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Commentary

Disabusing cocaine: Pervasive myths and enduring realities of a globalised commodity☆

Liliana M. Dávalos[a,1,2], Adriana C. Bejarano[b,*,2], H. Leonardo Correa[c]

[a] Department of Earth and Environmental Sciences, The Open University, UK
[b] Department of Environmental Health Sciences, University of South Carolina, USA
[c] Sistema Integrado de Monitoreo de Cultivos Ilícitos- United Nations Office on Drugs and Crime, Colombia

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ABSTRACT

For more than 30 years Colombia has waged an internal War on Drugs with the support of the international community. During this time, the illegal economy has evolved toward integrating cultivation with processing and trafficking, making Colombia the largest grower of coca in the world. The environmental impact of coca production and processing is vast, accounting for large quantities of toxic chemicals directly dumped onto the soil and watersheds, as well as most deforestation since the 1990s. The policies pursued to stem the coca economy, however, are based on unfounded assumptions about the behaviour of coca growers in the context of international markets. Despite their unfounded premises, these assumptions have acquired a mythical stature. In this article we review the most persistent myths about coca production with a view to understanding its links to environmental degradation. To this end, we present data on the economic and demographic background of coca growers, their impact on the environment, and their behaviour in the larger context of international markets and current eradication policies.

A recent review on the environmental impact of eradicating drug crops by aerial herbicide spraying in Colombia (Solomon et al., 2007) has revived the debate on the ecological collateral damage from the war on drugs. The mix of international and domestic politics, incipient scientific results, and chronic social ills has a role for everyone, from researchers to activists. The actual protagonists of the illegal agriculture and eradication drama, the illegal growers, seem strangely absent from the discussion. And yet it is the growers—responding as individuals to combinations of price signals, shifting social standards, and law enforcement—that are largely responsible for the direct and indirect environmental impacts of illegal crops. Understanding the actual conditions surrounding the growers becomes indispensable if environmental policies are to be responsive to the threats arising from illegal drugs.

As with other aspects of illegal economies, there are few systematic studies of coca growers in their environment, and some of the most widely cited articles on the subject are simply anecdotal reports (Dávalos, 2001), or passing mentions of the possible impact of illicit crops on wider environmental trends (Etter, McAlpine, Phinn, Pullar, & Possingham, 2006; Kaimowitz, 1997). This void of information has rapidly been filled by a number of assumptions about illegal drug producers and their relationship to environmental degradation in Colombia, as well as other producing countries. In time, and through constant repetition, these assumptions have acquired a mythical stature, despite their unfounded origin and contradictory premises. We review the most pervasive myths about illicit crops and their relationship to environmental damage by presenting new data from socioeconomic surveys of growers and remote sensing analyses conducted by the UNODC-sponsored *Sistema Integrado de Monitoreo de Cultivos Ilícitos* (SIMCI). The smallholder survey encompassed field trials in eight Colombian regions, as well as interviews with more than 1300 coca-growing families. Remote sensing analyses were part of SIMCI's mission of monitoring illicit cultivation every year. SIMCI verifies roughly 40% of coca detected, in areas of high density or dubious localities, through surveillance flights. The scope of the SIMCI's data collection efforts by no means exhausts the need for further field surveys and analyses, but it provides a critical quantitative baseline that has been missing from previous studies of the environmental consequences of illicit crops. We interpret these

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* Corresponding author at: Department of Environmental Health Sciences, Research Center, 921 Assembly Street, Columbia, SC 29208, USA.
Fax: +1 803 777 3391.
E-mail address: BejaranoAC@gmail.com (A.C. Bejarano).
[1] Current address: Department of Ecology and Evolution, 650 Life Sciences Building, Stony Brook, NY 11794-5245, USA.
[2] Authors contributed equally to this paper.

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data in light of the broader historical and socioeconomic context, departing from an exclusively environmental focus, to document the economic and demographic trends that underlie coca production and its effects on natural resources. Whilst our goal is to help shape environmental policy, understanding who the coca growers are, and how they behave as resource users is relevant to the struggle to suppress illegal drugs in the Western hemisphere.

