

Subjectivity of Land Cover Change Trajectories in Peri-urban Quito, Ecuador: Community characteristics, migration and participation in land use planning

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Abstract

The individual land managers who fuel transitions of land cover and use from rural to urban are motivated by many factors. A comparison of three communities along an urban gradient in the peri-urban interface of Quito, Ecuador highlights some of those important variables and how they have influenced migration patterns and, consequently, rates of land use and cover changes in each community. Household surveys were conducted in each of the three communities from June to August 2007, highlighting length of stay in the community, income and livelihoods, and land tenure including ownership and uses. Informal interviews with community leaders highlighted community demographics, land use and urbanization histories, and degree of participation in land use planning within the community and with other institutions at local, regional and national levels. Results emphasized the importance of internal rural to urban migration and settling patterns as determinants for peri-urban land use change and the rate of urbanization. The analysis argues that differences among rates of change are due not only to administrative management capabilities, but also to the diverse, household land use decision-makers occupying peri-urban lands. The differences observed are attributed to the land use decisions they make according to their specific goals and available resources (economic and other). When relocating, households weigh biophysical attributes (e.g., altitude, climate and topography) and economic aspects (e.g., transportation corridors, markets for goods and employment, land prices and income) against personal values (e.g., tranquility, traditional livelihoods and access to urban amenities) and household capabilities (e.g., income potential, professional training) that allow them to take advantage of specific community characteristics. It is important that peri-urban growth management take into consideration these motivations in designing planning policies and programs. Specifically, a regional, rural-urban linkages approach that focuses on flows of goods, natural resources and people across the peri-urban interface could be helpful in slowing uncontrolled growth that has threatened the Quito's natural resources.

Introduction

Implicit in effective natural resource management is an ability to plan for changes in land use and land cover. In an urban context, such management is even more challenging because of multiple users (individuals and groups) in more crowded spaces. Diverse stakeholders represent multiple motivations for observed changes in land cover that not only occur simultaneously, but often in response to one other. As population density increases and urban areas expand, such land use changes can lead to competition and conflict among different land users (i.e., urban and agricultural), which threaten the integrity and services provided by surrounding ecosystems (i.e., clean drinking water from watersheds).

As globalization fuels the concentrations of people, services and markets in growing cities worldwide, each city's growth remains unique as it is given shape by local processes and interfaces between the global and the local (Adell 1999). It is for these reasons that the peri-urban interface provides an ideal and dynamic context to observe land conversions that reflect a city's growth spatially, economically, socially and environmentally. It is a geographical space that bridges the urban and rural and links markets, cultures and environments with compositions of people and landscapes that remain dynamic, metamorphosing as those same economies, populations and environments evolve (Adell 1999, Allen 2003, Douglas 2006).

The peri-urban interface has only recently emerged in the literature as a research focus independent from urban and rural studies (Adell 1999, Allen 2003, Allen et al 1999, Budds and Minaya 1999, Mattingly 1999). For the most part, drivers of land cover change in peri-urban areas associated with urbanization have been discussed in general terms on large regional scales (Lambin et al 2003, Simon et al 2006, Drakakis-Smith 1995, Huston 2005, Pickett et al 2001). These dialogues are based on local and regional case studies that often highlight social, economic and planning policies, which shape the opportunity-costs of development to which individuals, groups and industries respond when making land use decisions.

More recently, research regarding urbanization-induced land cover changes began using situation- and location-specific approaches to analyze land cover changes in peri-urban areas as shaped not only by local and regional economics, land use regulations, and individual land users, but also by topography, ecology and overall suitability of land for urbanization (Briggs 1991, Lee 1979, Overmars 2005). This research uses the city as a case study to provide a perspective of land cover changes associated with urbanization that are more scale-appropriate for land management and conservation efforts.

However, we still have no clear concept of the relative importance of the drivers of land cover change in distinct regions of urban peripheries of many cities throughout the world. This is because each driver's relative importance shifts from one area of the city to the next and from city to city as social attributes, demography, economies of scale, topographies and site qualities change across cities and regions (Lambin et al 2003). Even when we do understand some of these dynamics, translating these into effective policies remains a major challenge to successfully managing uncontrolled urban growth and land cover transitions.

The inability to generalize the distinct peri-urban areas around any one city in spatial, economic and social terms has contributed to the great difficulty in attempts to manage the growing peri-urban interface. Quito, Ecuador is one city that has faced such a challenge. Located in Ecuador's sierra region, it is the nation's second-largest city and is currently experiencing development pressures that are hastening land cover and land use changes at its fringes. From 1950 to 1990, the city grew six-fold in population and twenty-fold in area, systematically incorporating minor urban areas on the periphery and extending into neighboring *cantones* (counties) (Pitkin 1997, Riaño 2001). At 2800 to 3200 meters above sea level (m a.s.l.), the region is home to just over 2 million people and the city itself measures 40 to 50 km long and 5 to 10 km wide taking the shape of the trough-shaped inter-Andean valley in which it lies (Carrión 2005, Riaño 2001). Its growth has consumed fertile agricultural lands and natural areas, prompting the agricultural frontier to expand outward into protected *páramo* (high altitude Andean grassland) and native forests. The result has been an increasing strain on rapidly declining natural resources (De Bievre et al. 2007a,b; Recalde pers. comm. August 2007). As of 2006, 62 percent of areas in this region originally covered with native vegetation had been altered or replaced (De Bievre and Coello 2007b).¹ Unsuccessful attempts to regulate urban regional growth and land cover transitions have included urban growth boundaries and decentralization of management powers to the distinct *cantones* (counties) in the region (Ramírez pers. comm. July 2007, Bermúdez pers. comm. July 2007).

