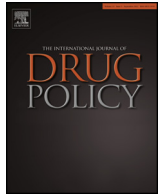




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Research paper

Coca cultivation and crop eradication in Colombia: The challenges of integrating rural reality into effective anti-drug policy

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ABSTRACT

This paper examines the positive and negative (or intended and unintended) impacts of anti-drug policies such as the aerial spraying of coca crops in Colombia. It provides spatial analysis of coca cultivation and crop eradication at a fine scale of resolution using the latest UNODC data. The findings suggest that anti-drug policy in Colombia between 2001 and 2012 has had some success with a significant decrease in overall levels of coca cultivation, but that it has also led to the displacement of coca cultivation, notably to areas within the Colombian Pacific region. Negative impacts include continued deforestation and damage to ecosystems, and the further marginalization of Afro-Colombian communities whose collective territories have been subject to increased coca cultivation between 2001 and 2012. Alternative development programs have not been well aligned with such areas where other illegal activities such as mining as well as coca cultivation now occur. Hence the importance of designing anti-drug policy that comprehensively integrates the local nuances of those peoples and places affected by coca cultivation and crop eradication according to their particular contexts.

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Introduction

According to the *World Drug Report 2015* produced by the United Nations Office on Drugs and Crime (UNODC, 2015), the latest data indicate that in 2013 coca cultivation continued to decline worldwide, reaching its lowest level since the mid-1980s. This decline in coca cultivation, which has mostly occurred in Peru and Bolivia, is seen by the UNODC as translating into reduced demand for cocaine with markets shrinking globally. In Colombia, however, coca cultivation in 2013 remained stable albeit at historically low levels. Indeed, Colombia remains the world's main supplier of cocaine (UNODC, 2015) despite the much-touted success of its crop eradication programs.

A concerted battle against coca cultivation and cocaine production and trafficking has been waged in Colombia with assistance from the United States of America (USA) since the 1980s (Mejia, 2015). It was initially unsuccessful as the removal of the traditional drug cartels left a vacuum that was soon filled by the Revolutionary Armed Forces of Colombia (FARC). Therefore, in

1999, the joint USA-Colombian strategy of Plan Colombia was announced. It aimed to reduce illegal drug production in its first stage through coca crop eradication, and to increase security conditions by wresting control of large areas of the country from the hold of paramilitary groups.

The eradication of coca crops in Colombia has progressed significantly under Plan Colombia with areas under cultivation having fallen from over 160,000 ha in 2000 down to 48,000 ha in 2013 (UNODC, 2013). In some respects, however, it has been a costly and ineffective exercise warranting attention on other programmes including greater investment in the development of alternative livelihoods (Mejia, 2015; UNODC, 2015). Yet even this seemingly positive policy inflection is problematic when viewed in light of the longstanding criticisms of coca crop eradication programmes conducted in Colombia and elsewhere in the Andean region.

Anti-drug policies vary internationally, as Guridi (2002) notes, particularly with respect to the Andean region. The overall policy of the European Union in relation to supply is based on the recognition that the fundamental problem of illegal drug production stems from the poor social conditions of certain regions, whereas the approach taken by the USA has been to blame the producing countries. The USA has subsequently aimed its anti-drug policies at “combating”

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production in Latin America (by strengthening the armed forces and applying measures for crop eradication), rather than creating structural solutions.

While interdiction and repression have characterised anti-drug policies in the Andean region, their implementation has not necessarily led to farmers abandoning coca cultivation. Instead, in Bolivia, for example, its expansion into other zones during the 1990s has been documented (Guridi, 2002). Similar outcomes in Peru led Cabieses (1999) to suggest that the forced eradication of illicit crops ought not be pursued as a condition or first step taken before developing alternative rural livelihoods, but rather that reduced coca cultivation would result with this latter's establishment early on.

In the Colombian case, Thoumi (2005) affirms that anti-drug policy has been formulated under simplistic suppositions about the origins of the phenomenon. Notably, he suggests that politicians have been reluctant to formulate basic questions about the causality of the coca cultivation problem, frequently reducing it to the existence of an external demand for drugs. This type of diagnosis does not enable one to see the internal differences within or the structural causes of coca cultivation in Colombia.