Planting coca improves the growers' standard of living

A high-value crop has the potential to relieve environmental pressure, as growers would obtain higher income whilst using less land. Cocaine is expensive, so surely coca growers have a huge income, right? Yes, but the standard of living of growers is low, increasing the need to exploit local resources and decreasing the resilience of these communities. Both the environment and the market play roles in determining this outcome. The regions where most coca is grown are not the ones that produce legal agricultural exports, such as coffee or flowers, and so these are not directly comparable. The export market for tropical commodities, such as bananas or oil palm, is restricted to a few large landholders. The cassava, plantains, legumes, or fruit that tropical smallholders grow is part of a subsistence economy or sold only at local markets. Even if there were comparable licit crops, the experience of Bolivia, another large coca producer, suggests there are few viable alternatives (Barrientos & Schug, 2006). Despite a multi-decade effort to reduce coca cultivation, the fight against this illicit crop is far from over in Bolivian lowlands. In Cochabamba, the adaptability of coca plants, low maintenance, high demand, high market security and low overall risks, make this crop more competitive that alternative crops such as pineapples, banana, passion fruit, palm heart and pepper. The initial investment for coca crops for 2002 was 4–24 times lower and employed a minimum of 18% and a maximum of 58% more workers than alternative crops in the region. Whilst the cost of coca amounted 230 US$/ha and provided employment for 280 daily workers; bananas and pepper required greater investments (in order, 995 and 5435 US$/ha) and employed fewer farmers (117 daily workers for the former and for the latter 215). Other disadvantages of these alternative crops in the global market versus coca include the demand for high quality products, the low relative prices, and the more intense competition with other producing countries. To summarize, in the ecological zones where most coca is grown in Colombia there is currently no other exportable commodity and smallholder alternatives involve either raising cattle (when enough land is available), or working as a hired hand in a larger farm.

Cattle ranching as an economic alternative to coca poses its own set of environmental risks and economic challenges. A study from Amazonian Ecuador in the 1990s found that the most environmentally unsound farming system—conversion to extensive pasture—was precisely the one that provided a higher standard of living (Murphy, Bilsborrow, & Pichón, 1997). Raising cattle provided more income to the richest local *campesinos* than other economic activities, such as timber extraction or growing lowland coffee, making it the preferred avenue to a better life. Strikingly, the proportion of land in pasture was positively correlated with household wealth and income, whereas the proportion of land in crops was negatively correlated. Technical assistance, prior experience, and a legal land title were all important determinants of affluence, as were better soils and closeness to the road. The picture that emerges is one where the most forest-consuming activity, cattle ranching, would require significant infrastructure investments and technical assistance to play the role that coca does in the Colombia's forested frontier.

Smallholders growing coca have higher income than legal producers. The estimated net income of a coca-growing family for 2006 was US$ 5194 (SIMCI & ICMP/UNODC, 2006), whereas the income of a rural family not involved in coca production adjusted for inflation to the same year was $2413 (Deininger & Olinto, 2001). Recent in-depth surveys, however, show that coca cultivation does little to improve a family's standard of living. There are two main reasons for this apparent paradox: first, most coca growers live in frontier settlements where the cost of living is substantially higher than elsewhere because of transport costs and disincentives to local production wrought by the easy cash associated with coca. Legal and illegal income, therefore, are context-specific and should not be compared as if they were interchangeable. Second, the average coca-growing family would incur higher labour costs and much greater risks in expanding production, making greater economic gains difficult. The mean number of persons per coca-growing family is between 4 and 5, with 2–4 being involved directly in illicit production. Household labour alone can sustain only moderate expansion before having to hire collectors (from large pool of itinerant *raspachines*), and there might also be a greater risk of detection and becoming a target of fumigation. According to the smallholder survey, involvement in coca cultivation is largely motivated by market stability and efficient commercialisation that lower economic risks compared to legal crops (UNODC & Gobierno de Colombia, 2007).

