

## PART II E3

### REGIONAL LITERATURE REVIEW ON ECOSYSTEM SERVICES AND POVERTY ALLEVIATION – DESAKOTA ASSESSMENT Amazon and Andes

Glenn Hyman, Sam Fujisaka and Mariano Mejia  
International Centre for Tropical Agriculture (CIAT)  
Cali, Colombia

#### Introduction

The Andes and Amazon have changed dramatically since the middle of the last century. Population in Latin America increased from about 161 million in 1950 to 515 million in 2000. By 2050, 818 million people are expected to populate the region. With population growth, substantial environmental change has occurred, including soil and water degradation in the Andes. These changes create problems and opportunities for the livelihoods of people. Although population growth means larger markets for goods and services, it also brings conflicts over natural resources, especially land and water.

Socioeconomic and environmental changes in developing countries are quite different from the development paths of the western industrialized nations, especially in terms of the rapid pace of industrialization in the case of the former. Globalization, infrastructure development, and technological changes have also spurred a new type of rural development, one that places a strong emphasis on new interactions between the urban and the rural. In Asia, this type of development has been referred to as *desakota*, a term taken from Indonesia meaning village-town (McGee, 1991; for an overview of concepts regarding the peri-urban interface, including a section on *desakota*, see Adell, 1999). McGee (1991) provides the following description of *desakota*:

*“Distinctive areas of agricultural and non-agricultural activity are emerging adjacent to and between urban cores, which are a direct response to preexisting conditions, time-space collapse, economic change, technological developments, and labor force change occurring in a different manner and mix from the operation of these factors in the Western industrialized countries in the nineteenth and early twentieth centuries”.*

A substantial literature on *desakota* in Asia has emerged over the last two decades. To what extent are these processes occurring in the Andes (and Amazon) of Latin America? Does the growth of transportation infrastructure lead to development adjacent to and between urban cores of the region? Are developments in transportation and communication leading to a time-space collapse across the region? Are non-agricultural and non-traditional employment and income sources growing? What effect is globalization having on rural areas? To the extent that the *desakota* phenomenon is occurring in the Andes and Amazon, what are the impacts on the environment and livelihoods? Does such development assist in poverty alleviation?

This paper addresses these questions. The Andean focus of the study includes the countries of Colombia, Peru, Ecuador, Bolivia and Venezuela. Some literature from the Andean areas of Chile and Argentina was included, but given less emphasis because these countries have less development challenges than the others. The Amazon focus includes the same countries just mentioned, plus Brazil. The literature review was conducted using CABDirect, Agris, Agricola, CGVLibrary, Popline, Scholar Google, OARE (Online Access to Research in the Environment), INTUTE (Social Science Information Gateway), REPEC (Research Papers in Economy), y OAlster to identify research and development literature related to *desakota*.

The term “*desakota*” is poorly represented in conventional scientific literature. For example, only five records were returned on a keyword search for *desakota* in CABDirect. Popline returned one record, and OAlster three. Google Scholar returned 597 records, but most of these were gray literature, referring to the phenomenon in Asian countries (often in Asian languages such as Chinese, Japanese, and Thai).

Our search strategy combined *desakota* related words and concepts, such as *demography* and *rural-urban migration*, *rural population change*, *urban/peri-urban agriculture* and (*population or demography*), *rural migration* and *poverty*, *non-farm income*, and *urbanization* and *agriculture*. Geographic keywords included *Andes*, *Andean region*, *Amazon*, and the countries of those regions: Colombia, Ecuador, Peru, Bolivia and Brazil. Based on the initial results, new searches were formulated that led us to select 99 articles or books for assessment.

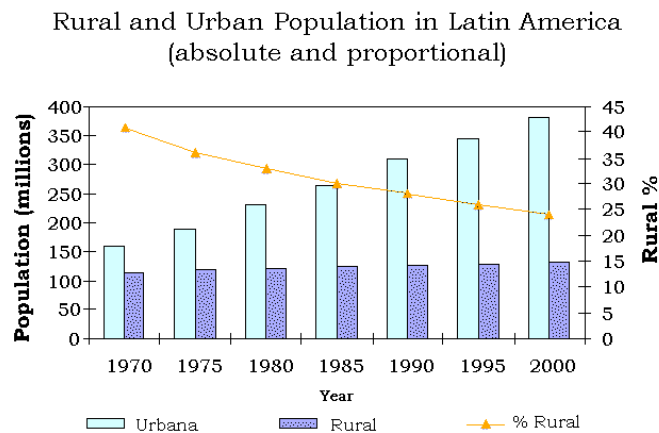
The paper starts with a general discussion of globalization and demographic change in Latin America. A review of literature on non-farm and off-farm rural employment and income – two important indicators of *desakota* – follows. Migration and remittances are discussed in the context of their effects on socioeconomic conditions in rural areas. The paper then focuses on the growth of agro-industrial pockets in the Andes (e.g., the cut flower industry). Another key trend in these regions is growth of supermarkets and their impacts on farmers and consumers. Transportation development is an important feature of *desakota* given its potential to reduce travel time and thus increase interaction between rural and urban areas. Information and communication technologies (ICT) are reviewed in the context of their impacts on interactions across the urban-rural continuum.

The review then turns to the impacts of *desakota* development on natural resources and environmental services, particularly water. The recognition of the importance of externalities related to natural resources use is discussed in the context of opportunities for *desakota* areas to take advantage of payment for environmental service schemes. The paper concludes with a discussion of poverty and livelihood implications of *desakota* development.

## **Demographic and Economic Change and Globalization**

The main population trend in the Latin American region over the last 50 years has been the growth of urban areas and population (Fig. 1). Urban population increased from about 150 million people in 1970 to 350 million in 2000. The percent of the population that is rural went down during that same period, from 40 to less than 25%. Much of urban growth came from people leaving the countryside for the cities. The overall number of people in rural areas, however, has remained about the same, just over 100 million. The rate of natural population increase in rural areas was able to make up for the loss from rural to urban migration. A key impact of this migration was the newly created link between urban migrants and the rural areas they left behind. When globalization became more prevalent in the latter part of the century, this link was important in facilitating the reach of interactions beyond cities and into the countryside.

Figure 1. Rural and urban population growth in Latin America between 1970 and 2000 (Hyman et al., 2005)



The trend towards globalization could lead to either the severe reduction or drastic modernization of Andean agriculture. Bebbington's (2001) study of four sites in Bolivia, Ecuador, and Peru revealed, however, that the more satisfactory outcomes can be achieved by organizing, engagements with networks providing linkages with international actors, and participation in new product and labor markets. In his study, two communities engaged in dairy development and production: one was ultimately a failure due to support by government-to-government aid programs and a corresponding lack of program ownership rights; while the other was successful due to a combination of local ownership, land reform, and assistance by a church-based organization and an international NGO. Other contributing elements ranged from credit to contracts with supermarkets for high quality cheeses. Impacts on poverty indicators in the successful community were positive. Two other communities shifted from hacienda production and social structure to *campesino* coca and coffee production. Interventions from the "global public sector" stemming from attempts to diminish coca and cocaine production successfully helped to provide alternatives--coffee in these two cases--to coca production.

A common notion is that globalization trends hurts workers, even though economic theory suggests that trade provides benefits to everyone.. Few studies, however, in either

developed or developing countries have studied the impacts of globalization. Farrington and Mitchell (2006) argue that, contrary to common notions regarding the impact of globalization, the rural poor can benefit. They suggest a series of strategies for engaging the rural poor in global economic processes that can improve their livelihoods. These include the development of policies and actions that lead to greater integration with value chains, increased wage labor participation in activities spurred by global economic processes, policies supporting pro-poor migration, and remittances and more developed connection between lagging regions and domestic markets.

Globalization and increased rural-urban integration has consequences for the environment, including impacts from land cover change (e.g. Killeen et al., 2007). There is little doubt that globalization, structural adjustment, regional integration and technological change has contributed to increased deforestation in the Amazon. Hecht (2005) argues that deforestation and land cover change in the Bolivian department of Santa Cruz is largely driven by outside forces. These trends also favor development of *desakota* landscapes. Other research suggests that two factors related to globalization are driving land cover in the Amazon (Nepstad 2007): the global rise in oil prices has led to a biofuels boom that has effected food prices, especially soybeans; and changing diets—especially greater meat and dairy consumption in Asia--have put pressure on food demand. Little is known about the future impacts of biofuels development on environmental services and poverty (Peskett et al., 2007). These pressures, however, are clearly driving expansion of the agricultural frontier in the Amazon.

Globalization and development have increased commercial agriculture and pastures for extensive livestock production, with some associated increase in non-agricultural activities and dynamic inter-urban corridors (albeit less than in the more densely populated *desakota* areas of Asia). Increased commodity prices due to biofuels development and global trade in staple crops has led to strong land cover change in the Amazon, especially in Brazil and Bolivia. These changes, motivated by forces outside the region--have increased rates of deforestation.