Deforestation is a major problem associated with coca cultivation, and 290,000 ha of forest were lost for this reason in Colombia between 2001 and 2013 (UNODC, 2015). Much of this forest clearance occurs in areas of high biodiversity, with the slash-and-burn technique increasing soil erosion, and the use of herbicides and fertilisers deleteriously impacting sensitive ecosystems (Álvarez, 2007; Dávalos et al., 2011). It is usually explained by the displacement of illicit coca cultivation following crop eradication. For example, Moreno-Sánchez, Kraybill, and Thompson (2003), using an econometric analysis, find that farmers respond to crop eradication by cultivating more extensively. Spatial analyses likewise demonstrate the displacement of coca cultivation using jurisdictional maps (Dion & Russler, 2008), land use coverage maps (Dávalos et al., 2011), and ecosystem maps (Rincón-Ruiz, Pascual, & Romero, 2013). However, the causes of deforestation are complex. While it is associated most with illegal logging and cattle ranching, crop eradication is also seen to precipitate deforestation due to farmers clearing even more land for growing licit (low value) crops rather than continuing coca cultivation elsewhere (Bradley & Millington, 2008; Dávalos et al., 2011).

The most important aspect of the strategy of the small farmers is not to achieve maximum benefit but rather to minimize risk, in other words, to guarantee secure income, through an adequate combination of crops and other types of activities that as a whole enable them to satisfy the basic needs of their families (Ibanez & Carlsson, 2010). Rather than high income levels for the communities, coca provides ease of storage, transport and commercialization along with guaranteed access to the market in isolated and poor zones (Rincón-Ruiz & Kallis, 2013; Rincón-Ruiz, Pascual, & Flantua, 2013). Thus structural solutions for local development might involve guaranteed local or regional markets. As Ortiz (2004) confirms, anti-drug policy in Colombia has failed to take into account the cultural and socioeconomic characteristics of the farmers and their reasons for cultivating such crops. In other words, the policies are not based on knowledge of the local reality nor are they agreed upon with the population.

It therefore appears that local models and nuanced interpretations can provide a much better explanation for the existence of coca crops than the averages identified by global models (Rincón-Ruiz & Kallis, 2013; Rincón-Ruiz, Pascual, & Flantua, 2013; Rincón-Ruiz, Pascual, & Romero, 2013). Likewise, anti-drug policy must be tailored according to local realities rather than, as is currently the case, a general policy that exists for the entire country (Isacson & Poe, 2009). Indeed, locally sensitive policies can be far more efficient than generalized initiatives.

In this paper, we provide further empirical evidence that helps to answer the fundamental question: What are the positive and negative (or intended and unintended) impacts of anti-drug policies such as crop eradication used to combat coca cultivation in Colombia? We add to the existing literature critically assessing anti-drug policy in Colombia with the research presented here. In particular, we provide new and more up-to-date information that has been generated and analysed in a spatial context, using fine-scale data and geographic information system applications to produce detailed maps.

Methodology

The data presented in this article are derived from the UNODC. Data on changes in land use, notably loss of vegetation cover due to the planting of coca (affectation) and its eradication or abandonment (substitution to legal crops or cover change), accord with information contained in the multi-temporal analyses which have been published annually by the Integrated Illicit Crops Monitoring System in Colombia (SIMCI) since 2001.

SIMCI is part of the Worldwide Illicit Crop Monitoring Program created by the United Nations General Assembly in 1998. Beginning in 1999, the SIMCI in Colombia has been monitoring illicit crops; during the first two years, its scope was focused on measurement of those areas planted with illicit crops based on the interpretation of satellite images and verification overflights. However, since 2001, the studies also have focused on the territories affected by the presence of these crops, generating multi-temporal analyses among others.

The methodology for carrying out the annual censuses of illicit coca crops has been approved in Colombia by the National Government and internationally by the United Nations and the University of Boku. The process involves four phases (UNODC, 2013): (1) Visual interpretation of satellite images that are downloaded, geometrically rectified and radiometrically and spatially improved, to identify and demarcate coca plots; (2) Field verification through overflights; (3) Corrections for areas without information, temporality and secondary information (aerial aspersion and eradication); and (4) Integration into the geographic information system of the SIMCI for spatial analyses.