While land cover changes in Quito's peri-urban interface have generally followed trajectories of land transitions from natural to agricultural to urban, in specific peri-urban communities the rates of these transitions and efforts to slow them have differed greatly. Municipalities have attempted to better manage urban and regional growth by using participatory planning. They generate land use planning objectives, including specific land use and cover targets while working with communities that often articulate their development visions in terms of improvements in infrastructure, health, education and the economy. In addition to the influence of administrative management capabilities, differences in rates of land use and cover change are influenced greatly by the diverse, household land use decision-makers in these peri-urban communities. To understand the differences in peri-urban land transitions, one should understand the decisions of these local-scale actors as well as decisions of land managers and the policy, economic and social contexts in which they operate.

Research Goal

Given the above context, my goal is to better understand the dynamics² and differences of land cover and land use transitions in Quito's peri-urban areas. My research is based upon the assumption that changes in land use and cover in these areas are expressions of the diverse strategies of citizens reacting to regional and national policies, economics, and society, as well as the biophysical site characteristics of their respective communities. I hypothesize that their land

¹ Characterization of land use in the upper Guayllabamba River watershed, in which Quito lies, as of 1980 includes: 36.9% agriculture, 13.4% livestock pastures, 7.7% natural and cultivated forests, 3.13% urban areas, 7% natural vegetation, 25% páramo, 6.87% eroded areas and bodies of water (De Bievre and Coello 2007b).

² 'Dynamics' refers to the drivers and inhibitors of land transition, the interaction of individuals, institutions and government with topography, economy, etc. whose physical expression is the pattern and rate of land transition observed.

use decision-making is a reflection of their personal- and community-development goals in the context of the histories that brought them to Quito's peri-urban interface.³ To answer this question, I investigated household characteristics in three different communities along an urban gradient at this interface, including their relationships to local land uses and transitions.

Site Description & History

Traditionally, the Ecuadorian economy has been export-oriented, focusing on cacao in the early 20th century, bananas in the middle of that century and then oil in the late 1970s. With jobs generated in urban centers around these export economies, massive migration to Quito began largely in the latter half of the 20th century. Making this migration more attractive to those wishing to own land was the Agrarian Reform Law of 1964, which divided up the extensive network of *haciendas* (large land holdings in colonial times) into small lots and distributed them to poor landless farmers. Many of these lots were converted to urban uses due to: (1) the difficulty in practicing productive agriculture on small plots; (2) the pressures of urbanization; and (3) the emerging private land market, which helped to increase land values. These trends, combined with land speculation and rapid urban spatial growth, led to the illegal division of parcels for urban development, invasion by the urban poor seeking housing, or conversion to residential areas by higher socio-economic classes (Murray 1997). Once the residential construction phase was completed in these communities, commercial spaces were slowly incorporated. They would then become a matrix of multi-functional land uses: Residential, business-operation, food-production and social (Riaño 2001). As the original farmers sold their lots, many formed additional communities in peripheral areas further from the city center, helping to continue the cycle of urban expansion. Today, Quito's peripheral areas remain multi-functional in their land uses with varying percentages of agricultural, urban, forested, and cleared land depending on their extent of development.

³ This study focuses on peri-urban land cover and land use change that results from household migration and land use decisions. Other important actors include large scale agriculture—especially flower plantations geared toward export markets—and industrial land uses that compete for land with the residential and agricultural uses, and which have greater impacts in other areas of Quito's periphery.