More coca means more forest, since other cash crops require greater area

If cattle ranching is the main alternative to coca cultivation, then coca might prevent forest clearing because it produces higher value in a smaller area (Álvarez, 2002, 2003; Kaimowitz, 1997). The reality, however, is that coca has hastened the pace of land transformation because productivity per unit area is not the only or the most important determinant of land use in forested lowlands (Plate 1). Deforestation rates associated with coca are alarming. In a single year (2005–2006) 47,256 ha of the total estimated area cultivated with coca (77,870 ha) were new cultivated lands, with 21% of the crops (9998 ha) replacing primary forests (UNODC & Gobierno de Colombia, 2007). According to the FAO, Colombia lost on average 47,000 ha/year of all types of forest between 2000 and 2005 (FAO, 2007), so coca alone can account for all the annual forest loss. Coca is the single most important driver of deforestation in the country (Fig. 1).

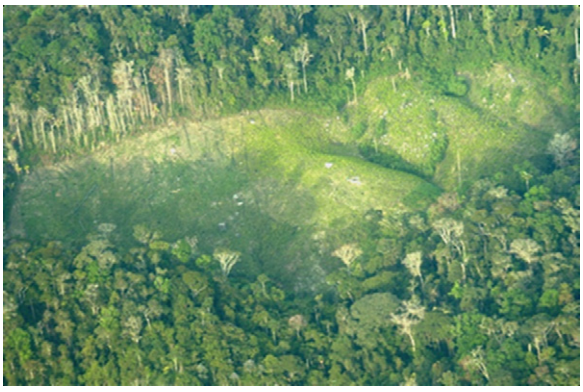

Plate 1. Land transformation linked to illicit coca crops in the forests of Colombia. Photo by H.L. Correa.

