

Part II G3

The Fuquene watershed: a Desakota case study from the Andes

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Globalization and advances in communication and infrastructure have changed the relationships between “rural” and “urban” in developing countries. The desakota model, developed in Asia, highlights the greater interaction and melding among local places and the larger national and international economic system. How well does this model explain recent changes in rural and urban development the Andes of Latin America? We provide a case study of the Fuquene watershed in the Colombian Andes to assess recent demographic, socioeconomic and technological changes and their effects on rural and urban development and on ecosystem services, especially water.

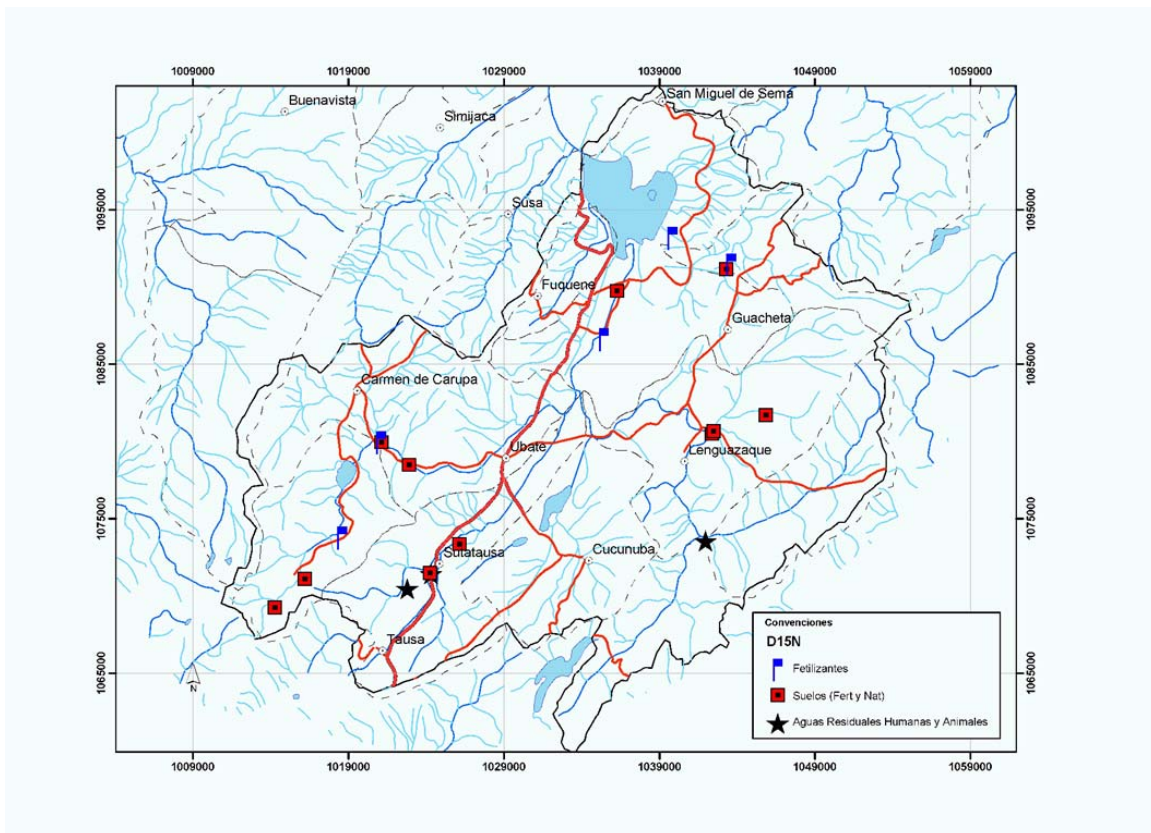
The Fuquene watershed (187,200 ha, 2300-3300 masl, 700-1500 mm rainfall) exhibits many of the changes commonly seen throughout the Andean region. Located two hours by road from Colombia’s capital, Bogota, development linked to urban demand has affected the economic and environmental conditions of the watershed. These changes have drawn the attention of the national government and international development organizations. Agricultural policy supporting labor-saving and productivity-enhancing technology as well as traditional inequitable access to and control over resources have guided economic growth in the watershed and similar rural areas of Colombia.

