through some of the smaller peripheral communities surrounding Otavalo and Laguna San Pablo I saw many small, dispersed stands of eucalyptus trees. Upon further investigation, many farmers told me that they maintain a small stand of eucalyptus for firewood and building materials. This may be an indication of a changing trend towards people viewing eucalyptus trees as less of an invasive species and more as an asset and a resource. Recent studies have been conducted in Brazil of genetically modified eucalyptus that reaches harvestable maturity at a much quicker rate than common varieties (Nature 2014). A species of eucalyptus with accelerated growth rates would have potential for tree farmers looking to increase their production of wood. As land-use practices continue to change in the Imbabura Valley, the potential for developing eucalyptus tree farms may be a valuable consideration for farmers.
Tourism and the Textile Industry

Although agriculture has the deepest roots in the Imbabura Valley, the textile industry has become a well known and profitable mainstay for many residents of this region. The textile industry grew out of the ancient skills of the indigenous population in manipulating the land and its resources to create useful tools and clothing. Their artistry did not go unnoticed, and in the 1950s, the national government began a campaign to draw more tourists to Ecuador, and particularly to Otavalo, to purchase crafts and textiles. The Otavalo market has since become world famous and is visited each year by thousands of tourists. The economic prosperity of the textile and craft industry in the Imbabura Valley has a magnetism that draws rural farmers and poorer residents to the cities in search of a better income. The textile industry has helped Otavalo and other towns to develop more quickly and spurned much of the industrialization that has modernized the region.

I initially theorized that tourism had a direct effect on land use in the Imbabura Valley. My theory grew out of an assumption that the revenues from tourism were enticing people from the rural sector to re-orient their occupations towards secondary and tertiary markets. Selling crafts and textiles, I posited, were taking the place of agricultural livelihoods and therefore creating changes in land use as farmers abandoned land or re-purposed it for producing artisanal goods. After analyzing these data and considering my time in Ecuador I realized that my theory was a bit ambitious. Tourism is not directly related to land-use change but rather is part of a larger mechanism driving the changes in land-use
practices and, by extension, landscape change. The last two questions of my interviews with local residents dealt with tourism and the perceived effects that it has had on the Imbabura valley (See Figure 54). It was clear from their responses that few participants directly participated in the tourism industry. Based on their responses, however, it was apparent that every participant not involved in the textile industry had, at the very least, a close, direct connection with someone who was involved in producing and selling artisanal goods.

The towns in the Imbabura Valley have retained a geographic organization that can be traced back to colonial times. Most of the smaller towns surrounding Otavalo are historically known for a specific craft and they continue to produce goods today. This is reminiscent of the colonial models of delegating the production of supplies to peripheral towns. The artisanal industry is dispersed throughout the valley and its connection to land-use change really comes down to the influence that the thriving industry has had on the region in terms of growth, development, and tourist attractions. It has brought prosperity and modernity to the region and has enticed many of the poorer, rural peasants to abandon land-based livelihoods for cash occupations. Consequently, the revenue generated from tourism adds fuel to the economic growth. Figure 61 describes the motivations of tourists to visit Otavalo and how those motivations changed between 2002 and 2010. The purchase of artisanal goods only increased by one percent but the important thing to consider is the fact that the artisan industry consistently motivated 40% of the tourist visits in the last 10-15 years.
Figure 59. Motivations for visiting Otavalo. Tourism data from the Otavalo Tourism Department. These pie charts describe the motivations for tourists visiting Otavalo and how they have changed between 2002 and 2010.
The natural beauty category saw the largest increase between 2002 and 2010 which adds further credibility to the influence of tourism and the artisan industry, since a large number of the sites with natural beauty contain shops and stands for selling artisanal goods.

Tourism and the sale of artisanal goods occurs throughout Ecuador but the Imbabura valley is unique in the quantity and extensiveness of the industries. The Otavaleños are well known for their textiles and crafts and have been inordinately successful. As the textile industry continues to modernize, human labor will most likely be replaced by mechanization. Regardless of this shift the stage for occupational transitions has been set. The service sector in the Imbabura Valley has shown remarkable growth and resilience, and residents of the rural periphery will continue to seek income opportunities beyond traditional subsistence and small-scale farming.

Summary

The methods of repeat photography and ethnographic interviews, coupled with archival research allowed me to better understand changes in land use in the Imbabura Valley from the perspectives of the local residents. Urban and peri-urban development and expansion have changed the way people use the land. Much of this can be attributed to the rapid influx of rural-to-urban migrants and the pressures of increased populations on the urban peripheries. Agricultural lands are supplanted by the construction of haphazard and often times poorly built dwellings as the capacity of urban areas is tested or surpassed. In the regions surrounding the larger cities like Otavalo, peri-urban growth is occurring
in many of the rural towns. Upgrades in agricultural technologies are facilitating shifts from subsistence farming to more focused cash crop cultivation. According to interview participants, these shifts are placing pressures on the land, causing deficiencies in crop growth and having deleterious effects on soil nutrients. In order to combat the deficits in soil nutrients, residents of the Imbabura Valley have adopted chemical fertilizers. Many residents are aware of the changes that are occurring in land use, and some have taken steps to create more sustainable practices. Roberto Espinoza is one such individual who is using hybrid methods of fertilization to cultivate his crops while also trying to protect the soils and environment.