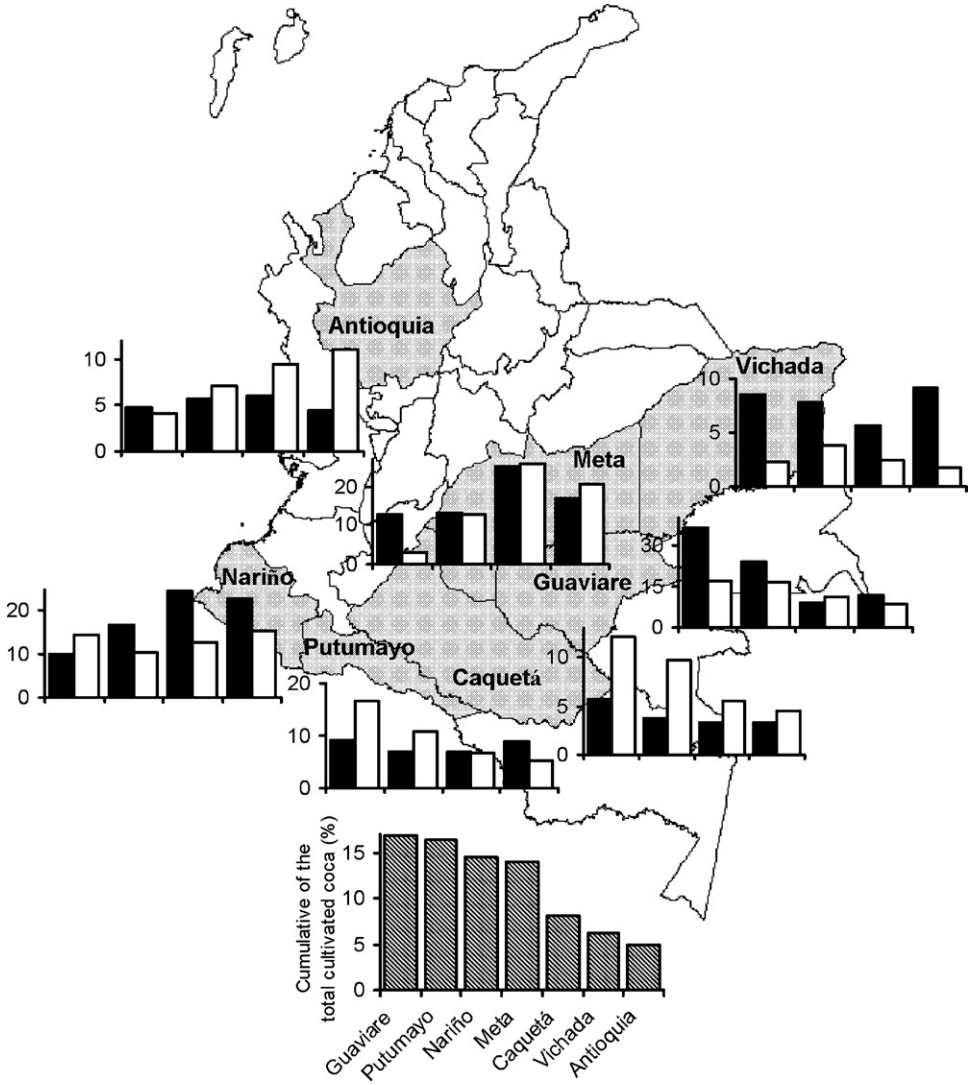

Fig. 1. Primary coca producer *departamentos* in Colombia between 2001 and 2006. Plots by *departamento* represent the percent coca cultivation (*y*-axis) replacing primary (■) and secondary (□) forests in 2001, 2002, 2003 and 2004 (left-to-right; *x*-axis). The bottom figure represents the cumulative coca cultivated by *departamento* over 6 consecutive years (total area cultivated 530,023 ha).

Despite the evidence, fragmentation from coca might be small compared to the impact from legal crops or cattle ranching if illicit crops suddenly ceased to be an option. Comparative deforestation analyses along the Ecuador–Colombia border suggest otherwise; coca is a catalyst for landscape change (Viña, Echavarria, & Rundquist, 2004). Between 1985 and 1996 rates of fragmentation in Colombia, where coca began to expand, almost trebled those of Ecuador. In Ecuador deforestation was linked solely to legal activities so these rates can be interpreted as a "background" rate of fragmentation, much lower than that in the dynamic Colombian frontier. Coca has produced much greater deforestation than can be accounted for by population growth and, although the study was limited to western Amazonia (Viña et al., 2004), these environmental effects are likely common to other areas of coca expansion.

Intensification of aerial fumigation programs and increased pressure and threats to coca growers have encouraged the mobility of illicit crops (Dion & Russler, 2008), particularly to areas where poor infrastructure and low state presence prevail. Some of the most remote, least accessible protected areas have been affected. In 2005 8% of new coca fields were within national parks, an area equivalent to 6646 American football fields. Before aggressive aerial eradication took hold in the Putumayo basin, *departamentos* within the Amazon basin (Vaupés, Guainía, and Amazonas) generally contributed little to total coca production because they lacked infrastructure and people. As of 2006, however, small new coca fields have sprung up in primary forests of the Orinoco and Amazon basins. These new fields are probably safer alternatives for coca commercialisation and transport, given the regional focus in fumigation and interdiction.

There is a counterargument, however, to the argument that eradication makes cultivation more mobile and dynamic: official government policy posed that without fumigation coca cultivation would expand beyond it current extent (US Secretary of State in Consultation with the Secretary of Defense, 2003). Weighing the hypothetical expansion without fumigation against the real displacement of coca with fumigation in the absence of comparative field surveys seems futile. We conclude from observation that whilst aerial fumigation has not succeeded in eradicating coca, its vertiginous growth has coincided with coca expansion to many vulnerable ecosystems.