Data on illicit coca (therefore excluding that grown by Indigenous peoples for legitimate use) were collated at the fine scale of the municipal level, and spatial analysis was conducted using the software packages SPSS, GeoDa and ArcGIS. However, any assumptions about the accuracy of the data remain with the usual caveats. Anti-drug policies have also been examined in relation to information about crop eradication which has been provided by the Dirección Nacional de Estupefacientes (DNE) and reported with the UNODC (2011, 2013). The deforestation caused by coca crops refers to the loss of vegetation cover stemming directly from the planting of coca (affectation) and its eradication or abandonment (substitution). We also use maps (shape format) divided according to the legal status of Colombian territories into: National Parks, Indigenous Reserves, and Afro-Colombian Communities, thus permitting the documentation of differentiated changes in coca cultivation and crop eradication in each of these territories.

Anti-drug policy and crop eradication 2001–2012

The eradication of coca crops is a key component of Colombia's anti-drug policy alongside efforts to disrupt cocaine production and trafficking (even though both are overshadowed by the investment in militarization and police and security forces). The main method of eradication is by aerial spraying or fumigation

which was pursued cautiously in the late 1970s in order to fight cannabis plantations, but was extended in 1994 to cover the expanding areas of coca cultivation. Aerial spraying has since intensified and proliferated variously across Colombia with the signing of Plan Colombia in 1999 and the creation of the Program of Eradication of Illicit Crops with Glyphosate in 2000. Plan Colombia has been celebrated by politicians there as a great success in reducing the total area of the country used for coca cultivation. Indeed, the total land area given over to coca cultivation has fallen from 144,800 ha in 2001 to 48,000 ha in 2012 (see Fig. 1). Aerial spraying increased from 2001 to 2006, was reduced between 2006 and 2009, and then continued at a constant pace between 2009 and 2012.

There are strong criticisms of aerial spraying. Mejia (2015) notes that an average of 128,000 ha has been sprayed annually in Colombia since 2001, and yet research indicates that aerial spraying has had little positive impact, is very costly, subverted by coca growers' novel responses, and negatively impacts human health as well as the environment. It has also been accompanied by

a policy of forced (and sometimes voluntary) manual eradication. While far less expensive, however, manual eradication campaigns have been made difficult by local hostility and by FARC's protection of coca crops with landmines. Colombian governments have therefore advocated aerial spraying over forced manual eradication, which has been decreasing since 2008 (see Fig. 1).

Although anti-drug policy has led to a significant decrease in coca crops between 2001 and 2012, the deforestation caused by illicit crops has increased especially since 2008 and despite the marked reductions in coca cultivation in the same period of time (see Fig. 2). One explanation for this paradox is that the cultivation of coca crops has been displaced to other areas, thus generating new deforestation. This phenomenon has generally been referred to in terms of 'the balloon effect' which is an economic description of what happens when, given a fairly elastic supply function but fairly inelastic demand function, temporary supply reductions lead to higher prices subsequently stimulating greater supply production. It is demonstrated for coca cultivation in the Andean region (Bradley & Millington, 2008) and specifically in the Colombian case