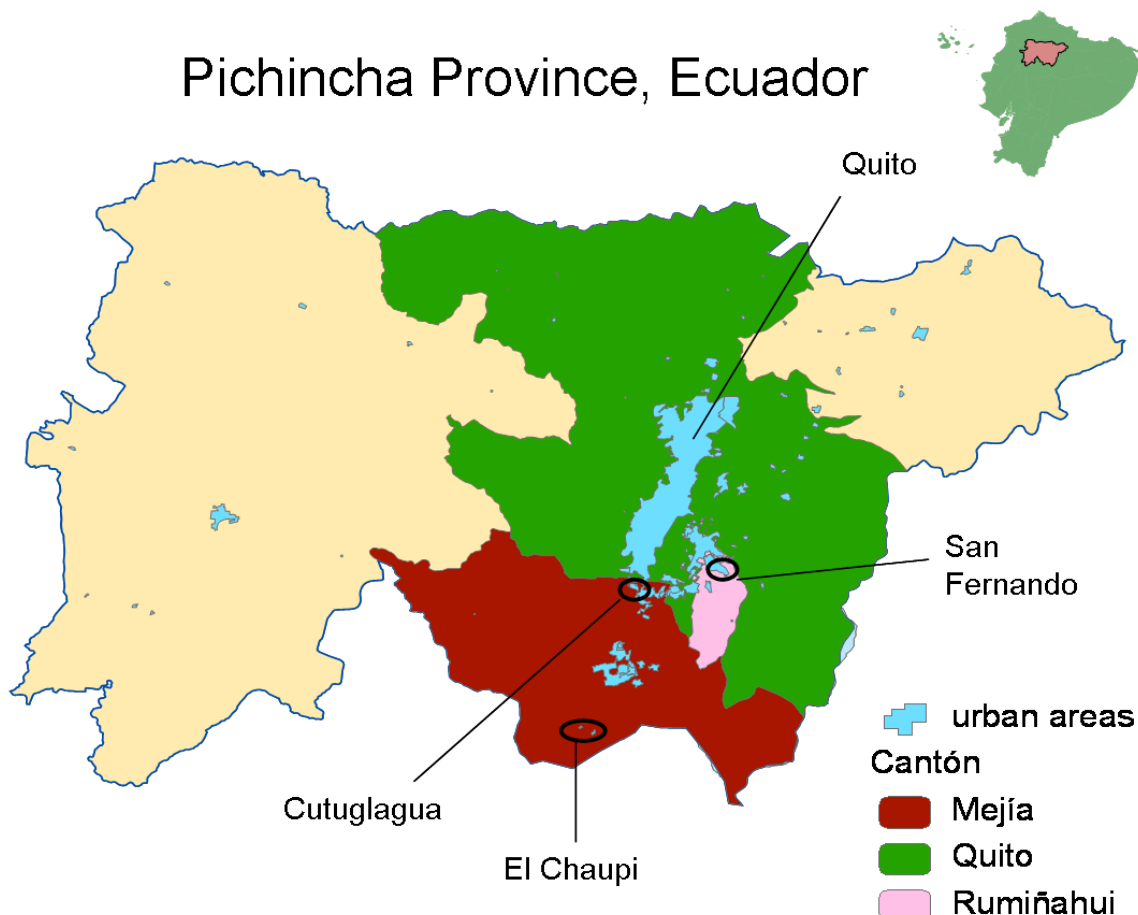


Figure 1: The Quito region lies in the Pichincha Province of Ecuador. It is located in the Andes Mountains. Urban expansion of the city has begun to extend into neighboring *cantones* (counties) of Mejía and Rumiñahui to the south and southeast. Specific study sites—Cutuglagua, El Chaupi and San Fernando—were chosen to represent a gradient of urban development.

I concentrated on land use histories and community characteristics in three peri-urban communities in two *cantones*—Mejía and Rumiñahui—to the south and southeast of Quito (Figure 1). These communities represent three points along an urban-rural continuum. El Chaupi (3352 m a.s.l.) in Cantón Mejía, is the farthest from Quito; it has the slowest rate of population growth and expansion of urban infrastructure. This region is the most rural of the study sites with an economy and population that depend on agriculture and cattle ranching. El Chaupi has experienced little population expansion; its current population of 1,322 inhabitants has fluctuated but never exceeded 2600 over the past 50 years (Plan Participativo de El Chaupi, 2002-2012). Cutuglagua (3022 m a.s.l.), a fast-growing parish closest to Quito, is merging with the city both economically and in transportation infrastructure even though it lies within Cantón Mejía. The earliest formal community in Cutuglagua was formed in 1980 and the most recent in the early 1990s. In 2006, it was formally declared an “urban” parish, distinguishing it from the rural parishes to its south in Cantón Mejía and awarding it a special planning focus in Cantón Mejía’s Strategic Plan of Development, which focuses primarily on the municipality’s urban areas (Toalombo, pers. comm. June 2007, Cajiao pers. comm. August 2007). San Fernando (2721 m a.s.l.), in Cantón Rumiñahui, is experiencing moderate growth, influenced by its milder climate

and lower population density, which attracts a mix of rural migrants and those wishing to leave Quito. For my unit of analysis, I focused on either a single water user group (El Chaupi and Cutuglagua) or a community association (San Fernando) within each community. Using this unit of analysis, there was an average of five persons per household in each community. In El Chaupi household size ranged from one to 12, in San Fernando from two to 10 and in Cutuglagua from one to six. In all households, members were either nuclear or extended family.

Methods

Suitable peri-urban regions were first selected by an informal remote sensing analysis that highlighted land cover transitions from rural to urban in the Quito region from 1987 to 2001. Regions chosen reflected a gradient of rates of land cover transition. From within these regions, communities were selected to represent a gradient of urban development. This selection would provide insights into the integration and participation of these communities in the urban growth management process across their urban-rural gradient. Communities studied were also selected based upon generating contacts with community leaders through site visits or a regional water fund NGO, the Fund for the Protection of Water (FONAG). It was important that all three communities be located in two critical sub-watersheds to the south and southeast of Quito, which are important water sources for potable, agricultural and industrial uses. This consideration insures that data and conclusions can be used by FONAG for future research, education and capacity-building programs in these areas.

Interviews with community leaders were informal and designed to highlight community demographics, land use and urbanization histories, as well as degree of participation and collaboration in land use planning within the community and with other institutions at local, regional and national levels. Community surveys administered on a household level concentrated on length of stay in the community, income and livelihoods, and land tenure including ownership and uses. All surveys were conducted on Saturdays and Sundays in July and early August of 2007. No maps of household locations were available to support random selection surveying. At first, surveys were conducted by going house to house within the most populated neighborhoods in each community. Towards the end of the survey period, surveys were administered by visiting the homes of the water user group or neighborhood association presidents during days when community members would arrive to pay utility bills. During these events, all residents who arrived to pay utility bills were surveyed.

Results

El Chaupi

In El Chaupi (3352 m a.s.l.), in Cantón Mejía, 48 households were interviewed, comprising 17% of the neighborhoods in one water-user group. It is the most rural of the three communities studied, and 58% of its current residents were born here (Table 1). Those that have moved to this region cite reasons for doing so such as opportunities for work in the agriculture and ranching land use economies that support this region, as well as the prospect of owning their own land and having married someone from the community. Examining El Chaupi's land-owning history, 65% of today's land-owning population first occupied their land within the last 20 years. An

additional 17.5% have owned their land for the past 31 to 40 years (Figure 2). At the center of the community sits the parish government, from which cobbled streets lead to the properties and houses of community members. Fifty-two percent of residents interviewed own and manage less than a hectare of land; however, 24% own 1-2 ha and 15% own 3-10 ha (Table 1). The largest parcel of any landowner included in the survey was 24 hectares. Sixty percent of these households purchased their land, while 38% of households inherited their parcels. Only 2% of households surveyed rent their land and homes. Compared to San Fernando and Cutuglagua, more respondents in El Chaupi indicated that they received some sort of government assistance to construct and maintain their homes (almost all from the Ministry of Urban Development and Housing) (El Chaupi, 22%, Cutuglagua 6%, San Fernando 5%).