The watershed is characterized by potato and grain cash-crop production at higher altitudes (xxxx to xxxx masl). Laguna Fuquene is located downstream at the lowest part of the sub-watershed. The watershed continues with the Fuquene River flowing from the lake. The area surrounding the lake is one of the richest dairy areas of the country (a stocking rate of seven cows/ha, each providing 15 liters of milk per day). Fuquene dairy farmers represent some of the richer and more powerful families of Colombia. Over the last century they have increased the dairy lands by filling in much of the shallow lake’s border with soils taken from slightly higher areas. The lake surface area has declined from some 13,000 to 2,000 ha. Although the filling-in of the lake has possibly been assisted by sedimentation from upper portions of the watershed and by eutrophication stemming from fertilizer-based nitrogen and phosphorus inflows, it is largely powerful private interests that have degraded an important local public good or set of environmental services.

The decreased lake volume has reduced its natural functions: a) in controlling downstream flooding during the rainy season, b) in providing domestic water for the urban populations downstream in the dry season, and c) in providing a habitat for wildlife. Downstream water users have requested that the narrow outlet to the lake be raised an additional 50 cm to provide additional drinking water. The raised volume would submerge some 5,000 ha of prime dairy land. Not surprisingly, the dairy farmers—who appear to have the upper hand—are not supportive of the proposal.

As might be expected, development has also led to reduced water quality and land degradation in the sub-watershed. These problems in the Fuquene, however, are perhaps atypical compared to many other cases of upstream and downstream management and use of soil and water resources. Upstream land degradation from cropping on sloping lands is actually limited by low rainfall and very deep soils. Although it was thought that the dairy farms contributed to eutrophication of the lake, nutrient inflows were traced to upper watershed users—from cropped areas when chemical fertilizer prices were low and from various point sources of contaminated residual waters (Figure 1). Again, any increased sedimentation and eutrophication helped increase the land area available for dairy cattle production, meaning that the downstream users (dairy producers) actually have had no objection to such normally negative inflows. Oddly (although this has not been reported) it is conceivable that the dairy producers could point at their upstream land users as culprits in arguing their own case against the interests of urban environmental service users downstream from the lake. Overall, the Fuquene represents long established power relationships between the elite and all others. The system of resource use is neither equitable nor has been subject to attempts to install more democratic systems. In part, the lack of improvement in water governance may be due to the much greater attention Colombia has had to pay to the long running conflicts with the leftist guerrillas and with the paramilitary groups (with the latter more aligned with the elite sectors of society).

Figure 1. Fertilizer and residual water contaminant flows determined using $\delta^{15}\text{N}$ isotope tracing. From Rubiano et al., 2007.



In terms of broader economic development in the area, several studies provide information for our assessment of the degree to which this site exhibits the characteristics of desakota development. Johnson et al. (2007) and Rubiano et al. (2007) provide an overview of these studies. Some preliminary findings follow.

Rural non-farm employment (RNFE) and income (RNFI) – one indicator of desakota – grew substantially over the last three decades in the Fuquene watershed (Johnson et al., 2007). RNFE was cited by 24% of households interviewed as the main poverty exit pathway – the most important factor in poverty reduction of all the ones identified (Table 1). Although more research is needed to define the characteristics of RNFE in Fuquene, mining and dairy appear to be the main elements of this change. The dairy industry has grown substantially given a large market for milk and cheese in Bogota—and more recently—increased prices due to rapidly increasing global demand (Figure 2). Increased exports of milk and dairy products largely reflects infrastructure development by national and international companies producing dried milk powder over the past decade.

Figure 2. Value of milk exports from Colombia, two-year moving average, 1985 to 2004