### ***Economic Change***

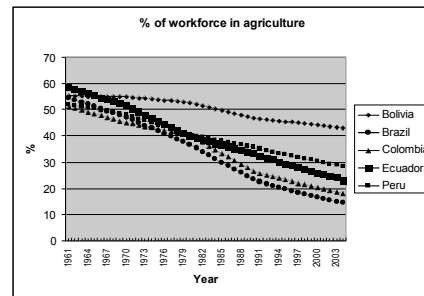
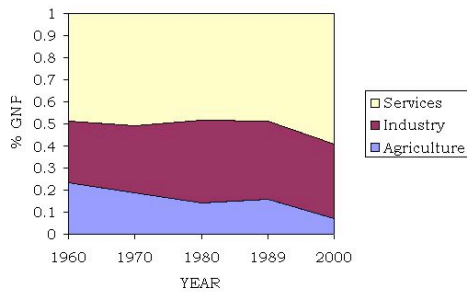
Another keyf economic trend over the last decades is the growth of services and industry relative to agriculture (Hyman et al., 2005; Figure 2a). Overall national development and the particular development of *desakota* areas have been accompanied by a corresponding drop in the proportion of labor allocated to agriculture (WRI, 2007; Figure 2b).

Figure 2. a) the structure of the Latin American economy, 1960 to 2000; b) the percent of the workforce in agriculture, 1961 to 2003, in the Andean and Amazon countries.

A

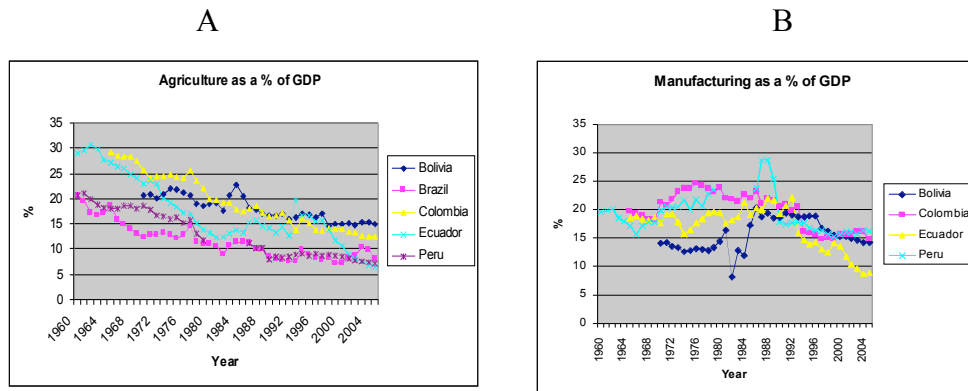
B

Structure: Latin American Economy



Declines in the percent of gross domestic product (GDP) coming from the traditional manufacturing and agricultural (Figures 3A and 3B) sectors mirror the rise in importance of new agro-industries and growth in services, communications, transport, and other markers of *desakota* in the Andes and the Amazon.

Figure 3. The percentage of GDP devoted to (a) agriculture and (b) manufacturing, 1960 to 2004, in the Andean and Amazon countries (WRI, 2007).



Many urban enterprises rely on rural demand; while access to urban markets and services is crucial for agricultural producers (Tacoli, 1998). Both urban and rural households depend on a combination of agricultural and non-agricultural livelihood sources. One hypothesis sees sound urban development as crucial for rural development. A “virtuous circle” model of rural-urban development sees rural households earning more from production of agricultural goods for non-local markets. These rural households then demand consumer goods, leading to creation of non-farm jobs and diversification of urban activities in *desakota* areas. Surplus rural labor is absorbed; demand for rural produce rises; and rural incomes and agriculture are further boosted. Non-agricultural rural employment include furniture and brick making, and beer brewing—sold in both rural and urban areas:

*“Forward linkages between non-agricultural and agricultural activities, such as processing and other manufacturing of agricultural raw materials, and backward linkages, such as manufacture of agricultural equipment, tools and inputs, and tourism in many areas,*

*are the basis for the most profitable types of non-farm rural employment” .... “Many of the rural-urban flows of people, goods, and wastes are the most intense and varied between the built up area of towns and cities and the peri-urban areas that surround them”* (Tacoli, 1998).

Building materials and fresh water flow into the urban areas from outer areas; wastes from the city flow back out. Much of the economic (and environmental) change in Latin America occurs where these urban-rural flows cross.

### ***Non-farm rural employment and income***

Rural non-farm employment (RNFE) and income (RNFI) have grown substantially over the last several decades (de Janvry and Sadoulet, 2000; Escobal, 2001; Reardon and Berdegue, 2001; Dirven, 2004). RNFE grew at 4.3% per year in the 1970s and now exceeds self-employment. RNFI far exceeds farm income and remittances; and service sector RNFI far exceeds manufacturing sector RNFI. Although poor households and zones have high shares of RNFI, the absolute value of that income is low compared to rich households.

Non-farm activities make up nearly half of economic activities in Ecuador (Elbers and Lanjouw, 2001) and are more prevalent in areas surrounding canton capitals and zones with good infrastructure – both *desakota* characteristics. Women tend to be over-represented in non-farm activities of low productivity in Ecuador. The more educated participate in high(er) productivity non-farm activities. Growth in high-productivity RNFE and RNFI reduces poverty on average, but increases inequality. Growth of low-productivity RNFE and RNFI has negligible effects on poverty and inequality.

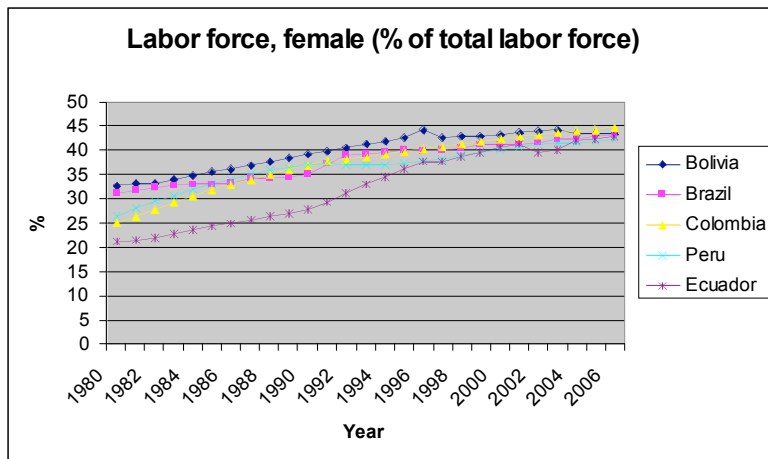
Substantial shares of income—45% on average—came from off-farm employment in Colombia (Deininger and Olinto, 2001). The problem of inequality limits the development impact of RNFE and RNFI. *Desakota* development in these areas may not reach the poorest populations.

Brazilian agriculture has grown substantially in the last 15 years. Such growth has been a motor for development, boosting RNFE and RNFI and leading to an urbanization of rural areas (Da Silva and Del Grossi 2001). Service functions are an important part of this trend. However, these increases do not necessarily lead to improved livelihoods. Many of the service jobs in rural areas receive low wages and are low-skilled.

Between 1990 and 1996, RNFE and RNFI increased 10 and 18% in two zones of Chile, reaching about 40% of both employment and income (Berdegue et al., 2001). These zones are clearly experiencing the mixed economic activity characteristic of *desakota* areas. Employment was driven by household human capital, education and access to credit and physical capital. Income levels had a geographic component. Zones that are economically dynamic and have good infrastructure--characteristics of *desakota*--were found to have higher levels of non-farm income.

As discussed in several of the papers reviewed, the new *desakota* industries—many tied to globalization and free trade policies—along with improved transport, and other factors have provided increased employment opportunities for women (Figure 4). These gains in employment, however, have not necessarily led to equal gains in empowerment or to long-term career development.

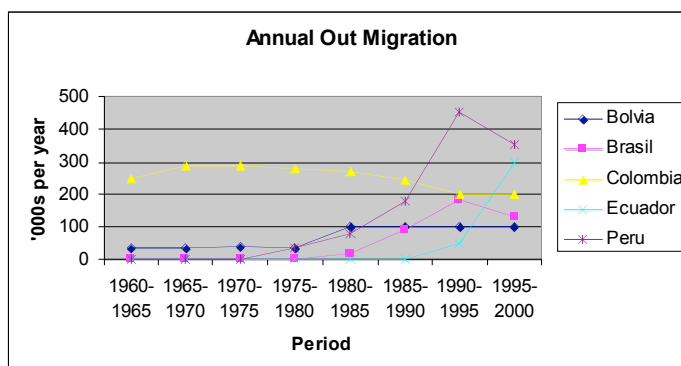
Figure 4. Participation of women in the labor force in Andean and Amazon countries, 1980 to 2006 (WRI, 2007)



### *Migration and Remittances*

Out-migration and remittances sent home by the migrants are a major economic force in many countries, and have contributed in various ways to the emergence of *desakota* landscapes. Figure 5 shows how migration grew substantially in Andean and Amazon countries in the 1980's, continuing into the 1990s. A growing world-wide interest has developed on the impacts of the remittances that migrants send to family left behind in their home country. Many of these families come from rural or *desakota* regions. Remittances have been channeled into what were previously isolated rural areas—even if that added investment has been in “ostentatious” housing awaiting the retirement of people working outside of the country (Jokisch, 2002).