Table 1: Selected community characteristics of El Chaupi, San Fernando and Cutuglagua located in peripheral areas of Quito, Ecuador. Characteristics were evaluated through household surveys in each community.

Community	Interviewed	Residence	Reason for locating here	Livelihoods	Income	Income Variable?	Occupation Variable?	Lot size	Relatives Abroad	Receive Remittances
El Chaupi	48 households (17%)	42% born there, 58% migrants	work land marriage	ranching agriculture teachers retirees domestic	< \$100 /mo. (19%) \$100-300 /mo. (35%) \$300-500 /mo. (30%) > \$500 /mo. (16%)	Yes (81%)	No (79%)	<1 ha (52%) 1-2 ha (24%) 3-10 ha (15%)	Yes (46%)	No (93%)
San Fernando	56 households (35%)	63% born there, 37% migrants	land marriage tranquility/health	construction domestic business professors retirees engineers	< \$100 /mo. (2%) \$100-300 /mo. (49%) \$300-500 /mo. (26%) > \$500 /mo. (20%)	Yes (75%)	No (95%)	250-500 m ² (24%) 501-1000 m ² (33%)	Yes (47%)	No (93%)
Cutuglagua	78 households (13%)	12% born there, 88% migrants	land "country life" work marriage education economics	construction domestic skilled work	< \$100 /mo. (22%) \$100-300 /mo. (50%) \$300-500 /mo. (17%) > \$500 /mo. (11%)	Yes (74%)	No (64%)	250-500 m ² (58%) 501-1000 m ² (22%)	Yes (51%)	No (87%)

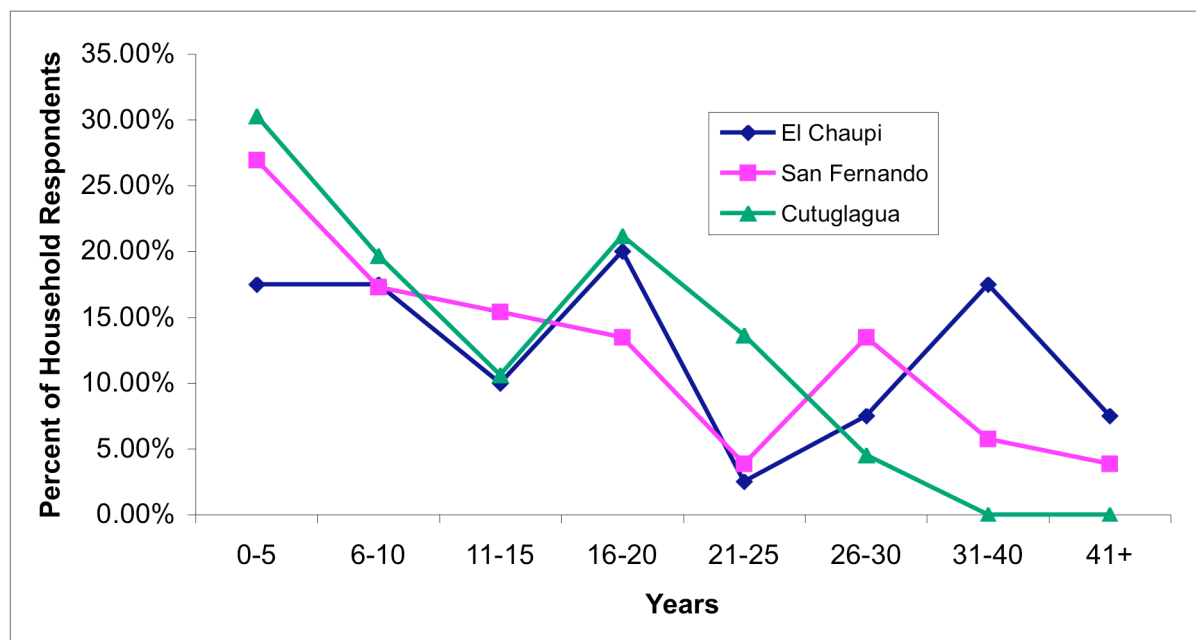


Figure 2: Time since current landowners first occupied their land in each of the three communities studied.

San Fernando

In contrast to rural El Chaupi, San Fernando (2721 m a.s.l.), in Cantón Rumiñahui, is expanding at a moderate pace. Located just to the south of urbanizing Sangolquí and El Valle de los Chillos, San Fernando remains physically separated from rapid growth in this region. This separation affords its residents the benefits of more disperse housing and larger lot sizes compared to more urban areas, yet still offers them convenient access to urban amenities, including robust commercial economies and educational institutions. Fifty-six households were interviewed here, representing 35% of one contiguous neighborhood. As with El Chaupi, the majority of current household heads were born in this region (Table 1). Though, for those who have moved to this region, reasons for doing so have included not only marrying into the community and a desire to own land, but also health reasons and the attraction of tranquility and a more rural lifestyle. The most cited occupations were construction, domestic work, small business, professorship, retirement and professional engineering, in that order. As in El Chaupi, most current residents first occupied their land within the last 20 years (Figure 2). Thirteen and one-half percent of current households first occupied their land 26 to 30 years ago. Unlike El Chaupi, the majority of landowners in San Fernando only own 251 to 1000 m² with a handful of interviewed households owning more than 2000 m² of land at the periphery of the community (Table 1). Side-yards and backyards are put to good use in San Fernando, which 32% percent of interviewed households use to generate extra income; they sell small quantities of food crops and spices that they cultivate, and animal products including cow's milk. There are also a number of retired residents that rely on retirement benefits to support themselves. Of the households interviewed, 56% indicated that they inherited their lands, while 37% purchased their parcels and 7% rent. Today, current land prices in this neighborhood range from US\$12,000 to 15,000 for a 1000m² lot.