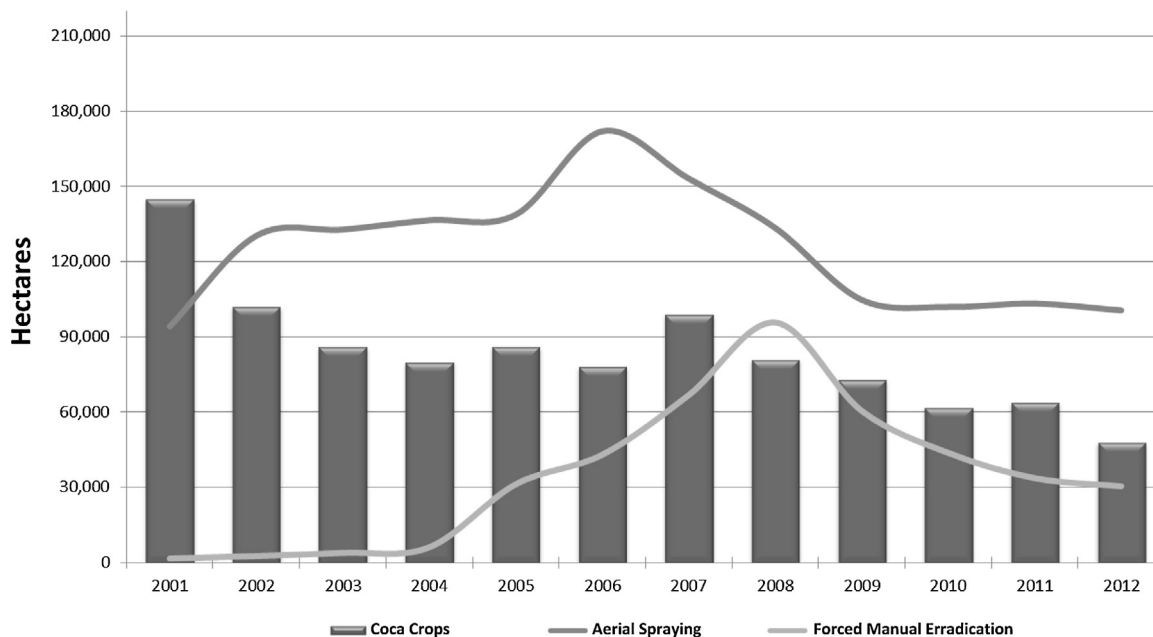


Fig. 1. Coca crops, sprayed areas and areas subjected to manual eradication 2001–2012. Source: UNODC (2013).

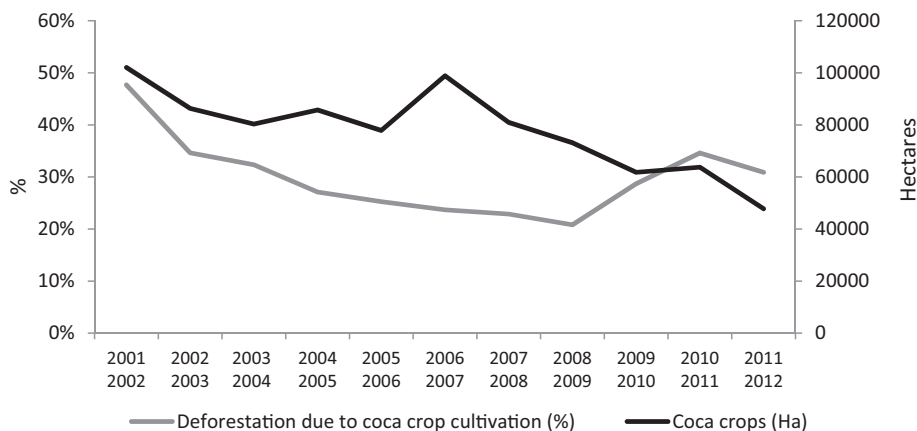


Fig. 2. Rate of deforestation due to coca crops 2001–2012. Source: UNODC (2013).



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations.

Map 1. Coca crops in Colombia by Regions. Source: UNODC (2013).

(Rincón-Ruiz & Kallis, 2013) including with the most recent data presented in this paper.

Regional trends and permanence of coca crops 2001–2012

According to the UNODC methodology, the departments of Colombia where there are illicit crops according to the interpretation of satellite images are administratively distributed to