Figure 5. Annual out-migration from Andean and Amazon countries, 1960 to 2000 (WRI, 2007).



The magnitude of remittances throughout the world is substantial. Chami et al. (2005) used econometric modeling to examine effects of remittances (averaging \$81 billion per year) on development. Data for 113 countries over 1970-1998 covered the period of rapid increases in the 90s. Remittances are not profit-driven, but are compensatory transfers and do not work like foreign direct investments. “Compensatory” in this case means that remittances are sent, “...in order to help the family avoid shortfalls created by a poor economy or simple bad luck.” There was, in fact, a negative correlation between immigrant remittances growth and per capita GDP growth. Further, “If these remittances are used by recipients to reduce their labor supply and labor market participation, then it is possible that economic activity will be adversely affected (Chami et al., 2005).”

Latin America received \$40 billion in remittances in 2004, representing 27% of all remittances to developing countries. Analysis of aggregate and country data for ten Latin American countries showed that remittances had a positive and statistically significant effect on growth (Acosta et al. 2008). Effects of remittances on inequality were small and mixed. Variable—but generally small—outcomes reflecting differences among countries are discussed. Acosta et al. (2008) stress the need to view remittances in the context of poverty, “expressed as a function of two factors: the average income level of the country and the extent on income inequality”

Studies also show that urban-rural migration is higher than rural-urban in two Andean countries (21% vs. 16% in Ecuador and 23% vs. 12% in Peru (Billsborrow 2002)). Rural to urban migration is substantially higher than urban-rural in Brazil and Honduras (and most of Asia except Malaysia). The settlement in the Peruvian and Ecuadorian Amazon of urban populations—aside from environmental degradation--may imply demands for urban services in such places of settlement.

Gender and age may play a crucial role in migration decision making and selectivity. Research has hypothesized that women may be more concerned than men regarding household well-being—important when opportunities for women’s employment arise both in nearby and in far away areas (Tacoli 1998). Women are increasingly migrating to cities; while women left behind are subject to social determinants regarding access to resources and opportunities.

Remittances as a result of international migration can have substantial impacts on agricultural and (desakota) landscapes, as was the case of the effects on agriculture of migration of Andean Ecuadorians to New York (Jokisch 2002). Remittances were initially used to pay for the transaction costs of migration, and previous debts; and later to obtain consumer goods, land, and large, stylish houses. People left behind—especially women—continue to practice subsistence crop production as a low return but risk-averse strategy. The result is a desakota landscape of gentrified, cultivated high value real



estate—most strikingly featuring large, ostentatious cement block homes awaiting the retirement of successful migrant workers.

### *Agroindustrial pockets in “rural” areas*

Casual observers of rural landscapes in the Andes and other parts of Latin America notice the presence of modern dairy operations or greenhouses for cut flowers. Over the 1980s, the value of non-traditional agricultural exports (NTAEs) increased twofold in Central America and almost threefold in South America (Korovkin, 2005).

Dolan and Sorby (2003) produced a major deskota paper for all regions on the topics of new agro-industries, gender, globalization, and employment—especially female. Their World Bank-sponsored research examined gender equity, and reached beyond income and economic benefits to study qualitative improvements in women’s lives. They found that globalization and declining returns from traditional commodities have led to production of high value agricultural (HVA) exports, generating foreign exchange (HVA accounts for two-thirds of agricultural trade), new skills, and opportunities for employment, especially for the poor and for women.

HVA opportunities have arisen from changes in consumer demands in developed countries and deskota type policies in developing countries (devaluation, relaxation of foreign exchange controls, trade liberalization, and tariff reductions). Many factors have driven HVA. These include changes in the food system such as weak performance of traditional commodities, increased market demand (stemming from demand for healthier foods, rising incomes), rising demand for convenience foods, availability of out-of-season crops and of new crop varieties and growing concerns about food safety. Trade liberalization, policies of international lending institutions, the rise in global supply chains, the restructuring of employment, feminization of the workforce and moves toward flexible labor have had their influence on HVA as well.

Female employment in production and processing and other impacts in the HVA of cut flowers, fresh fruit and vegetables, vanilla, and poultry were selected because they are labor intensive (Dolan and Sorby 2003). Although women dominate important parts of the production chain, gender issues in these HVA are relatively under-researched. HVA’s are part of global commodity chains driven by northern companies. Most have faced or responded to pressures to meet improved labor, environmental and quality assurance standards. Important issues related to the growth of HVA’s are the social nature of gender relations, household organization, job stability, wages, working conditions, opportunities for career development, and bargaining power. In that context, Dolan and Sorby’s (2003) paper examines: a) characteristics of the workforce, b) nature of employment and opportunities for career development, c) social norms and intra-household issues.

While such employment has been empowering for women, there have been several shortcomings from occupational segregation and environmental health issues to gender-

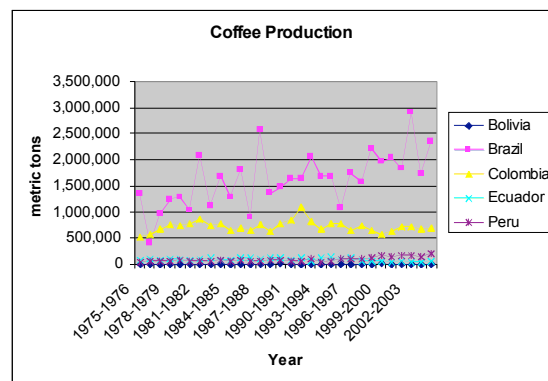
based constraints in farming systems. Negative impacts can be alleviated or averted through effective training, and enforcement of labor protections and codes of conduct.

Cut flowers are one of the most important HVAs, and, as such, are significant to the desakota analysis of the Andean region. Northern country consumption was \$30 billion per year in 2000, with Americans accounting for \$16 billion. Colombia, Ecuador, Kenya, Uganda, and Zimbabwe are global players. Developing countries had 29% of global exports in 1998. Some two-hundred thousand people worked in cut flowers in developing countries by 2000.

Export of cut flowers is growing especially fast. Colombia is now the world's second largest flower exporter after the Netherlands. Ecuador's flower exports increased from approximately US\$ 2000 in 1988 to almost US\$ 300,000 in 2002. Research also indicates that Ecuador's flower export production hampers rather than helps efforts to alleviate poverty because: a) although the cut flower industry creates employment, it does not allow workers to raise themselves above the poverty level; and b) it undermines pre-existing support networks and community organizations that provide rural families with a minimum of security and access to the processes of decision making. Flower employment had largely negative effects on women's social and political status. Unfortunately as well, small farmers appear to be at a disadvantage relative to corporate farms in terms of NTAEs (Korovkin ,2005).

Coffee production has been a high value crop activity with a relatively long history in the Andean region compared to other HVAs (Figure 6). Brazil and Colombia are major global coffee producers. Production in Brazil makes clear the effects of boom-and-bust price cycles, a danger for such industries and for emergent desakota areas tied to such production.

Figure 6. Coffee production in the Amazon and Andes countries, 1975 to 2004 (WRI, 2007).

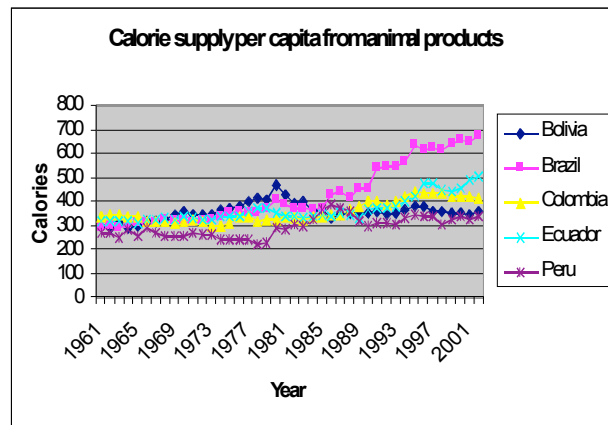


Development of the coffee sector in Colombia led to increased demand for seasonal and specialized labor (Hataya, 1992). Seasonal labor demands provide temporary employment for urban and desakota area workers—especially from the marginal barrios of nearby cities. Workers take advantage of the social infrastructure of the city in terms of

education, culture, communication, and medical care. Dormitory towns around the cities are purely *desakota* regions. The labor force in the coffee growing regions also grew in commerce and personal services, with coffee workers relying on other forms of urban employment during the coffee off-season. While rural agricultural employment provided needed incomes, laborers' own goals were oriented towards personal and family success in the urban areas.