Cutuglagua

Finally, Cutuglagua (3022 m a.s.l.) at the northern-most edge of Cantón Mejía, is the fastest growing sector and the closest to Quito, merging both infrastructure and economies over the past 30 years. Seventy-eight households were interviewed, representing 13% of one water user group within the community. Unlike either El Chaupi or San Fernando, 88% of residents surveyed in Cutuglagua have migrated from other areas, mostly from other rural and urban areas in the highland region of Ecuador with a few coming from Quito (n=4) (Table 1). For those moving to this community, they cited reasons such as owning land, the attraction of ‘country life’, employment opportunities, marrying into the community, education for their children and a more economically-feasible lifestyle. As in San Fernando, the most cited occupations included construction, domestic work and other skilled work in both Quito and Machachi (a nearby, small urban area to the south). Current residents first occupied their land within the last 25 years, with few before then (Figure 2). Average lot size among households interviewed in Cutuglagua is smaller than in El Chaupi or San Fernando. Fifty-eight percent of households own lots from 251 to 500m², with 22% owning lots of 501 to 1000 m² (Table 1); the largest landholding mentioned is six hectares. Reflecting the recent parcelization and urbanization of this area, 70% of interviewed households purchased their land, while 15% inherited their land with an additional 15% renting. Current land prices in this community are dictated by proximity of the parcel to the PanAmerican Highway that passes to the south and east. Closer to this transportation corridor, 1000 m² parcels sell for US\$5,000 to 7,000, while similarly-sized lots further away and higher up on the hillsides sell for between US\$3,000 and 5,000. Unlike flat El Chaupi and San Fernando, the undulating topography of the neighborhoods in Cutuglagua allows only trucks, jeeps and other SUVs to traverse the cobbled streets, requiring most residents to walk and for housing construction techniques to be creative. As in San Fernando, side-yards and backyards here are used to generate additional income.

Across the Urban Gradient

In the conversion process from more rural to residential and urban uses⁴, current residents in all three communities indicate that they would purchase lots and then wait a few years before building their homes and relocating to the area. This trend most likely reflects the needs of new landowners to save sufficient funds to afford the construction of their homes; they often build their own homes, working with family and friends, only purchasing materials or occasionally hiring skilled labor from the community for small wages. The amount of time between land purchase and house construction is less in Cutuglagua and San Fernando than in El Chaupi, which does not necessarily reflect their relative incomes or purchasing power. A greater percentage of interviewed households in Cutuglagua have monthly incomes less than US\$300 when compared to either San Fernando or El Chaupi (Table 1). Even though the distribution of monthly household incomes in all three communities differed, respondents overwhelmingly indicated that their incomes vary greatly from month to month (Table 1). Interviewed households in all three communities indicated that their employment category does not change that frequently (Table 1). Therefore, for households with wage laborers, income fluctuations most likely reflect changing quantities of work hours. For households with primary incomes from

⁴ As pointed out earlier, this process is more evident in communities in Cutuglagua and San Fernando than in El Chaupi.

farming or livestock, fluctuations can indicate changing agricultural markets and yields. For both types of households, seasonal work could also contribute to fluctuations in income, though this was not specifically targeted by any survey question.

As mentioned in San Fernando and Cutuglagua, households often supplement their principal incomes by selling agricultural and animal products. Other supplemental forms of income mentioned in these communities include retirement benefits, a small business, financial and household support from children and occasional domestic services such as sewing. The Ecuadorian economic crisis in the late 1990s led to severe devaluation of the sucre (the national currency), eventual dollarization of the economy in 2000 and the exodus of hundreds of thousands of Ecuadorians principally to Spain, Italy, the United States and other Latin American countries. These emigrants sought (and continue to seek) work and more promising economic opportunities. In light of Ecuador's recent economic history, many of the interviewed households in these three communities have relatives living abroad (Table 1). On a national scale, remittances from these relatives play a significant role in strengthening the Ecuadorian economy and purchasing power of poorer Ecuadorians. However, not many of the interviewed households in these three communities indicated that they receive remittances from their relatives living abroad (Table 1). When they do have extra available income, many households invest in family health, education and home improvements, in that order.

Discussion

Internal migration still constitutes the core of population growth and thus dictates the patterns of urbanization and associated land use and cover changes in Quito's immediate periphery (Carrión et al 2003). In all three communities, it was evident that households seek opportunities for improved livelihoods, defined by opportunities for employment, owning land and for those leaving more densely settled areas, the "country life". These responses were applicable to all households surveyed, whether they had migrated to their communities or not. The migration decision-making process is one that both households that do and do not migrate often make. This study reveals that choice of community (which may or may not lead to migration) is often influenced by the physical characteristics and the economic and social opportunity-costs of the communities themselves. Such variables include personal preferences such as tranquility, traditional livelihoods and access to desired amenities (i.e., education); biophysical attributes such as altitude, climate and topography, which can influence economic aspects such as land prices; and connectivity attributes such as transportation corridors, opportunities for employment and access to markets, which are aspects of urban integration. The timeline of migration according to these preferences and developing community characteristics can shape land cover and land use in a community as it attracts residents with different land use goals and practices.

Migration: Who, Where and Why?

Personal Preferences

In all three communities, households had specific reasons for living in their respective communities. Frequently mentioned reasons included opportunities for employment, owning land, marrying into the community, the tranquility of a more rural lifestyle, access to education

and a more affordable lifestyle (Table 1). Land and marriage were mentioned in all three communities. In more urbanized communities (San Fernando and Cutuglagua), reasons became more diverse to include tranquility or the “country life”, education, economics and work. Those residents who mentioned the “country life” suggest that they are aware of what urban life is like. Some residents in these communities left crowded urban areas such as Quito, preferring its urban periphery with less congestion, thus contributing to the region’s own process of suburbanization. Residents in both El Chaupi and Cutuglagua also mentioned work opportunities. In El Chaupi, this response refers to a preference for the farming and ranching lifestyle, whereas in Cutuglagua it indicates aspirations for more diverse opportunities for wage employment.