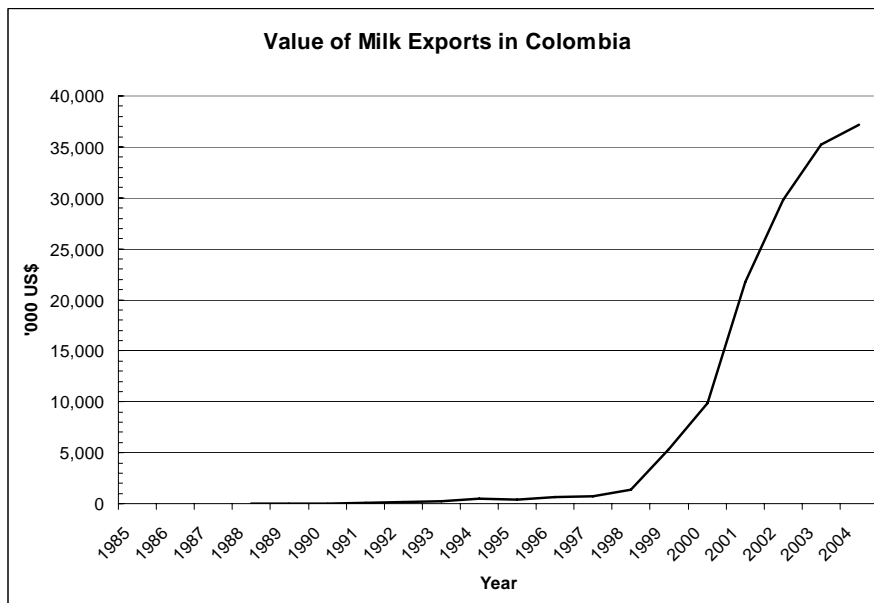


Table 1. Reported causes of changes in poverty status, Fuquene (% of families); adapted from Johnson et al., 2007.

Causes	Named as 1 st cause n = 251	Named as 2 nd cause n = 181	Named as 3 rd cause n = 71	% of all
Off farm employment	24	24	11	22
Inheritance	19	9	11	14
Help from family, friends	8	15	10	11
Day labor	7	8	4	7
Government aid	6	5	7	6
Pension	6	3	4	5
Savings/investment	4	14	14	9
Agriculture	2	4	6	4
Livestock	1	3	9	3
Education/training	1	2	4	2
Illness/accident	4	2	4	3
Bad habits	4	3	0	3
Unexpected loss, small landholding, credit, large family, small family, newly established family, good money management, old age, collective action, fishing, migration	14	8	14	11
	100	100	100	100

Families interviewed in the watershed reported that inheritance and help from family and friends are major pathways out of poverty. Long term migration and remittances was mentioned but was relatively unimportant, however (Table 1). Illness or accidents and “bad” habits were seen as factors contributing to poverty. Overall, poverty has declined throughout the area in the period 1985-2002 (DANE, 2005; Table 2). Poverty is not associated with the rural or urban nature of municipalities, a finding that agrees with the *desakota* idea of breaking down older rural-urban distinctions (Figure 2).

Technological changes leading to the growth of small industry and increased interaction between rural and urban areas reflect *desakota* processes. One critical change in the Fuquene watershed was subsidized adoption of automated milking machines and cheese-making technology that led to unemployment for the mostly women who previously milked the cows.

Increased use of cell phones, the Internet and other information and communications technologies (ICT) have also reflected *desakota* phenomena. ICT growth has effectively reduced the costs of communication and improved interaction between the Fuquene watershed, Bogota, the rest of the country, and the world. Given connectedness to friends and relatives, the poor from the watershed are as likely and able to seek ways to improve family or individual well-being by taking advantage of opportunities in Bogota and surrounding areas as compared to staying with the confines of the Fuquene.

Development and change in the Fuquene watershed represents both *desakota* and non-*desakota* characteristics. On the one hand, modern development in an otherwise rural

area has stemmed from cash cropping and a strong modern dairy industry combined with urban market demand, transport infrastructure, communications and information services, and participation in regional and global markets. It appears that such development has led to the creation of off-farm employment activities; and that those activities in services, transport, information and communications, and the like have led to local increases in wellbeing.

On the other hand, dairy development has been made possible by the expropriation by local/national elites of public environmental services (albeit via a policy loophole that allowed land ownership to the shores of the lake, regardless if that shoreline was moved by land in-fills). The land increases have come at the expense of the lakes services to downstream users in terms of flood control and domestic water supplies, and to the wider public in terms of wildlife habitat. Strong policy measures will be required to reverse these inequitable outcomes. The government-supported mechanization of milking also led to the unemployment of women milkers—another factor that has worked against desakota type development.

Conclusions

The Fuquene is perhaps not atypical of Latin America, with land and water resources (and corresponding ecosystem services) still controlled by traditional elites. Production systems in such areas are undergoing change with participation in regional and global markets and with corresponding “modernization” of infrastructure—i.e., mechanized dairy production for global markets in the present case. Although poorer women lost jobs as milkers in the process, the poor have overall enhanced their position locally by participation in off-farm activities—ostensibly in the provision of goods and services that support the local agro-industries. The closeness to Bogota—physically and in terms of communications and social networks--also means that many people are tied equally to local and to Bogota-oriented opportunities.