Global demand for animal products—including milk, meat, and dairy--has been rapidly increasing, especially in the emergent economies of Asia. Consumption in major producer/exporter countries such as Brazil has also sharply risen over the past two decades (Figure 7). The Andean countries reflect lower but steadily increasing rates of animal product consumption.

Figure 7. Calorie supply per capita from animal products in the Amazon and Andean countries (WRI, 2007).



A study of the dairy industry in Colombia suggests the types of impacts that increased consumption of animal products are having. *Desakota* agro-industries can become more productive and competitive, but less profitable (Holman et al. 2003). The study examined the dairy industry in Colombia, specifically: a) effects of technological change on different milk production systems of the country; b) relationships among productivity, technological change, profitability, and competitiveness; c) evolution of milk production systems in Colombia; and d) impacts of market concentration on milk price. Some findings included that herd size increased competitiveness by decreasing production costs per unit of milk and beef, increasing net incomes per cow, and improving returns to capital investment. Higher productivity and income and increased competitiveness came from such innovations as adoption of improved pastures, pasture divisions for livestock rotation, and milking twice a day. Farms located in sites where the commercial value of land was high and near market centers had higher productivity than those with commercial value of land medium and low; but were less profitable in all regions. Reduction in prices paid to producers did not translate into lower prices for consumers, but remained in the hands of supermarkets and milk processing plants that expanded and modernized with long-life technology (Holman et al. 2003).

Policies oriented to markets will be increasingly "oriented to supermarkets". Three or four supermarket chains in Colombia control the retail food market. Holman et al.'s (2003) case study illustrates problems and opportunities of the dairy sector in Colombia. These systems represent similar situations in other countries and desakota areas of Latin America.

The rise of organic farming in the Andean and Amazon regions reflect changing consumer demands both internally and externally. Organic (and fair trade) high value crop exports to northern countries are increasing, reflecting those consumers willingness to pay and providing new desakota-type opportunities to what were traditional agricultural areas. Table 1 shows the number of organic farms, land area and percentage land area for the Andean and Amazon countries. One problem of assessing the organic food industry is the lack of data going back over time. The snapshot picture in Table 1 shows that area in organic farming, while large, is relatively small compared to the area under conventional farming..

Table 1. Organic farming in the Andean and Amazon countries (WRI, 2007).

2005-2006	# of farms	land area (ha)	% total ag area
Bolivia	6,500	364,100	0.99
Brazil	14,003	887,637	0.34
Colombia	4,500	33,000	0.07
Ecuador	2,427	27,436	0.34
Peru	23,400	260,000	0.85

Pockets of modern agro-industries can have negative environmental and social impacts(Kessler et al. 2007). The cut flower and dairy industries have received the most attention. Research has also examined soy in Argentina and Brazil, palm oil in Indonesia and Malaysia, beef in Argentina and Brazil, and coffee in Honduras and Vietnam. Although results were varied, losses of biodiversity and declines in socioeconomic indicators were found in 54% of studied production areas. Explanatory factors were characteristics of the commodities, macroeconomic and governance issues, history of the production area, and whether production increased due to frontier expansion or intensification. Export oriented development did not necessarily stimulate economic growth and reduce poverty. The study itself relied on the natural Capital Index (NCI) for biodiversity assessment; and on various socioeconomic indicators for those impacts. Growth in the production and export of the agro-commodities is documented; and impacts analyzed per commodity,, providing a useful set of impact measures and methods appropriate to examining change and impacts of new agro-industries in the desakota areas (Kessler et al. 2007).

### ***Supermarketization***

A strong trend receiving increased attention in Latin America is the growth of supermarkets and their effect on small farmers and rural areas. A key feature of this trend is the integration of rural and urban markets (Chowdhury et al., 2005). Supermarkets are drawing rural areas into national- and global-level economic activities, a development in accordance with the *desakota* concept. Reardon and Berdegue (2002) wrote an early overview paper on the topic, discussing policy options to facilitate the participation of small farmers in supermarket value chains.

Until recently the domestic food market in Latin America took place largely in the informal sector of small shops and wet-markets (Balsevich et al., 2003). The situation changed greatly in the past 20 years with the rapid rise of supermarkets. Supermarket retail food sales rose from 20% in 1990 to 50-60% in 2003. Supermarkets have shifted away from reliance on traditional wholesale markets for procurement of fresh fruits and vegetables (FFV) to centralized distribution centers and specialized wholesalers. Preferred and contract suppliers and collection centers in rural areas have emerged. Supermarkets' standards of quality and safety for FFV affect suppliers and their practices. The majority of suppliers are small/medium farmers; although the majority of volume comes from large farmers. The application of quality and safety standards by supermarkets will be a challenge and a driver of change for small farmers.

Expansion of supermarkets has been driven by rising incomes, urbanization, motorization and increasing female employment (Humphrey, 2007). The process is accelerating because of the promotion of supermarket formats in the context of international retail expansion. It was hypothesized that small farmers would fail to gain access to the most dynamic and expanding marketing channels because they lack the quality assurance, volume or traceability that a modern retail sector requires. The most recent studies, however, suggest that small farmers have not been left behind because a large proportion of fresh fruit and vegetables continues to be sold through traditional channels—and sold especially to low income consumers—and because supermarkets have actually ended up purchasing from small farmers. Buyers had to turn to small farmers because they represent "the vast majority of the potential supply base." While transaction costs are higher for small farmers, large farms present different problems, particularly in relation to contract enforcement. In some cases small farms have lower costs, particularly for labor-intensive products. Buyers prefer a mix of suppliers in order not to be too dependent on a few large ones. Companies that know how to manage small farmers are more likely to incorporate them into their supply chains (Swinnen, 2004, 39–40, cited by Humphrey). A key to incorporating small farmers into supermarket value chains are control mechanisms that ensure product specifications (size, appearance, safety), quantity, quality and safety requirements of the customer.

The rapid and extensive growth of supermarkets in Chile also appeared to come at the expense of traditional small neighborhood retailers and small poor farmers (Faiguenbaum et al., 2002). Competition among supermarket chains pushed smaller chains into the smaller rural, lower income, and *desakota* areas. Traditionally, fruit and vegetables were supplied by some 120,000 small and medium sized farmers. Supermarkets, however, are buying their produce from medium to large producers or from specialized suppliers.

Supermarket meat procurement, processing, and application of safety and quality standards, and sales have displaced small independent butcher shops. Supermarkets, however, have indirectly aided the expansion of the milk and dairy sector—now representing some 18 thousand farmers. The shrinkage of low-end traditional markets is limiting the options of small and poor farmers.

### ***Transportation***

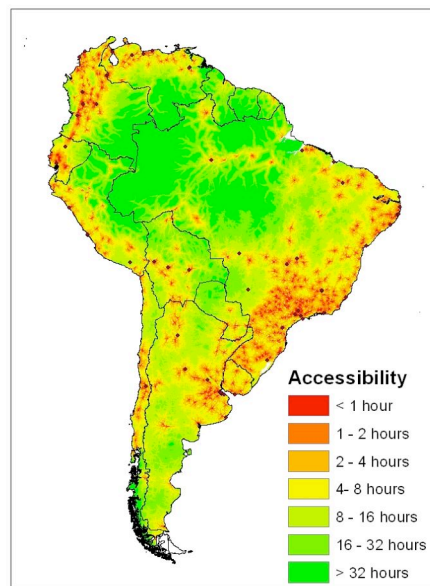
Dense and improved transportation infrastructure characterizes *desakota* development between urban hubs. Latin America, however, could be considered an exception to the typical *desakota* development pattern seen in Asia. Indeed, transportation may be the "Achilles Heel" of development in the region (Keeling 2002). Many roads are unpaved: the region has less than 3% of the world's paved road; and the entire region has fewer highways than California, Germany, or Japan.

There is little research on transportation in the Andes and Amazon. Acosta Rojas et al. (2006) show the importance of road infrastructure in the Andean region and the economic potential of improved roads. An infrastructure gap has been noted by many concerned with transportation in Latin America (Calderon and Severn, 2003). More information is available on the potential impacts of planned projects, although much of this is non-research literature. The conservation and environmental impacts of the Initiative for the Integration of the Regional Infrastructure of South America (IIRSA) are being examined. The IIRSA is an ambitious plan to connect the populated southeastern coast of the continent to the entire region (Killeen 2007).

A prominent characteristic of the transportation system in the Amazon is the low road density compared to other parts of Latin America. Figure 8 shows travel times to cities of 20,000 or more (Jarvis et al., 2008). Vast areas of the Amazon remain isolated, lacking modern transportation connections to the larger region. The Amazon has not seen a *space-time collapse* that is characteristic of development in *desakota* regions. Cities show greater spacing and, except for environmentally destructive agricultural activity, development along transportation corridors is weak.