In the end, a household’s choice of community comes down to the community’s ability to satisfy the needs and personal preferences of that household. Such needs are defined not only by personal preferences, but also by a household’s ability to take advantage of specific community characteristics. Examples include a household’s ability to afford land prices and cost of living, as well as the degree of professional training of household laborers, which allows them to access employment. These relationships will be discussed in the sections below.

Biophysical and Economic Attributes

In Cutuglagua, land prices are much less expensive than in San Fernando. A greater percentage of households in Cutuglagua are also located in lower income brackets, suggesting the significance of land purchasing power as a determining factor of community choice. More affordable land prices in Cutuglagua are likely a function of altitude (which dictates climate) and topography within the neighborhood (Velásquez, pers. comm. August 2007). At 3022 meters above sea level (200 meters above Quito), on average Cutuglagua is colder and receives more rain (Niell and Jorgensen). In addition, the steep undulating topography prevents much automobile access and transport. In comparison, San Fernando, lying in a relatively flat valley at 2721 meters above sea level (lower than Quito), enjoys a milder, warmer climate and residents are able to get around easily in vehicles and on foot.

It is possible that the lower land prices also attract younger families. Though the average age of heads of households surveyed in all three communities is around 42, in Cutuglagua the age range is much greater, spanning from 17 to 84 years, with a median of 38. In comparison, the age range of household heads interviewed in San Fernando is 24 to 73, with a median of 41. This difference is not that great. Though, with a greater number of household surveys, it would be possible to better test the hypothesis that younger migrant families live in less expensive communities because they have not had sufficient time to save money for land purchase and house construction in more expensive areas.

Urban Integration and Connectivity – Transportation Corridors, Opportunities for Employment

Transportation corridors that directly link a community to an economic center are one of the more important determinants of urbanization patterns. All three communities can easily access such transportation networks. Cutuglagua, whose economy and infrastructure are both merging with Quito, could be described as having the least opportunity-cost imposed by transportation corridors. Moreover, residents in Cutuglagua often work in both Quito and Machachi, another

urban area to the south. Land prices within this particular community also reflect proximity to the major transportation corridor; those parcels further from the highway and located higher up on the hillsides cost less than those closest to the highway. San Fernando is well connected to the economies and markets in El Valle de los Chillos to the north. Finally, though a 2.5-hour drive separates El Chaupi from central Quito, its peripheral nature is embodied in supplying the city with important flows of goods (mostly agriculture and livestock) and people that travel along transportation networks. El Chaupi is near the edge of the connected periphery, where transportation networks are sufficient to maintain low transport costs and to keep economic exchange of goods profitable. With the construction of a new highway along the Itchimbia hills, which separate the inter-Andean valley in which Quito lies from the lower-lying El Valle de los Chillos, there is potential for increased flows and spatial expansion of this periphery. Only thirty years ago, Cutuglagua was sparsely populated. Before large investments and development in infrastructure in El Valle de los Chillos, San Fernando was also a rural area.

Urban integration and connectivity to markets represented by transportation networks also influence opportunities for income generation. While many in Cutuglagua have lower incomes, they are better connected to the urban economy and job market in Quito. San Fernando is better connected to El Valle de los Chillos. San Fernando's more diverse and more skilled workforce (compared to El Chaupi and Cutuglagua) is likely tied in with income level. The professional training of those migrating to this community allows them to take advantage of the skilled job markets, including professorships in educational institutions.

In Cutuglagua, proximity to industries, urban economies and other residential areas offers opportunities for work in factories and construction, as well as domestic employment (within wealthy Ecuadorian homes). As mentioned above, El Chaupi is connected to both Machachi and Quito to its north by good transportation networks, which allows residents in this more rural community to survive with primary livelihoods in the agricultural and ranching economy. Other rural areas that are less well connected to the markets that receive their agricultural goods often maintain smaller and more disperse populations. They also tend to rely heavily on agriculture for their subsistence needs; they supplement their diets by purchasing supplies with the income generated from selling surplus goods.

Community Composition and Land Use and Cover Change

The process of internal migration as influenced by the preferences and community characteristics discussed above often determines the demographic compositions of communities located in Quito's peri-urban interface. Community composition, density and adaptation of previous practices can ultimately affect land use decisions and patterns, including how well these communities work with and respond to land use management initiatives at a municipal level.

Community Density and Heterogeneity

As shown in Figure 2, land occupation intervals reveal cohorts of new landowners arriving at different times in each of the three communities. For El Chaupi, many of the current landowners arrived 31 to 40 years ago as well as 16 to 20 years ago. San Fernando experienced an increase in new landownership of current residents 26 to 30 years ago as well as within the last five years. In

Cutuglagua there was a sharp increase in arrival of current residents 16 to 20 years ago as well as within the last 10 years. In both Cutuglagua and San Fernando, the arrival of large cohorts in the past coincides well with the increased land availability due to the division of *haciendas* under the Agrarian Reform Law. Not all lands in El Chaupi were former *haciendas*. Arrival of current landowner cohorts here seems to follow a different pattern.

In Cutuglagua, the fastest growing of the three communities surveyed, significant variables that influence its growth have included low land prices, proximity to jobs and livelihoods (especially for non-skilled workers), as well as transportation corridors that provide access to many other areas. These incentives, combined with smaller lot sizes, increase population and housing density. Slowing rates of land conversion and improving management of existing land uses and land cover in this community—including side-yard agriculture, provision of basic services and community establishments such as schools—will require consensus among more individual household land managers. With increasing migration and housing density in this region, the community of land use decision-makers becomes more heterogeneous without strong ties to the community itself—other than the affordability and access it provides (Toalombo, pers. comm. June 2007).