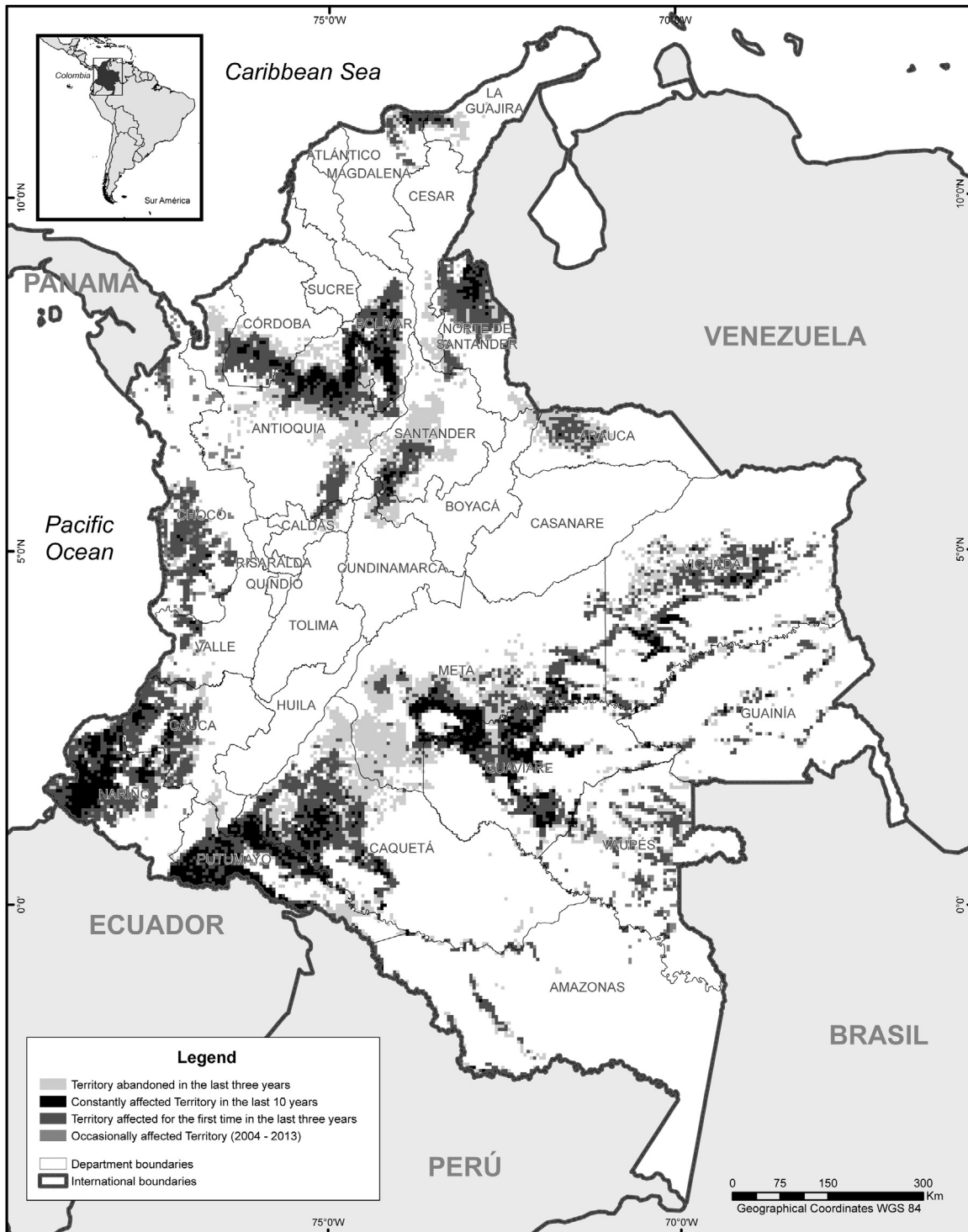
regions as follows: Amazonía (Amazonas, Guainía and Vaupés), Central (Antioquia, Bolívar,¹ Boyacá, Caldas, Cesar, Córdoba, Cundinamarca, Norte de Santander and Santander), Guaviare-Meta (Guaviare and Meta), Orinoquía (Arauca and Vichada), Pacifico (Cauca, Chocó, Nariño and Valle), Putumayo-Caquetá

¹ The South of Bolivar has a different dynamic compared to the rest of the department.

(Caquetá and Putumayo) and the Sierra Nevada (La Guajira and Magdalena). The trends and permanence of coca cultivation between 2001 and 2012 varies significantly among the different regions (see Map 1).

In 2001, Colombia's Putumayo-Caquetá region was responsible for the country's largest area of coca cultivation by region, accounting for 43% of the national total with over 61,000 ha under coca. By 2012, coca cultivation in Putumayo-Caquetá had been

reduced to less than 16% of what had been the region's 2001 level. This region has thus been leading more than just reflecting the national decrease in coca cultivation, which fell by 67% between 2001 and 2012 (from 145,000 to 48,000 ha). Nonetheless, despite such reductions, the cultivation of coca crops has been displaced to the Colombian Pacific region. This region is one of the world's most biodiverse (Myers, Mittermeier, Mittermeier, da Fonseca, & Kent, 2000) and the only region of the country in which there has been an



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Map 2. Permanence of coca crops (2001–2012).
 Source: UNODC (2013).

increase in the cultivation of such crops, rising from 11,200 to 19,000 ha during the 2001–2012 period.

In the Pacific region, there was an increase of approximately 70% in areas of coca crops between 2001 and 2012, in which Nariño has accounted for the lion's share (an average of 74% of the coca in the region is in this department). However, the increase in Chocó (869%) and Valle (162%), even though they constitute the two departments with the smallest area planted with coca in this zone of the country, shows the considerable displacement over the last

decade of this illegal activity towards the plains of the Colombian Pacific (Cauca had an increase of 38% and Nariño 43%). Currently, 40% of coca crops in Colombia are located in the Pacific region.