It has been hypothesized that road building will lead to massive deforestation in the Amazon. Indeed, Laurance et al.'s (2001) road expansion model suggests that this development will not necessarily lead to the kind of mixed-activity and land use that is characteristic of *desakota*. Although we would see space-time collapse, it is not yet strong enough to create the new kind of rural development characteristic of *desakota*.

Figure 8. A map showing travel time to cities of 20,000 population or greater.



Another interesting hypothesis is that improved access in places that have already been cleared may lead to a decrease in deforestation in the Amazon (Weinhold and Reis 2008). While the evidence is not overwhelming, this kind of intensified road development in rural areas is characteristic of *desakota*. But given the open frontier and vast expanses of available land, road building may just lead to more deforestation.

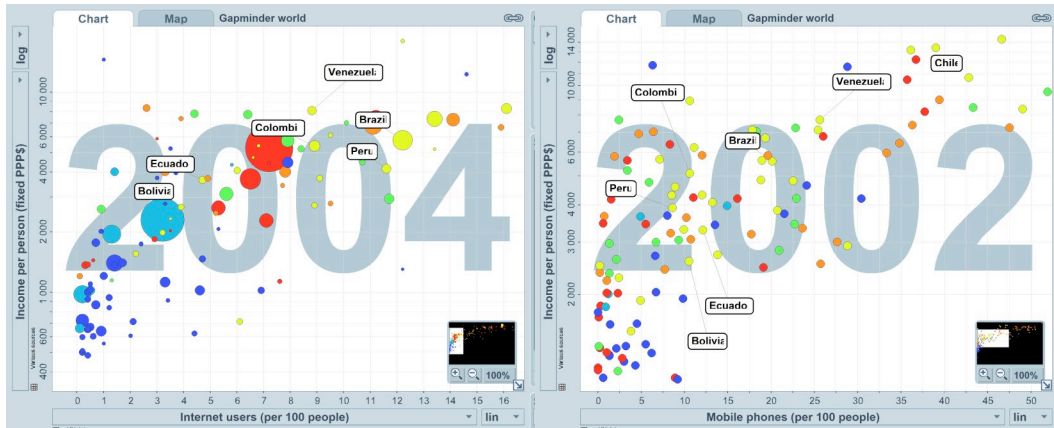
### ***Information and communication technologies***

Information and communication technologies (ICT) indicate *desakota* development since they reduce space-time in interactions between urban and rural areas. ICT in Latin America have experienced a patchwork evolution (Garcia-Murillo 2003). Throughout the region, obsolete and state of the art ICT co-exist. Inequality is a problem: Investments tend to be appropriated by the wealthy few, leaving the poorest behind. Policy-makers will have to provide special attention to "digital divide" issues to ensure more equitable ICT outcomes.

Internet use increases as incomes increase (Figure 9a). Among the Andean countries, greater number of internet users in Peru and Colombia compared to Ecuador and Bolivia not only corresponds to income, but to accompanying degree of emergence of *desakota* zones and factors associated with *desakota* regions—e.g., higher levels of remittances, supermarketization, and new agro-industries.

Similar to Internet use, mobile phone use increases with income (Figure 9b). Both mobile phones and Internet usage connect people to information in ways not previously possible; and represent a “feed-forward” loop, decreasing rural isolation and strengthening the emergence of *desakota* regions.

Figure 9. (a) The number of Internet users per 100 people and (b) the number of mobile phones per 100 people (Gapminder Foundation, 2008).



As distinguished from cyber cafes, telecenters in Latin America are non-commercial and generally have social and development goals (Menou et al. 2004). Unfortunately very little, if any, impact research has been conducted on community telecenters. One of the key problems in their development is long-term sustainability. Governments have promised many more than were actually created. Many of those created cannot acquire the funding and support to keep going. Evidence showing these telecenters to have helped to collapse space-time in rural areas of Latin America is incomplete.

There is a serious lack of studies evaluating the impact of ICTs both globally and in Latin America (Nielsen and Heffernan, 2006). Although their study of resource poor Bolivian farmers showed that there is a potential for these technologies to improve livelihoods and that farmers could learn methods for improved animal husbandry through multi-media learning tools--the broad adoption of such tools has yet to take place.

More research is needed on the impact of ICT in development. Although they must be having some positive development impacts, they could equally be supporting frivolous, non-productive communication and entertainment that does little to improve livelihoods.

### **Consequences/implications for natural resources and environment**

The style of recent rural development in the Andes and Amazon has had strong impacts on natural resources and environmental services. In general, there has been a growing interest in environmental services and functions of natural resources (Pagiola et al., 2005; Poats, 2006). Little research has directly addressed the impacts taking place at the intersection of urban and rural areas (Allen et al., 1999). Jayaraman and Lanjouw's (2004) found that small scale enterprises disproportionately emit pollutants in Brazil, where small scale enterprises (20 employees or less) account for 62% of pollution, but only 50% of employment.



Environmental problems from development differ markedly in the Amazon and the Andes. Development in the Amazon leads to deforestation and soil nutrient and quality loss from land cover change; reduced water quality from mining operations; and climate change and local livelihood impacts from hydroelectric development. As the Amazon is a major global ecosystem, these effects often have global implications. In the Andes, both water availability and water quality are key issues, as well as soil erosion on sloping lands. Development in the Andes has substantially affected the provision of water as an environmental service.

### ***Water demand and conflict in desakota regions***

Access to, and use and regulation of traditional water for agriculture has experienced varied changes and impacts as new agro-industries and non-agricultural demands have developed in the desakota areas; and as newer models of control over and management of water systems for domestic, industrial, and agricultural uses have been added to or supplanted traditional systems. A key feature in the Andes—and one not readily evident to outsiders—is that traditional access to resources has long been inequitable as a result of and a cause of strong social stratification (even among those we consider “poor”).

Traditional water management systems are undergoing changes in the Andes. In one case (Ruf, 2001) nationalization was initially effective in modernizing the traditional water rights system, but was followed by perhaps expected intercommunity conflicts. Intervention by “outsiders” (i.e., the World Bank in this case) also led to perhaps equally expected resistance. A weak state, an ineffective market, and poor common property links may be not uncommon problems faced in emergent desakota areas. Working against the interests of local elites in the Andes will always remain problematic.

Traditional irrigation systems and their management and access are having to adapt to modern desakota forces and demands. Recent research on the Andean irrigation sector posits that local and indigenous water rights and rules in the Andean region have been neglected and discriminated against; and that recognition of and security for local rights and management frameworks is crucial for improving rural livelihoods and food security (Cremers et al., 2005). The Government of Ecuador requested research to propose institutional reform to strengthen the national irrigation sector. Examined were institutional viability, political democracy, equity, and water rights security. Elements for institutional reform are suggested. The complementary roles of central Government, local governments and water user organizations in water resources management are emphasized as is the need to strengthen enabling legal and policy frameworks. The importance of translating constitutional recognition of local and indigenous rights and common property systems into practical procedures and institutional structures is stressed.

There is a substantial literature on Andean irrigation systems. Traditional irrigation systems have been commonly plagued by conflict, if not inefficiency. One case, however, shows how local traditionally-based social organization that has “modernized” (i.e., adapted to new challenges) can lead to equity, transparency, and incentives to obey rules

and conserve water (Trawick, 2001). Building on traditional social norms is likely to be important in settling conflicts over resources in the *desakota* areas of the Andes.

A study of water access and payments for environmental services in the Jequetepeque watershed in Peru suggests that areas with greater *desakota* characteristics (i.e., non-traditional features of Andean systems--higher non-farm employment and income, greater market orientation, higher value perennial crops) are those that would be best able to reap benefits from PES (Raben 2007). Existing inequality reflecting traditional systems could limit the development impacts of PES because poor households lack land and water tenure, and therefore may not be eligible to participate in PES schemes.

Water for modern urban and household use is a *desakota* issue in the Andes. In the city of Cochabamba, Bolivia, domestic water was supplied by a publicly subsidized formal service to higher income users and by an informal system providing more expensive water to more marginal communities (Marvin and Laurie 1999). Such distribution with its differential costs also represents traditional Andean urban social stratification. Recent privatization is resulting in greater internal efficiency and cost recovery, and attention to environmental costs, user participation, smaller scale water technologies, and equity of distribution.