In San Fernando a similar pattern is emerging, though at a much slower pace. Density remains lower than in Cutuglagua given the larger lot sizes. Though, with the recent arrival of new cohorts of landowners, community heterogeneity increases. The impact this will have on participation of landowners in community management is still unknown. Though, some point out that already there are many community members who prefer not to participate in community development projects or decision-making processes (Pinto pers. comm. June 2007).

Though not explicitly studied here, there is a new trend emerging within the increasing heterogeneity of peri-urban communities and their capabilities to transform landscapes. With the Ecuadorian economic crisis in the late 1990s, the economic hardships for many increased beyond a certain threshold. Migrating to Quito and its periphery subsequently became less attractive compared to opportunities and aspirations to improve quality of life by living and working abroad—both legally and illegally. This large exodus of Ecuadorians (10% of Ecuadorians live outside their country) has not greatly impacted land use transitions in Quito's periphery since the majority of households surveyed do not receive remittances. In other regions, the case may be different. However, as the Ecuadorian economy stabilizes, many Ecuadorians who have made respectable livings outside of their country are now seeking opportunities to return. With new-found wealth they have the potential to influence urbanization and land cover transitions as they aspire to own their own homes in urban peripheries with access to land as well as urban amenities.

Adaptation of Previous Practices and Land Management According to Personal Preferences

While Cutuglagua, San Fernando and El Chaupi all differ in their degrees of urban development, the surveys did not indicate that differences in livelihoods and incomes dictated differences in the types of household land uses. In San Fernando and Cutuglagua, households commonly supplement their diets and incomes by growing small food crops and spices in their side-yards as

well as raising some livestock. These practices are adaptations of previous household land management customs as well as coping mechanisms in the face of economic uncertainty.

For these communities, where owning land and the ‘country life’ are either integral characteristics (El Chaupi) or desired characteristics (San Fernando and Cutuglagua), households often invest much money and time in their land, especially if they are capable of deriving livelihoods or supplemental incomes from it. In more settled urban areas, where populations may have more distant ties to the land and a family history of farming, households may invest in other kinds of property (e.g., house, business, job, etc.).

Respondents in both Cutuglagua and San Fernando who point to the ‘country life’ and tranquility as attractive community assets reveal specific land management values. Such responses suggest that the household heads have either lived in the city or have enough knowledge of urban living to prefer a more rural setting. These particular households manage their land and participate in community land management initiatives to preserve the community character that provides ‘country life’ and tranquility, while still allowing them to access more urban amenities. In El Chaupi, most residents are either from that area or migrate from other rural areas. The ‘country life’ is an asset that most current residents would consider essential for any community in which they reside.

Households in all three communities indicated that when they do have surplus income, they invest it in education, health and home improvements, in that order. Their preference reveals the value that they place upon improving the quality of life for their families, which is a function of all three variables. Management of land as an asset, whether in a more urban or rural area, reflects these quality of life priorities. Households in all three communities manage their lands to derive the most value from it, including small or large agriculture and livestock.

Opportunities for Connections with Policy and Land Management Institutions

Landowners and household heads who have inherited their land often grow up in the communities in which they live. Transition of ownership through inheritance can lead to increased subdivision in successive generations. While multiplying the number of land managers in the community, such a trend often builds strong communities with familial ties, as in San Fernando and El Chaupi.

Communities with strong personal ties and shared, articulated visions are generally much easier to work with when it comes to promoting development projects and incorporating land use and community goals into regional Plans of Development (Quezada pers. comm. July 2007). The Ministry of Urban Development and Housing, for example, operates a community-development program, but only works with communities which have a strong sense of community responsibility and accountability, common visions for development and low degrees of corruption.

Communities in El Chaupi, Cutuglagua and San Fernando participate in planning processes through community organizations and representative local government. They express their development goals in terms of improvements in infrastructure, health, education and the

economy. Because Cutuglagua and San Fernando are classified as “urban” areas, their goals are incorporated into the Plans of Development of Cantón Mejía and Cantón Rumiñahui, respectively. El Chaupi, on the other hand, is considered rural. It collaborates exclusively with the Provincial Government of Pichincha. In any of these cases, the lesson here is for future land use planning approaches to be cognizant of the similarities and differences that are important determinants of land use and cover changes in Quito’s expanding urban periphery. Collaboration and compromise to articulate a shared land use planning vision will require better organization for these diverse and evolving communities, as well as agencies that are more effective on local levels. The result should be policies and goals that celebrate community planning through self-determination. Support from municipalities that have access to resources and expertise to implement such policies should do so in view of the community’s stated goals or outcomes desired.

In the absence of this kind of support, on-the-ground observations suggest that local non-governmental organizations have often functioned well as collaborative mediators, bridging the gap between local, regional and national agencies and those communities so desperate to improve their quality of life and exhausted by growing without control (which puts at risk the natural resources and landscapes upon which they depend).

Conclusions

The individual land managers who fuel land cover transitions from rural to urban are motivated by many factors. A comparison of three communities along an urban gradient in the peri-urban interface of Quito, Ecuador highlights some of those important variables and how they have influenced migration patterns and, consequently, patterns of land use and cover changes in each community. When relocating, households weigh biophysical attributes (e.g., altitude, climate and topography) and economic aspects (e.g., transportation corridors, markets for goods and employment, land prices and income) against personal values (e.g., tranquility, traditional livelihoods and access to urban amenities) and household capabilities (e.g., income potential, professional training) that allow them to take advantage of specific community characteristics.