As urban influences continue to creep into the lives and dwellings of the rural periphery, land-use change will continue to occur at a rapid pace. Inheritance laws created to maintain order in developing regions are also placing difficult restrictions on the ways people can use their inherited land. For many heirs these restrictions severely limit their ability to generate additional income through farming. As the younger generations consider alternatives to the much more difficult land-based livelihoods of their fathers, lands are left abandoned and unattended. In the countryside surrounding Otavalo, eucalyptus trees stand as witnesses to the changing physical and cultural landscapes.
CHAPTER VI

CONCLUSION

The human connection to land is deep. Throughout history, humans have altered landscapes and adapted to the physical environment in order to survive. Land-use change is a phenomenon that must continue to be studied if we are to understand the implications of our relationship with the land and the effects we have had on it. Landscapes are like a palimpsest with numerous layers and remnants of change. Residents of the Imbabura Valley have seen many changes over the last 65 years. The prosperity of the Otavaleños has been a catalyst for growth, development, modernization, and tourism. Magdalena Sniadecka-Kotarska described the indigenous artisans of the Imbabura valley as, “one of the few Latin American ethnic groups to have achieved a position of economic strength as a result of their own ingenuity and work ethic (Sniadecka-Kotarska 2006, p 88)”. Magdalena is referring to the successful textile and artisanal industry that has greatly altered the economic environment of this Andean valley. What was once a thriving agricultural region under the watchful eye of the volcano Taita Imbabura (Father Imbabura), has evolved into a destination for national and international tourists.

Using repeat photography, ethnographic interviews, and archival research, I was able to investigate changes in land use in the Imbabura Valley over the last 65 years. The original photographs taken by John Collier Jr. and Robert West depicted land-use conditions of the 1950s around Otavalo. I re-photographed the original sites to create photo pairs for detecting change over time. Between
my photographs and the original photographs there is a 65-year gap which is referred to by Bass (2002) as hidden time. The responses from the ethnographic interviews as well as archival data helped fill in this gap and develop a narrative of change. The combination of the three methodologies allowed me to better understand changes in land-use from the perspective of the local residents. The photo-pairs were a medium through which all participants could visualize change. Beyond those who participated in interviews, I was involved in many spontaneous road-side conversations where I was able to gather additional insight on the photo-pairs.

After analyzing the photo-pairs I was able to detect a number of changes in land use and those changes were confirmed by the responses of the interview participants. One of the primary changes that has occurred is the urbanization that has fueled a transformation of rural landscapes around Otavalo. Demographic transitions due to population growth and rural-to-urban migration have driven urban and peri-urban growth. Along the periphery of Otavalo the urban environment has expanded into agricultural lands in the form of homes and businesses. Corn fields and traditional highland houses have been replaced with cinder-block structures that creep up the valley slopes in a precarious fashion. Rural migrants increasingly move to urban areas to find work and are relegated to the periphery where land is more affordable. Unfortunately, these conditions are ripe for rapid and haphazard construction and can be detrimental to the land and environment. Many of the interview participants commented on the rapid growth of housing and buildings on land traditionally used for agriculture.
Despite the spread of the urban environment into the rural fringe, it is interesting that many of the homes along the urban periphery retain a portion of land for cultivating crops. In many cases, these plots are much more than traditional urban gardens in that they provide a much needed food source for poor urban residents, many of whom only recently arrived from the countryside. Here we see the temporary peri-urban or hybrid communities where rural and urban characteristics converge. The difficulty with these small farm plots is the tendency of farmers to over-work the land. With limited space at hand, urban subsistence farmers utilize every inch of available land for crops and afford the soils little time for regeneration. On top of cultivating the land for crops, many people use small side plots for housing animals like sheep, goats, pigs, and chickens.

In the regions surrounding Otavalo such as the small towns and communities on Loma Negra, Yambio, and along Laguna San Pablo, there are several additional changes that are occurring in land use. Many of these communities have seen a decrease in population due to out-migration while many have also experienced small-scale development. The influences of modernization and globalization are reaching into the Imbabura Valley. In terms of agricultural change, the adoption of tractors and other machinery has greatly changed the way that people use the land. Tractors have allowed farmers to clear and prepare land at a much faster rate and many have shifted their focus towards monoculture and cash crops. An interesting trend that I noticed in the photo-pairs, particularly along the base of Imbabura, was the correlation between
the decrease in agricultural elevation and the increase of urban elevation. As agricultural activity receded from the higher elevations, urban structures and the built environment seemed to reach farther up the slopes of Imbabura. This is in part due to the general movement of locals from the higher elevations down into the towns and communities where they can take advantage of telephone and internet availability, small grocery stores, schools, and other services. In most cases the land that is abandoned is the land that was difficult to farm in the first place such as areas along steeper slopes, areas with poor soils, and areas with limited access to water. These abandoned lands often see a quick regrowth of vegetation or Eucalyptus trees.