For nearly a decade the La Paz–El Alto concession in Bolivia was seen by donor organizations, the state and the commercial water industry as a private sector ‘pro-poor’ model (Laurie and Crespo, 2007). Managed by one of the largest water multinationals in the world (the French company, Suez), the water network itself was extended beyond the original contract. The concession’s pro-poor image was analyzed, focusing on issues of social exclusion and network extension, contract negotiation, participation and transparency. The rise of social protest about the concession is documented. The paper highlights the need for new mechanisms and delivery models to ensure greater national control over private companies and the development of a framework for international water governance

Problems associated with new irrigation management approaches can be both social and technical. The World Bank’s promotion of privatization of water has, again, perhaps not unexpectedly led to farmer protests (Trawick, 2003). The proposed alternative seeks to both protect the rights of small farmers and to improve the irrigation system. Again, our own experiences highlight that local elites will object to and try to obstruct schemes that take away their long-held advantages. In traditional highland communities, wealth and status differences are not necessarily visibly obvious.

Nunez et al., (2006) calculate the value of fresh water for urban areas. Water is an ecosystem service provided by temperate forests (which also provide internal nutrient cycling, soil protection, biodiversity conservation, and climate regulation. Notable is recognition by policy makers that valuation of such benefits is necessary to then promote sustainable forest management and conservation.

### ***Land degradation***

Studies have examined the effects of non- and off-farm employment on soil conservation in the Andes (Zimmerer, 1993). Off- and non-farm employment opportunities in one Andean community led to reduced implementation of traditional labor intensive conservation methods and to the adoption of more destructive practices. Non-farm opportunities included wage labor in the city of Cochabamba. Off-farm opportunities included seasonal work on commercial coca fields. Traditional intensive soil conservation methods included stone walls and terracing and diversion channels. More erosive practices included tillage by tractors, mono-cropping of wheat, and over-grazing after shifts to less labor intensive livestock production.

Other efforts have shown that natural resource sustainability is not necessarily correlated to poverty (Swinton and Quiroz, 2003). The relationship was variable. Poorer farmers practiced fallowing that reduced soil erosion and fertility loss. Overgrazing and range species loss increased with herd size—a measure of wealth—but was reduced by rotational grazing, a size-neutral practice. Only deforestation from fire wood harvesting was associated with the poor. Increases in social and human capital led to choice of more sustainable practices.

Traditionally in the Andes, farmers have had diverse systems that included soil conserving measures (Pretty and Shah, 1997). Agricultural development in the 20th century brought with it coercive and often single-technology options that were not adopted and often resisted. Inappropriate methods, further, often didn't function as intended, some actually worsening land degradation. A return to farmer participatory methods and building on farmer knowledge and practice could improve soil conservation. Facilitating farmer innovation, building local institutions, and promoting different types of participation are suggested interventions.

### ***Changing demand for environmental services***

In the last decade, global financial institutions and national ministries promoted compensation for environmental services in the Andes (Gentes, 2006). Goals were to mitigate or prevent environmental destruction and to finance sustainable rural development in poor and vulnerable regions. As Andean countries show a "traditional" asymmetric distribution of power, PES models promise sustainability through new rationales and institutions related to the environmental and water administration sectors (Castro, 2004).

### **Consequences/implications for poverty**

#### ***Is poverty increasing, decreasing, and/or changing in desakota regions?***

Desakota-style development can reduce poverty or is associated with poverty reduction, as shown by the growth of agro-industries, non-farm employment and activities increasing labor mobility. Evidence also shows, however, that development works to amplify existing traditional inequality (Acosta et al., 2008). The majority of the world's

poor will continue to live in rural areas for decades to come (Ravallion et al., 2008). Can new urban-rural interactions such as urban dwellers paying for environmental services in their hinterlands potentially improve rural livelihoods? What possible interventions could reduce rural poverty?

The "stages-of-progress" methodology for measuring poverty could also be a promising framework for measuring the influence of *desakota* development (Krishna; 2004; Krishna, 2007). Instead of assessing the income, consumption, and assets of people, the method focuses on the reasons people either fall into or escape poverty. There could be substantial changes in who is becoming poor or who is escaping poverty, even if the poverty rate remains unchanged. A main advantage of the method is that it suggests possible interventions. By targeting the reasons people become more or less poor, not people's income or consumption level, the method suggests actions and policies needed for alleviating poverty. Inherent in the approach are clues to *desakota* characteristics: e.g., developing non-farm income sources could be a poverty exit pathway and fits the *desakota* characteristic of diversifying activities.

Another poverty analysis framework looks at five potential exit paths out of poverty in the agricultural sector (Dixon and Gulliver, 2001).. Farmers could expand operations by simply clearing and cultivating more land (*anti-desakota*, just doing more of the same). A second pathway would be to intensify production by using improved varieties, fertilizers, and pesticides to boost yield on current plots (*trending towards desakota*). A third pathway would be to diversify production by growing different kinds of crops and developing different kinds of farm activities. This pathway seeks to reduce income variability. A fourth pathway with clear *desakota* characteristics is to develop non-farm employment and income. A final poverty exit pathway would be to leave farming altogether. For the Andean region, the growth of the dairy processing industry has been one way for farmers to diversify their activities and generate new income (Dixon and Gulliver, 2001).

The Fuquene watershed in the Colombian Andes shows many *desakota* elements (Johnson et al., 2007). The proximity to Colombia's capital, Bogota, has been an important driver of change. A highly lucrative dairy industry has developed to serve the Bogota urban market. According to local residents, non-farm rural employment and income is the most important factor in whether a household falls into poverty or is able to escape it. In terms of environmental services, the powerful dairy farmers have filled in most of Lake Fuquene to create more of some of the richest dairy lands in the country. In so doing, they have deprived nearby downstream urban populations of domestic water supplies in the dry season and protection from floods in the wet season.

In the Jequetepeque basin in Peru, analysis of poverty, water and land showed associations between characteristics of the household and the level of poverty (Gomez et al., 2007). Poverty was first defined through a participatory process with 21 residents of the watershed. A household survey of 400 families was carried out based on the variables identified in the first step. The analysis resulted in some implied pathways to exit poverty. These include the development of animal husbandry, increasing the share of

non-farm employment and income, and increasing participation in perennial crop cultivation and irrigation – all activities characteristic of *desakota*.

### ***Environmental services and poverty: policy implications***

Several issues need to be addressed if the Andean rural areas of Bolivia, Peru, and Ecuador are to diversify their activities in ways that provide pathways out of poverty (Rushton and Viscarra 2006). These include better links between rural and urban areas, value chains and market integration, better education and services for rural areas. Several areas of research could foster this type of development, including research on improving education in rural areas, on securing property rights, on increasing social capital, on market integration and value chain analysis, and on financial services for the rural poor.

In the Amazon, forest guardians need to be able to sell forest environmental services such as biodiversity, carbon storage, and water provision in order to help achieve the twin goals of maintenance of environmental services and local development (Fearnside, 1997). Challenges include meeting short-term needs while building environmental services, as well as the quantification of services, setting up payment schemes, and how to use such income for sustainable development. After a national decision to sell environmental services rather than beef or soy, recommendations include the usual involvement of local peoples, independent monitoring, economic viability for local peoples, and “how to make services into development”.

Recommendation and policy prescriptions have also be made regarding payments for environmental services in areas long deforested, used for agriculture, and now degraded—i.e., presently providing few environmental services—in the eastern Amazon (Borner et al., 2007). A premise is that policy makers are (somewhat shortsightedly) interested in standing forests and their services rather than in degraded areas. What policies would help generate forest-based ecosystem services and agricultural outputs in such degraded areas? The authors describe the study area and provide land use system analyses—including ecosystem services and small-holder economic/financial returns by land use. The result is a “farm level bio-economic (optimization) model”. Policy scenarios were simulated: use of alternative technologies (mechanized land preparation, improved pasture management, others), PES (for maintaining rather than re-converting older fallows), taxing slash-and-burn agriculture, incentives for mechanical mulching—with and without chemical fertilizer use, and payments for farmers setting aside a portion of their lands for natural regeneration. Various environmental and economic impacts or outcomes are discussed for the different scenarios. Some combination of policy instruments, in the end, will be necessary to face poverty-environmental trade-offs. The paper is important in providing what is essentially an *ex ante* modeling based assessment of several policy alternatives to reverse resource degradation in ex forest areas. The values assigned to the variables used are based on currently available selected, relatively convincing field studies.

A review of eight case studies of market initiatives (schemes providing payments to the poor for environmental services) for carbon sequestration and watershed protection

resulted in suggested policy implications for future development (Grieg-Gran et al., 2005). The goal of using market mechanisms is to achieve both conservation and development. The poor were small landowners--as well as poor service users, and, landless laborers, and poor consumers. Impacts were discussed in terms of the Sustainable Livelihoods Approach of five assets or capitals. Projects included a reforestation program in Ecuador, an avoided deforestation project in Bolivia, and several tree planting projects in Brazil. Problems included inclusion of and payments to wealthier large holders rather than small holders and communities in some cases, contract violations, payments to those who had intended to keep land in forest (where opportunity costs are high), benefits only from employment in two commercial schemes, and insufficient willingness to pay for environmental services. Impacts included increased local incomes, greater land tenure security, and institutional gains—although some of these impacts are somewhat speculative given the recentness of project initiation. Factors limiting impacts included: insecure tenure, high transaction costs, lack of voice in rule formulation, flat payments combined with differential opportunity costs, and spatial specificity forces service buyers to target poor suppliers.