Fumigation will make immigrants who produce illicit crops return to their area of origin

Part of the justification for focusing much of the aerial fumigation program in southern Colombia was the assumption that most growers were recent arrivals from regions in conflict, or seeking stable employment after trying their luck in the cities. If this were the case, fumigation would succeed in relieving pressure on the forest by pushing these immigrants away from the frontier and into the cities, or back to already heavily transformed Andean landscapes. The demographic survey of coca growers has shown that, contrary to this expectation and in agreement with anthropological studies, growers are second- and third-generation residents of the rural areas of municipalities in the *departamentos* of Nariño, Cauca, Antioquia, Bolívar, Meta, Caquetá, and Putumayo (Ramírez, 2001b; SIMCI & ICMP/UNODC, 2006). In fact, in Putumayo and Caquetá, the focus of the most aggressive eradication campaign, 65% of growers were born in the same *departamento*. Only relatively new coca fields in Vichada have a majority of growers from other regions (60%). Recent immigrants to coca-growing regions are, according to the survey, primarily smallholders displaced from their areas of origin—often other conflict-ridden frontiers—by force, or poverty (SIMCI & ICMP/UNODC, 2006).

There was a time when first-generation immigrants populated the forested frontier (and this is the case today in, for instance, Vichada and Guaínia). Generalized armed conflict beginning in the 1940s, boom-and-bust cycles of resource exploitation, and policies in the 1960s intended to relieve agrarian conflict in the Andes by offering titles and land in the Amazonian lowlands were responsible for vast migrations to the forest frontier over the last century (Pérez-Martínez, 2004). By the late 1990s when eradication began in earnest these populations were already rooted in their regions (Ramírez, 2001a; Ramírez & Molano, 1998).

Today, most frontier smallholders driving coca deeper into the forest are second and third-generation locals. Even when government programs enticed immigrants to the frontier: (1) public and private investment remained low, the latter mostly focused on resource extraction and similar low-employment economies; (2) services and law enforcement have not reached the large colonisation fronts; (3) these areas have not been integrated into domestic transportation networks until very recently. The coca economy has taken hold of parts of the country where economic disadvantage is structural and systemic rather than linked to transient or current economic conditions. These conditions also help explain why the higher profit margins of coca cultivation have not produced higher standards of living. Rather than dislodge the *colonos* (settlers) from the forest frontier, aerial fumigation has strengthened coca growers' identity and connection to the land (Ramírez, 2001a), making future relocation to less environmentally sensitive areas even more difficult.

Illicit crop eradication increases consumer price thereby reducing demand

This is one of the main stated goals of eradication (Bureau of International Narcotics and Law Enforcement Affairs, 2004; The White House, 2005), and since both cultivation and aerial fumigation have had profound consequences for forests and natural resources, we review it here. The current eradication strategy is driven by the assumption that limiting coca production will directly result in reduced availability of cocaine, thus increasing its street price, diminishing profits and discouraging consumption. There are several reasons why this scenario has not played out as planned, one is practical, the second is agronomical, and the other two are economic.

First, aerial fumigation has not been particularly effective at eradicating the crop, and therefore has not limited production. Despite hundreds of thousands of hectares fumigated, year-to-year analyses show that fumigated plots readily re-grow or are re-planted. The on-site investment in alternative development necessary to sustain eradication gains has lagged far behind the fumigation campaign—in part because it is easier to spray a plant from the air than to generate sustainable alternatives on the ground. As of 2006, US expenditures on alternative development in coca-growing regions of Colombia stood at US$ 72.0 million, whilst the costs of military assistance focused on aerial fumigation were around US$ 205.0 million (Center for International Policy, 2007). The current cocaine production is so high that the prices in both the US and the European markets continue to decline. Whilst in 1990 the estimated price of cocaine in the US was $45/g and in Europe was c. $90/g, by 2004 prices had dropped by 50–56% (SIMCI & ICMP/UNODC, 2006).