All regions of the country where coca crops have been recorded show areas of permanent affectation, corresponding to 16% of the total surface area affected since 2001. Those areas or territories of permanent affectation are mostly found in the departments of Nariño, Putumayo, Meta, Guaviare, the South of Cauca, South of Bolívar and Norte de Santander (see [Map 2](#)).



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations.

Map 3. Coca crops in Natural parks, Indigenous reservations and collective territories of Afro-descendent communities 2012. Source: UNODC (2013).



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations.

Map 4. Alternative development and stability of coca crops.
 Source: UNODC (2013).

Recent territorial expansion or zones of recent affectation refer to areas where coca crops have been found during the last 3 years. They are mainly located in the Pacific, Sierra Nevada and Amazon regions. These areas correspond to 6% of the total area affected since 2001.

However, 48% of the territories with records indicating the presence of coca crops since 2001 have had intermittent affectation. In other words, for those zones where this illegal activity of coca cultivation has occasionally been found, it is

present in some years but not in others. This phenomenon has mainly occurred in the departments of Chocó, Vaupés, Vichada, South of Cauca and Norte de Santander.

Areas where coca crops have been abandoned over the last 3 years are mainly in the South of Meta, the Urabá Antioqueño² and Santander. They account for 30% of the total area affected by coca cultivation since 2001.

² Refers to the northern region of the department of Antioquia (coastal area).

Impacts on tropical rainforest, ecosystems and protected areas 2001–2012

According to UNODC (2013) estimates, a total of 259,086 ha of forest was cleared for coca cultivation in Colombia between 2001 and 2012. Even though the size of the area planted with coca in 2012 was less than in the previous year, clearing land specifically for the cultivation of that crop resulted in 15,307 ha

of forests that existed in 2011 subsequently being cut down. Of these forests, 61% was primary tropical rainforest of great complexity, biodiversity and richness.

When comparing areas of coca cultivation in 2012 with the ecosystems map of Colombia (IDEAM et al., 2007), it is calculated that 84% of coca crops are concentrated in just 4 of the 34 biomes identified in Colombia. Furthermore, 33% are in the tropical rainforest of the Pacific and Atrato River Basin, 24% in tropical



The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations.

Map 5. Mining and coca crops.
Source: UNODC.

rainforests in Amazonía and Orinoquía, 16% in the foothills (lower orobiome of the Andes) and 11% in forests along the rivers (helobiome) of the Pacific and the Atrato Basin. It is noteworthy that the highest percentage of coca crops is to be found in tropical rainforests, mainly along the Pacific, a region considered one of the country's, and the world's, most important in terms of biodiversity.

The size of areas planted with coca crops in protected areas of the National Parks system decreased by 44% between 2001 and 2012 (from 6050 to 3400 ha). In the Indigenous Reserves, there was a 62% decrease in the area of coca crops (from 11,900 to 4500 ha). However, in the collective territories belonging to Afro-Colombian Communities (located principally in the Pacific region), there was a 46% increase in areas planted with coca (from 4500 to 6600 ha), with the high points occurring in the years 2007, 2008 and 2011 with 12,100, 12,600 and 12,100 ha, respectively (see [Map 3](#)).

Anti-drug policy, sustainability and future challenges

Highly vulnerable ecosystems and populations in Colombia (mainly the tropical rainforests and Afro-Colombian Communities of the Pacific region, respectively) have been the most affected in the last decade by the displacement of coca cultivation. As a result, and as [Rincón-Ruiz and Kallis \(2013\)](#) demonstrate, aerial spraying has impacted the collective territories of Afro-Colombian Communities, with negative effects on human health, loss of crops and pollution of water sources. Furthermore, these Afro-Colombian peoples are frequently dispossessed of their land because their remote location leaves them caught between an absent state and a paramilitary involved in counter-insurgency and drug trafficking, as discussed by [Ballvé \(2012, 2013\)](#) in relation to the borderlands between the Pacific and Central regions.

So, even though coca cultivation has decreased nationally in Colombia, it persists through displacement and concentration in other, often more disadvantaged rural communities as well as ecologically sensitive areas. In fact, if there is one rural problem that has not been resolved by anti-drug policy, it is the failure to provide alternative development³ programs where they are needed. Rather, the rollout of alternative development programs tends to be located far from the areas where coca crops have been reported (see [Map 4](#)). Such programs require certain conditions (means of communication, access to services, security conditions and a visible state presence) that do not precisely and totally coincide with the current locations and local contexts of where illicit coca crops are grown.