Some policy research recommends that cities acknowledge and pay for rural environmental sustainability (Gutman, 2007). People and—even more so—wealth has migrated to urban areas. The terms of exchange between rural and urban have worked against the former for 200 years. More rural production and out-migration will not lift rural areas out of poverty. And rural agricultural production has contributed massively to environmental degradation. Needed are: a) increasing society's acknowledgement and willingness to pay for sustainable ecosystem services, b) helping the poor become major suppliers of ecosystem services, c) doing business in the new rural-urban contract, d) a labor intensive conservation model, e) new roles for government, development agencies, and international negotiations, and f) more and better science.

## **Conclusions**

Desakota development in the Andes and Amazon regions is evident, but certainly contrasts markedly with Asian desakota, where the concept was originally developed. The economies of the Asian countries have grown rapidly over the last two decades, often led by exports and new types of employment (e.g., in ICT in India). Economic growth in the Andean and Amazon countries has been more measured, and has often focused on commodity exports. Asia has seen strong manufacturing growth, in contrast to a growth in agro-industries and services in Latin America.

Desakota processes are occurring in the Amazon, but at a reduced scale compared to other regions of the world. The Amazon lacks the high rural population density characteristic of desakota in other areas. Transportation axes to large cities and to more economically advanced regions are poorly developed, leaving the region isolated and remote. Livelihoods continue to be based on agriculture and extraction of natural resources. Changes in global demand for biofuels and changing meat-based diets have put new pressures on the agricultural frontiers of the Amazon in Brazil and Bolivia (Nepstad, 2007). These global processes are putting more pressure on the Amazon's

forests (Hecht, 2005). While this growth has created some opportunities for reducing poverty, levels of inequality direct much of the growth towards local elites. Deforestation, soil depletion and degradation, major losses of biodiversity, and emission of greenhouse gasses are key environment consequences of development in the Amazon. Deforestation affects the Amazon's role as a global carbon sink. A key opportunity for addressing poverty in the Amazon is to develop payment for environmental service schemes to avoid deforestation through forest conservation and preservation (Swallow et al., 2007; Fearnside 1997).

Desakota in the Andes is somewhat more similar to the Asian model, but still quite different. The region has relatively high rural population densities. Transportation axes have been developed over centuries, although they lack improvements that could spur development. Andean people have migrated to cities, other rural regions such as the Amazon, and abroad in search of economic opportunities. Remittances return to the rural Andes, but their impact on development appears to be weak. Recent agro-industrial development has increased opportunities for wage labor throughout the region, especially in industries such as dairy, cut flowers and non-traditional agricultural exports. Economic gains, however, are tilted towards local elites in highly unequal societies rather than to the poorer wage earners, especially women. Such wage labor has, however, provided needed employment and has contributed to the emergence of desakota areas. Development in the Andes has exacerbated water availability and quality problems. Soil erosion and degradation and water quality are the key environment consequences of development. Water conflicts between upstream and downstream users have created tensions (e.g. Proano and Poats, 2000), but also opportunities for environmental service provision under schemes that account for these services. Rural-urban compacts are needed to alleviate poverty in the Andes.

Future research on desakota in the Amazon and Andes should focus on the how interactions and flows between urban and rural areas can be enhanced for mutual benefit. Researchers need to address the knowledge gap on the rapidly changing impacts of information and communication technology on development in desakota regions. Improvements in transportation infrastructure could have positive impacts in the Andes, but need to be considered carefully in the Amazon where environmental tradeoffs could be largely negative. While the growth of agro-industry has been positive, benefits have been skewed towards the wealthy and powerful. Fortunately, increased environmental awareness, emergence of democratic civil societies, and general decreases in poverty levels are positive trends throughout the Andean and Amazon countries—factors that may somewhat predict the emergence of desakota characteristics.

## REFERENCES

- Acosta, P., C. Calderon, P. Fajnzylber, and H. Lopez. 2008. What is the Impact of International Remittances on Poverty and Inequality in Latin America? *World Development* 36 (1):89-114.
- Acosta Rojas, G. E., G. Calfat, and R. G. Flôres Jr. 2006. Comercio e infraestructura en la Comunidad Andina. In *CEPAL Review*, 45-60.
- Adell, G. 1999. Theories and models of the peri-urban interface: a changing conceptual landscape, 1-46: University College London.
- Allen, A., N. Da Silva, and E. Corubolo. 1999. Environmental problems and opportunities of the peri-urban interface and their impact upon the poor, 1-46: University College London.
- Balsevich, F., J. Berdegue, L. Flores, D. Mainville, and T. Reardon. 2003. Supermarkets and produce quality and safety standards in latin america. *American Journal of Agricultural Economics* 85 (5):1147-1154.
- Bebbington, A. 2001. Globalized andes? Livelihoods, landscapes and development. *Ecumene* 8 (4):414-436.
- Berdegue, J., E. Ramirez, and T. Reardon. 2001. Rural Nonfarm employment and incomes in Chile. *World Development* 29 (3):411-425.
- Bilsborrow, R. E. 2002. Migration, population change, and the rural environment. *ECSP Report* 8:69-94.
- .
- Borner, J., A. Mendoza, and S. A. Vosti. Ecosystem services, agriculture, and rural poverty in the Eastern Brazilian Amazon: Interrelationships and policy prescriptions. *Ecological Economics* In Press, Corrected Proof.
- Calderón, C., and L. Servén. 2003. The output cost of Latin America's infrastructure gap. In *The Limits of Stabilization: Infrastructure, Public Deficits, and Growth in Latin America*, eds. W. Easterly and L. Servén. Stanford: Stanford University Press.
- Castro, E. 2004. Pago por servicios ambientales (PSA) en cuencas cafetaleras: Valorando económica y ecológicamente la dinámica e integralidad de los agroecosistemas.
- Chami, R., F. Connel, and S. Jahjah. 2005. Are Immigrant Remittance Flows a Source of Capital for Development? *IMF Staff Papers* 52 (1):55-81.



- Chowdhury, S., A. Negassa, and M. Torero. 2005. Market Institutions: Enhancing the Value of Rural-Urban Links. In *Food Consumption and Nutrition Division Discussion Paper*, 1-44. Washington, DC: IFPRI.
- Cremers, L., M. Ooijevaar, and R. Boelens. 2005. Institutional reform in the Andean irrigation sector: Enabling policies for strengthening local rights and water management. *Natural Resources Forum* 29:37-50.
- Da Silvia, J. G., and M. E. Del Grossi. 2001. Rural nonfarm employment and incomes in Brazil: patterns and evolution. *World Development* 29 (3):443-453.
- Deininger, K., and P. Olinto. 2001. Rural nonfarm employment and income diversification in Colombia. *World Development* 29 (3):455-465.
- Dirven, M. 2004. Rural non-farm employment and rural diversity in Latin America. *CEPAL Review* 83:47-66.
- Dixon, J., and A. Gulliver. 2001. *Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World*. Rome and Washington D. C.: FAO and World Bank.
- Dolan, C. S., and K. Sorby. 2003. Gender and employment in high-value agriculture industries, World Bank.
- Elbers, C., and P. Lanjouw. 2001. Intersectoral transfer, growth and inequality in rural Ecuador. *World Development* 29 (3):481-496.
- Escobal, J. 2001. The determinants of nonfarm income diversification in rural Peru. *World Development* 29 (3):497-508.
- .
- Faiguenbaum, S., J. Berdegue, and T. Reardon. 2002. The rapid rise of supermarkets in Chile: effects on dairy, vegetable and beef chains. *Development Policy Review* 20 (4):459-471.
- Farrington, J., and J. Mitchell. 2006. How can the rural poor participate in global economic processes? *Overseas Development Institute (ODI), Natural Resource Perspectives* 103.
- Fearnside, P. M. 1997. Environmental services as a strategy for sustainable development in rural Amazonia. *Ecological Economics* 20 (1):53-70.