Second, eradication has not translated into reduced cocaine availability because growers have, over the course of the years, selected for plant varieties with higher cocaine content than those planted 30, 20, or even 5 years ago. During that time illegal laboratories have also perfected more efficient purification methods. The joint result of these trends is more efficient cocaine production. From a documented average yield of about 0.11% weight of cocaine from fresh leaves estimated by the US Drug Enforcement Administration's operation "Breakthrough" in 1999, current coca cultivation in Colombia currently yields about 0.15% of its weight in cocaine (SIMCI & ICMP/UNODC, 2006).

Third, fumigation has not led to declines in production because coca cultivation eradicated in one country or region has been relocated to another, this is the so-called "balloon effect" (Fig. 2). Within Colombia, it is difficult to trace the migration of growers who, as pointed out before, are mostly confined to the region where they were born. The occurrence of coca in regions where it was previously unrecorded, as happened in parts of Nariño following aggressive eradication campaigns in Putumayo, suggests production in one area replaces that of another. The link between different areas has been inferred (Dion & Russler, 2008), but direct documentation has been elusive. Cross-country figures more clearly show the rise and fall of production depending on in-country policing, and provide stronger evidence for the balloon effect.

The final reason why aggressive eradication has not produced a steep decline in production is the expansion of the market worldwide. This has allowed production to remain stable or expand without sharp drops in prices (although a gradual multi-decade decline in prices has been noted above). The last decade has

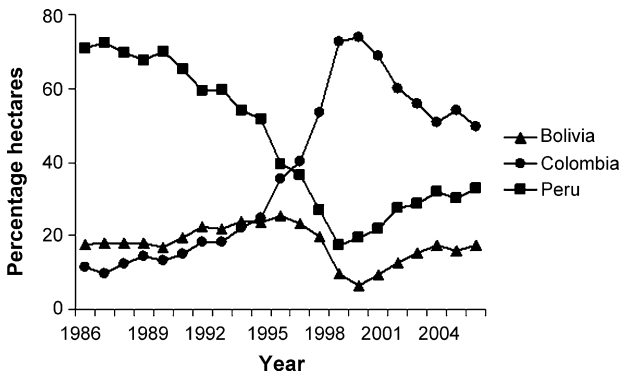

Fig. 2. Cumulative percentage of hectares per year cultivated with coca in Bolivia (▲), Colombia (●) and Peru (■) between 1986 and 2007.

been one of growing consumption of cocaine and derivatives in parts of Western Europe, developing countries, including Colombia (UNODC, 2006), and emergent economies of former communist countries (UNODC, 2007). Despite lower revenues, particularly in developing countries, these emerging drug markets more than make up for any decline in consumption from the United States (National Drug Intelligence Center, 2008). It is important to point out, however, that the stated policy goal of consistently increasing the street price of drugs through coca fumigation has not been achieved over the last 10 years in Colombia, or anywhere else. Coca eradication and production, and consumer prices and demand for cocaine are not as tightly coupled as the myth assumes. Fumigation has not led to overall declines in production, and growing worldwide demand can make coca lucrative—especially considering the social and environmental context of the smallholders—despite expanding production.

The behaviour of the illicit crop problem over the years suggests that internationally coordinated eradication and development strategies are necessary but not sufficient to achieve lasting reduction of cocaine production and its impact on forests. The development and promotion of alternative agricultural markets, together with strategies to reduce aggregate demand, are also critical to sustaining eradication gains.

Illicit crop eradication through aerial fumigation is environmentally neutral and it works

Aerial fumigation has been the main strategy to eradicate illicit crops in Colombia over the last 20 years. The environmental effects of aerial fumigation have not been studied in detail, but some reports argue that fumigation is preferable to the large-scale deforestation and chemical use associated with illicit crops (Cavelier & Etter, 1995; Solomon et al., 2007). Fumigation could have the opposite effect. A recent study from Putumayo documented defoliation of more than 32,000 ha of vegetation other than coca, including native forest as well as food crops (Messina and Delamater, 2006). If fumigated areas were effectively eradicated, spraying might be environmentally beneficial in the long run, by curbing pressures on the forested frontier. Aerial fumigation, however, has not translated into lasting eradication and has had little impact on coca production. Although short-term estimates sometimes show decreased coca cultivation, total production remains high and is essentially stable. This reflects adaptation on the part of growers by, among others: (1) protecting their plants from herbicide by manual defoliation or by preventing herbicide absorption through the leaves; (2) selecting highly productive coca varieties with higher yields and adaptations to specific regional features; (3) planting smaller plots that can be overlooked by current monitoring programs; (4) clearing new plots in remote and often inaccessible and remote areas surrounded by natural forests; (5) switching to agroforestry coca, plants mixed with native trees or legal crops, such as plantains or fruits, to hide the illegal crop or reduce the efficacy of aerial fumigation (UNODC & Gobierno de Colombia, 2007).