The sustainability of anti-drug policy comes into question when it does not deal comprehensively with the vulnerability of the affected territories according to their particular contexts. Actions that are aimed at reducing coca cultivation (namely, aerial spraying and manual eradication) do not translate into real improvements for the affected rural areas. Instead, they continue to leave open the opportunities and need for illegal activity, a phenomenon that evolves over time as a result of the obligation to satisfy the needs of local actors along with the lack of effective alternatives. One indication of this problem is the persistence of the illegal logging of tropical hardwoods and the illegal mining of minerals such as coltan and gold. Indeed, there appears to be an increase in the illegal open-pit mining of alluvial gold in places historically associated with the presence of coca (see [Map 5](#)).

³ There are three main lines of Alternative Development in Colombia: The Forest Ranger family Programme (encourages the recovery and preservation of forests), Productive Projects Programme (improves productivity and market access with technical assistance) and Post-Eradication and Containment Strategies (strengthens rural production sustainability after the eradication of illicit crops). The most promoted production lines on Alternative Development are silvopastoral, coffee, minor species, cocoa, fish farming, cane, transient crops and fruit crops ([UNODC, 2014](#)).

Notably, these areas of suspected illegal mining in 2012 are also where there has been a trend in recent years towards decreased coca cultivation, including in the departments of Chocó, Córdoba, Antioquia, Guainía and Nariño.

Looking to future challenges, our findings suggest that there are associations between coca cultivation, crop eradication and anti-drug policy which might be drawn albeit tentatively. There are no individual factors exclusively associated with coca cultivation and crop eradication, but there is instead a set of social, economic, political and environmental variables that characterise these areas (which makes it necessary to think about a more comprehensive policy). Additionally, the factors usually mentioned in the literature are not constant in space or time. This is another element that explains why anti-drug policy has not been completely effective in Colombia, because it is applied without taking into account complex local realities that are heterogeneous and dynamic.

At the time of writing, the World Health Organisation's determination of glyphosate's carcinogenicity means that suspension of aerial spraying is likely (but still a highly contested proposition) in Colombia ([El Espectador, 2015](#)). Whatever decision is made at the national level, the ramifications will no doubt play out differently in various locales with yet more unintended as well as intended consequences.

Conclusion

In this paper we have presented the findings from a spatial analysis of coca cultivation and crop eradication under current anti-drug policy in Colombia. The primary data generated by the UNODC, DNE, and SIMCI are taken at face value although the usual caveats about such data still hold. Likewise, the associations between coca cultivation, crop eradication and anti-drug policy are drawn tentatively. That said, the findings provide further, more up-to-date empirical evidence in support of the ongoing critical assessment of anti-drug policy in Colombia. The spatial data and their analysis are also novel and valuable because of the fine scale of resolution which is taken down to the level of the municipality.

In conclusion, we reiterate that anti-drug policy, particularly the aerial spraying of illicit crops with glyphosate, has been celebrated for its evident success in crop eradication with a significant decrease in coca cultivation resulting between 2001 and 2012. However, it is also associated with the displacement of coca cultivation to new areas in this same period of time. It has been especially problematic as this displacement has been to some of the most socially and environmentally vulnerable areas of Colombia, notably within the Pacific region.

The Pacific region of Colombia, which is viewed as one of the country's, and the world's, most important in terms of biodiversity, saw an increase of approximately 70% in the land area planted with coca between 2001 and 2012. In 2012, 40% of the coca plantations found in Colombia were located there. The research also determined that 84% of coca crops are concentrated in just 4 of Colombia's 34 biomes including significant areas of rainforest in the Pacific Region. Likewise, in the collective territories belonging to Afro-Colombian communities, which are located mainly in the Pacific region, there was a 46% increase in coca cultivation (from 4500 to 6600 ha) between 2001 and 2012.

More generally, we have shown that alternative development programs are located in areas distant from the places where coca crops have been reported. Illegal activities in addition to coca cultivation such as suspected illegal mining are perhaps being pursued in their stead. Together, these findings lead us to conclude that anti-drug policy in Colombia would be better aimed at dealing more comprehensively with those regions, departments and territories affected by coca cultivation and crop eradication

according to their particular contexts and local nuances. The ongoing generation of current empirical evidence and its spatial analysis at appropriate scales goes part way in addressing this matter.

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