Poverty alleviation throughout the Andes is taking place; and, as in the Fuquene, such progress is being made less from local agricultural development and more by economic diversification, continued and high urbanization, relatively sound investment in and provision of social services in health and education, demand for new goods (including cut flowers and food provision for supermarkets within the country) and services (including in health, education, communications),

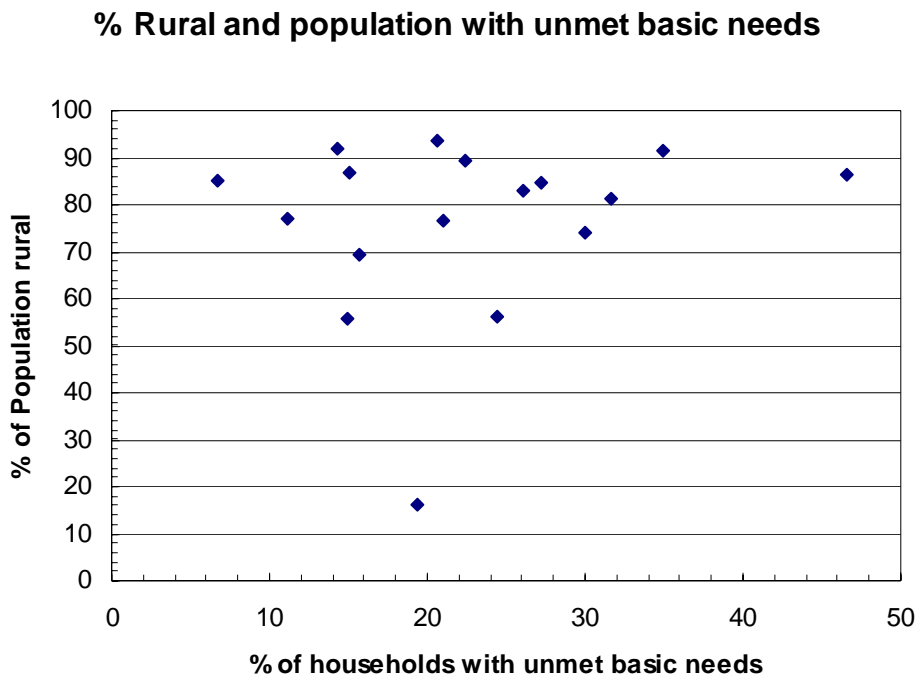
A free trade agreement between the US and Colombia is currently being negotiated; and, if approved, will have further implications for desakota development in the Andes. Will Andean producers of poultry, milk and dairy, shoes, liquors, and other goods targeted for export be hurt or helped by the agreement? If helped, it is conceivable that small to medium scale agricultural-based processing and industry could prosper while providing needed employment for many. It is equally possible that US subsidized goods arriving in Colombia will pose a further threat to local development.

Finally, the inequitable access to and management of ecosystems services in the Fuquene may be an anachronism. Colombia has long had an active public, one that, for example, protests loudly and successfully in the face of the possibility of urban public infrastructure projects cutting down any trees. For desired change to occur, the public (and especially downstream water users) will need to embrace the Laguna Fuquene as a public good and take active steps for its restoration.

Table 2. Poverty reduction in municipalities of the Fuquene watershed, 1985-2002

Municipality	NBI 1985	NBI 2002	Reduction NBI 1985-2002 (%)
Caldas	73	21	52
Chiquinquirá	40	19	21
Ráquira	80	47	36
Saboyá	85	35	50
San Miguel de Sema	64	15	49
Sutamarchán	88	32	56
Tinjacá	91	27	64
Carmen de Carupa	70	26	44
Cucunubá	85	7	78
Fúquene	60	14	45
Guachetá	67	16	51
Lenguazaque	77	11	66
Simijaca	48	15	33
Susa	65	21	44
Sutatausa	63	30	33
Tausa	72	22	49
Ubaté	42	24	17

Figure 3. Percent households with unmet needs vs. % rural population of each municipality (each dot is a municipality in Fuquene)



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