The fumigation strategy might be successful if illicit crops were invasive species responding only to environmental conditions, rather than the resources and commodities that they in fact are. Because illicit crops are intimately linked to the rural economy and global trade, eradication strategies that exclude coca growers and offer no economic alternatives have failed. In fact, aerial fumigation has only marginally affected coca cultivation, but seems to have contributed to population displacement (Dion & Russler, 2008). Since the most aggressive aerial fumigation campaign began large numbers of growers have moved into national parks and protected areas, increasing colonisation and development pressures there. There is no definitive proof that fumigation has caused this expansion, but the parallels are suggestive and point to, at least, correlation. The shift in cultivation to Amazonia, and in particular its natural parks, can be traced in time to intensive eradication in the Putumayo basin. As noted before, over the last 5 years coca cultivation has also migrated to the Pacific region, where poverty is more common and infrastructure poorer than in the rest of the country. The Pacific region of Colombia, sometimes called the biogeographic Chocó, is also a biodiversity hotspot harbouring more than 2200 endemic flowering plants and more than 420 endemic vertebrates. Displacement to the Pacific threatens with extinction many more species than in the Caquetá or Putumayo. More research to track the causal network of cultivation, fumigation, and environmental degradation is urgently needed. By necessity this research will have to be interdisciplinary, drawing insights from economics, ecology, anthropology, and toxicology. The report on environmental consequences of fumigation commissioned by the Organization of American States (Solomon et al., 2007) is only the beginning of a much needed research program in Colombia and in other global biodiversity hotspots affected by illicit crops (Fjeldså, Álvarez, Lazcano, & León, 2005).

Conclusion

As with other lucrative activities, the production of illegal drugs is a powerful and far-reaching agent of environmental degradation that is only beginning to be studied. Unlike other productive endeavours, there are international agreements—however disputed—to suppress the production and flow of illegal drugs. Suppression thus far has been carried out through policies that ignore the environmental and economic context of illicit crops, as well as the demographic characteristics of growers. Ongoing efforts against opium poppy in Afghanistan, where coerced eradication temporarily reduced cultivation but also increased local instability and political turmoil, only decrease the long-term viability of the state (Mansfield & Pain, 2007). The Colombian and Afghan experience shows that aggressive policies that reduce the growers' income without providing real solutions to wider economic and social needs are doomed to failure. There are many policy changes implied in the growing body of knowledge on illicit crops (e.g., Jones, 2004; Vargas-Meza, 2008), and models of eradication that have met with more success than that applied in Colombia (e.g., Rerkasem, 1999). It is beyond the scope of this paper to describe what future policies ought to be.

We argue that the first element toward building more effective policies is systematic research on the characteristics of smallholder households, both within and outside coca-growing regions. Right now, monitoring counts coca as if it were an invasive species, to the point that fumigated plots are counted as eradicated (again, this would be true only if coca were an invasive plant). There is a void of knowledge about the differences in outlook and income between households that grow coca and those that do not in any given region. Aside from the smallholder survey, which focused on productivity and yield but produced data on many other variables, very little is known about how growers manage and adapt to their environment. These are not idle academic pursuits; these are pressing questions, critical to establishing legal markets and providing viable alternatives. Only policies based on the realities of the growers rather than on long-cherished myths have any chance of making a difference.

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