Eucalyptus trees are interesting in the Imbabura Valley because many consider them an invasive species while others allow them to grow for firewood and building materials. Forest transitions are certainly evident in the photo-pairs yet many interview participants voiced their concerns about the disappearance of trees. Small stands of Eucalyptus trees can be seen all over the valley in places where they weren’t found 65 years ago. Abandoned agricultural land is now home to Eucalyptus trees and other forms of vegetation. For land that has been abandoned on steeper slopes, Eucalyptus trees can be a useful deterrent to landslides and erosion. However, a negative characteristic of Eucalyptus trees is their penchant for using extraordinary amounts of water. Regardless of their value, it is clear that areas within the Imbabura Valley are transitioning towards forest cover again.
For the lands that continue to be farmed, there is concern about the amount of chemical fertilizers being used and their impact on local soils and the environment. Various residents explained to me that the land was yielding much less than in the past due to the lack of nutrients in the soil. The leaching of the soils from over-use and extreme chemical inputs is believed to be stunting the growth of crops like corn, potatoes, and beans. The time I spent with Roberto Espinoza in his small field showed me that some farmers are attempting to reverse this situation with more sustainable practices. It is difficult to know how well these labor intensive methods will hold up against the more production oriented cash crop and monoculture trends. As families grow and younger generations continue to pursue non-agricultural occupations, changes in land use will undoubtedly place pressure on traditional farming practices. Many families have become multi-occupational with some members working the land and others traveling to the cities to work in the secondary and tertiary sectors. As the older generations pass on and their children inherit family land they are faced with decisions about the ways they should use it. These decisions are made more difficult by city ordinances that limit the use of inherited land. As a result, agricultural land has slowly been replaced by homes, roads, and green spaces.

Globalization and modernization have indeed caused changes in land use in the Imbabura Valley. The old woman I met on Olmedo Street has probably witnessed many versions of the Imbabura Valley during her life. As I consider the changes that I witnessed through the photo-pairs and my discussions with
Figure 60. Coraza parade in San Rafael, Imbabura Valley.
A. Photograph by John Collier (1949)
B. Photograph by the author (2015)
local residents I am reminded of a parade that I attended in San Rafael. Each year the parade depicted in Collier’s 1949 photograph (Figure 62A) follows the Coraza (patron of the parade) along the same route through San Rafael. Despite significant changes in land-use throughout the Imbabura valley, traditions like these endure. Residents have experienced great success in agriculture and the artisanal industry. Like any developing region, the Imbabura Valley will continue to experience change and much of the evidence will be visible in the landscape. Hopefully the changes will be managed in a way that protects and preserves the history, culture, and physical environment of this beautiful little valley in the Andes Mountains.
### APPENDIX A

#### GEOGRAPHIC COORDINATES AND CAMERA SETTINGS OF THE PHOTOGRAPHS

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APPENDIX B
COUNTY ORDINANCES IN OTAVALO

Art. 94.- Por su ubicación.- Toda intervención territorial, se sujetará a las disposiciones técnicas emitidas en el Informe de Regulación Urbano-Cantonal, el mismo que estará conforme a la calificación del suelo como urbano, urbanizable o no urbanizable.

Art. 95.- Afectaciones.- De acuerdo a los requerimientos del desarrollo físico territorial, de manera progresiva y permanente, las Direcciones de Planificación, Obras Públicas y Alcantarillado determinarán la necesidad de apertura de vías u otro tipo de afectación, ante lo cual a petición del interesado será ratificado o negado por la Cámara Edilicia.

Art. 96.- Proporción.- Todo terreno a ser: subdividido, lotizado o urbanizado tendrá una proporción máxima de 1 a 4 (frente – fondo), y estar orientado perpendicularmente hacia una vía pública, salvo excepciones de carácter técnico.

Art. 97.- Tolerancia.- En subdivisiones, lotizaciones y urbanizaciones se aceptarán áreas y frente de hasta un 10% menos al establecido en la zonificación, pero en ningún caso con frente menor a 6.00 m.

Art. 98.- Del Área Verde.-

a).- Se dejará el 15% para área verde y/o equipamiento comunitario, todo terreno a subdividir, lotizar, urbanizar o ejecutar un conjunto habitacional que sobrepase de cuatro lotes y que el área total del terreno sobrepase los 2.500 m².

b).- Si la lotización, urbanización o conjunto habitacional pasa de las 60 unidades habitacionales, se deberá el 20% del área total, para atender la mayor demanda del resto de equipamiento requerido.
NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Event Report Form".
- If approved, the maximum period of approval is limited to twelve months.
- Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 150324102
PROJECT TITLE: Crops or Crafts: Agricultural Land Use Change in Otavalo, Ecuador
PROJECT TYPE: New Project
RESEARCHER(S): Chris Hair
COLLEGE/DIVISION: College of Science and Technology
DEPARTMENT: Geography
FUNDING AGENCY/SPONSOR: Arthell Kelley Grant
IRB COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 04/02/2015 to 04/01/2016

Lawrence A. Hosman, Ph.D.
Institutional Review Board
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69(1): 115-139.


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