- Gapminder Foundation. 2008. Gapminder. Available from <http://www.gapminder.org/>. Accessed on 29 April 2008.
- Garcia-Murillo. 2003. Patchwork Adoption of ICTs in Latin America. *The Electronic Journal on Information Systems in Developing Countries* 15 (1):1-9.
- Gentes, I. 2006. Compensation for environmental services and public policies in indigenous and peasant communities of the andean countries: New methodologies and strategies for a countrywide dialogue. *Rev. geogr. Norte Gd.* 35:29 - 44.
- Gomez, L. I., K. Raben, H. M. Ravnborg, and D. Rodriguez. 2005. Pobreza, agua y tierra en Jequetepeque, Perú: perfil de pobreza y el acceso y manejo del agua y de la tierra en la parte alta de la cuenca de Jequetepeque, Perú. *DIIS working paper* 2005 (14):1-50.
- Grieg-Gran, M., I. Porras, and S. Wunder. 2005. How can market mechanisms for forest environmental services help the poor? Preliminary lessons from Latin America. *World Development* 33 (9):1511-1527.
- Gutman, P. 2007. Ecosystem services: Foundations for a new rural-urban compact. *Ecological Economics* 62 (3-4):383-387.
- Hataya, N. 1992. Urban-rural linkage of the labor market in the coffee growing zone in Colombia. *Developing Economies* 30 (1):63-83.
- Hecht, S. 2005. Soybeans, Development and Conservation on the Amazon Frontier. *Development and Change* 36 (2):375-404.
- Holman, F., L. Rivas, J. Carulla, B. Rivera, L. Giraldo, S. Guzman, M. Martinez, A. Medina, and A. Farrow. 2003. Evolution of Milk Production Systems in Tropical Latin America and its interrelationship with Markets: An Analysis of the Colombian Case. *Livestock Research for Rural Development* 15 (3).
- Humphrey, J. 2007. The supermarket revolution in developing countries: tidal wave or tough competitive struggle? *Journal of Economic Geography* 7 (4):433-450.
- Hyman, G., C. Perea, G. Lema, E. Barona, and J. Correa. 2005. Local, national and regional scale context of sustainable development in Latin America and the Caribbean.
- Janvry, D., and E. Sadoulet. 2000. Rural poverty in Latin America: Determinants and exit paths. *Food Policy* 25 (2000):389-409.
- Jarvis, A., S.E. Castano, G. Hyman, S. Gebhardt, E. Guevara, M. Castro, J. Touval, L.

- Sotomayor, 2008. Project Report: TNC Threats Assessment Version 2. The Nature Conservancy and Centro Internacional de Agricultura Tropical.
- Jayaraman, R., and P. F. Lanjouw. 2004. Small-scale industry, environmental regulation, and poverty: The case of Brazil. *World Bank Economic Review* 18 (3):443-464.
- Johnson, N., J. Garcia, J. Rubiano, M. Quintero, R. Estrada, E. Mwangi, A. Moreno, A. Peralta, and S. Granados. 2007. Watershed management and poverty alleviation in the Colombian Andes.
- Jokisch, B. 2002. Migration and Agricultural Change: The Case of Smallholder Agriculture in Highland Ecuador. *Human Ecology* 30 (4):523-550.
- Keeling, D. J. 2002. Transportation Challenges for Latin America in the 21st Century. In *Latin America in the 21st Century: Challenges and Solutions*, ed. G. Knapp, 77-104. Austin: University of Texas Press.
- Kessler, J. J., T. Rood, T. Tekelenburg, and M. Bakkenes. 2007. Biodiversity and Socioeconomic Impacts of Selected Agro-Commodity Production Systems. *The Journal of Environment and Development* 16 (2):131-160.
- Killeen, T. 2007. A Perfect Storm in the Amazon Wilderness: Development and Conservation in the Context of the IIRSA. *Advances in Applied Biodiversity Science* 7:102.
- Killeen, T., V. Calderon, L. Soria, B. Quezada, M. K. Steininger, G. Harper, Solorzano, and C. Tucker. 2007. Thirty Years of Land-cover Change in Bolivia. *Ambio*.
- Korovkin, T. 2005. Creating a Social Wasteland? Non-traditional Agricultural Exports and Rural Poverty in Ecuador. *Revista Europea de Estudios Latinoamericanos y del Caribe* 79.
- Krishna, A. 2004. Escaping Poverty and Becoming Poor: Who Gains, Who Loses, and Why? *World Development* 32 (1):121-136.
- . 2007. For Reducing Poverty Faster: Target Reasons Before People. *World Development* 35 (11):1947-1960.
- Laurance, W., M. Cochrane, S. Bergen, P. Fearnside, P. Delamonica, C. Barber, S. D'Angelo, and T. Fernandez. 2001. The future of the Brazilian Amazon. *Science* 291:438-439.
- Laurie, N., and C. Crespo. 2007. Deconstructing the best case scenario: lessons from water politics in La Paz–El Alto, Bolivia. *Geoforum* 38:841-854.
- Marvin, S. and N. Laurie 1999. "An Emerging Logic of Urban Water Management, Cochabamba, Bolivia." *Urban Studies* 36(2): 341-357. McGee, T. 1991. The

- Emergence of Desakota Regions in Asia: Expanding a Hypothesis. In *The Extended Metropolis: Settlement Transition in Asia*, eds. N. Ginsburg, B. Koppel and T. McGee. Honolulu: University of Hawaii Press.
- Menou, M. J., K. D. Poepsel, and K. Stoll. 2004. Latin American Community Telecenters: "It's a long way to TICperary". *The Journal of Community Informatics* 1 (1):39-57.
- Nepstad, D. 2007. Interactions between Amazon economies, ecosystems, and climate: Opportunities for policy intervention. Climate Change and the Fate of the Amazon, Oxford, United Kingdom.
- Nielsen, L., and C. Heffernan. 2006. New tools to connect people and places: the impact of icts on learning among resource poor farmers in Bolivia. *Journal of International Development* 18 (2006):889-900.
- Nunez, D., L. Nahuelhual, and C. Oyarzun. 2006. Forests and water: The value of native temperate forests in supplying water for human consumption. *Ecological Economics* 58 (3):606-616.
- Pagiola, S., A. Arcenas, and G. Platais. 2005. Can Payments for Environmental Services Help Reduce Poverty? An Exploration of the Issues and the Evidence to Date from Latin America. *World Development* 33 (2):237-253.
- Peskett, L., R. Slater, C. Stevens, and A. Dufey. 2007. Biofuels, Agriculture and Poverty Reduction. *Overseas Development Institute (ODI), Natural Resource Perspectives* 107.
- Poats, S. 2006. Report on the Latin American Regional Workshop on Compensation for Environmental Services and Poverty Alleviation in Latin America. *World Agroforestry Centre 2006*.
- Pretty, J. N., and P. Shah. 1997. Making soil and water conservation sustainable: From coercion and control to partnerships and participation. *Land Degradation & Development* 8 (1):39-58.
- Proaño, M., and S. Poats. 2000. Abundancia o Escasez? Concesiones, Conflictos y Políticas en el Manejo del Agua en la Cuenca del Río El Angel, Carchi-Ecuador. *CONDESAN Gray Literature*.
- Raben, K. 2007. Access to water and payment for environmental services, Jequetepeque watershed, Peru. *DIIS Working Paper* 2007 (10):1-27.
- Ravallion, M., S. Chen, et al. 2008. New evidence on the urbanization of global poverty.

- Background paper for the World Development Report, 2008. Washington, DC, World Bank: 47.
- Reardon, T., and J. Berdegue. 2001. Rural nonfarm employment and incomes in Latin America: overview and policy implications. *World Development* 29 (3):395-409.
- . 2002. The rapid rise of supermarkets in Latin America: challenges and opportunities for development. *Development Policy Review* 20 (4):371-388.
- Ruf, T. 2001. "Water disputes in the Ecuadorian context up to the Third Millennium: no state, no market, no common property. The transition of Santa Rosa (Tungurahua province)." *International Journal of Water: 1:3/4: 250-269* 1(3/3): 250-269.
- Rushton, J., and R. Viscarra. 2006. Productive Strategies for Poor Rural Households to Participate Successfully in Global Economic Processes, 1-53.
- Swallow, B., M. van Noordwijk, et al. 2007. Opportunities for Avoided Deforestation with Sustainable Benefits. Nairobi, Kenya, ASB Partnership for the Tropical Forest Margins: 52.
- Swinton, S., and R. Quiroz. 2003. Is Poverty to Blame for Soil, Pasture and Forest Degradation in Peru's Altiplano? *World Development* 31 (11):1903-1919.
- Tacoli, C. 1998. Rural-urban interactions: a guide to the literature. *Environment and Urbanizations* 10 (1):147-166.
- Trawick, P. B. 2001. Successfully Governing the Commons: Principles of Social Organization in an Andean Irrigation System. *Human Ecology* 29 (1):1-25.
- . 2003. Against the Privatization of Water: An Indigenous Model for Improving Existing Laws and Successfully Governing the Commons. *World Development* 31 (6):977-996.
- Weinhold, D., and E. Reis. 2008. Transportation costs and the spatial distribution of land use in the Brazilian Amazon. *Global Environmental Change* 18 (2008):54-68.
- WRI (World Resources Institute). 2007. EarthTrends: Environmental Information, World

Resources Institute. Available from <http://earthtrends.wri.org/index.php>

Zimmerer, K. 1993. Soil erosion and labor shortages in the Andes with special reference to Bolivia, 1953-91: Implications for "conservation with-development". *World Development* 21 (10):1659-1675.