El Chaupi, San Fernando and Cutuglagua

As urbanization continues in Quito’s peri-urban interface, increasingly heterogeneous communities will be formed, which have differing densities, community attachments, previous land management practices and which represent a variety of personal values and development goals. Many individual households in these communities come from rural areas and a few from other urban areas. They adapt to new opportunities for urban integration as the influence of transportation networks and markets expand. El Chaupi, the most rural, will most likely remain so for the next 20 years or more. Its distance from urban centers buffers the effect that markets and migration have on its lands and their uses. It remains a large rural center due to well maintained transportation corridors that connect it to those distant urban centers. If these networks expand, the effect of urbanization could become more pronounced. In San Fernando, urbanization is moderate. Unlike Cutuglagua, demand for skilled labor in the nearby economies coupled with higher land prices has deterred rapid urbanization. While land prices here are relatively high, those who seek to live in this region with its milder climate and who have more

money often find housing elsewhere. San Fernando remains a suburban farming community; other more strategically situated communities in this low-lying valley offer better access to Quito and the urban centers in El Valle de los Chillos. Cutuglagua, the most rapidly growing community in this study, has experienced rapid demographic expansion and population growth, which has affected land use and cover. Its higher altitude, hilly topography and location at the southern edge of Quito have suppressed land prices and attracted households seeking employment opportunities (much unskilled labor), land ownership and access to urban markets in order to improve their livelihoods.

As discussed, not all individual household land managers evaluate migration and land use decisions using the same criteria and values. Across Quito's entire peri-urban interface, household land use and migration decision-making will be distinct. The specific compositions and experiences of the three communities described cannot and should not be extrapolated to describe the collective experience of the many communities in Quito's periphery. However, these three case studies do provide important insights into the need for more targeted land management regulation and coordination.

Determining the appropriate nexus for these communities and regulatory agencies to work together—given their differing characteristics and land use decision-making priorities—has been a challenge. As demographic and land use heterogeneity in peri-urban communities continues to increase, it will be important for land managers to better understand the individual decision-making processes that lead to migration and thus the heterogeneous nature of this region.

Peri-urban Management Approaches

Traditionally, perceptions of the peri-urban interface have emerged from either an urban focus or rural focus. The urban focus views the peri-urban interface in terms of urban activities. From this perspective, land management focuses on transformations of urban planning systems such as transport and land use, land regularization and housing. Localized actions are used to address infrastructure, sanitation, and health needs and pollution problems on a larger scale. Realizing that cities depend on their 'hinterlands,' such urban-focus policies continue to manage the inputs and outputs required and produced by the city. The rural focus concentrates more on localized actions (i.e. micro-credit) to improve land-based livelihoods, living conditions and social infrastructure with a goal to increase rural production. With this approach, emphasis is often placed on preventing migration to the cities and disaggregating groups within communities, especially those marginalized by current social structures (Allen 2003).

Decentralization of land management decision-making powers in Quito, while intended to allow land managers to be responsive to local needs, has been unaccompanied by adequate resources and trained staff, obstructing the ability of municipalities to generate and implement effective land use planning policies. To overcome the lack of resources, many municipalities have turned to each other to share costs and technical assistance for planning. However, regional planning is still dominated by the Metropolitan District of Quito (DMQ) with greater resources and trained staff. Within municipalities, an urban bias hinders comprehensive planning, preventing holistic management of peri-urban areas including the biophysical characteristics and the economic, social and cultural processes that shape them. As peri-urbanization continues and urban areas

solidify across municipal boundaries, there is a need for meaningful collaboration and coordination of planning goals that goes beyond lending technical assistance and sharing resources.

An urban-rural linkages or regional perspective, concentrates on pressures and flows that move across the peri-urban interface, such as people, job markets, commodities and raw materials. This perspective emphasizes creating networks between cities, rural areas and other minor centers to reinforce rural-urban links (Allen 2003). In this way, the regional perspective incorporates the changing features of urban and rural areas and how they affect people and commodity flows and thus the political, socio-economic and environmental structure of the peri-urban interface (Adell 1999).⁵

Challenges to achieving such a regional development approach in Quito still remain. Growth control efforts, in addition to urban growth boundaries and decentralization of management powers, are embodied in municipal zoning that attempts to direct growth of urban areas to more suitable sectors. In a country such as Ecuador, however, where many live at or below the poverty line, following such guidelines established by a government that is often late in providing basic services, is not a first priority for individuals and households converting lands and ignoring regulations. Applying an urban-rural linkages approach in Quito will be challenging, but could stimulate much needed management coordination by focusing on growth processes and motivators instead of symptoms.

No matter the approach to regulating expanding peri-urban areas in this region, it will be important take into consideration the community goals and decision-making patterns that transform landscapes at Quito's periphery. In this vein, regional planning policies can incorporate the heterogeneity of the communities by strengthening linkages between urban and rural markets and communities. Such an improved network will increase access to urban amenities, the "country life", and opportunities for employment without households having to migrate to be closer to Quito. On a large scale, an urban-rural linkage approach can better shape the flows of commodities, capital, natural resources, people and pollution across the city's peri-urban interface. Resulting national policies can then be flexible enough to allow for diversity of contexts and communities to which those policies are applied. With better opportunities to improve quality of life and self-determination of household land use within a supportive regional and national policy framework, important ecosystems might have a better chance of being spared transformation due to urban expansion.

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⁵ Examples of these changing features could include (1) population and employment dispersing to the periphery, thus created sub-centered areas within the metro area (2) decentralized manufacturing employment and specialization of the city center in service employment (3) increased reliance on roads for transport for people and commodities (4) land-markets as strong determinants and (5) the effect of high urban housing demand not always being sufficiently met by supply (Adell 1999).

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