Foreign Policy
at BROOKINGS

Plan Colombia: An Analysis of Effectiveness and Costs

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Improving Global Drug Policy: Comparative Perspectives and UNGASS 2016

EXECUTIVE SUMMARY

Key Findings

- Colombia has paid a high price to fight the "war on drugs," with costs amounting to approximately 1.1 percent of its GDP per year from 2000 to 2008.
- Colombia has also paid a high cost in human lives. An estimated 25 percent of intentional homicides between 1994 and 2008 were drug-related.
- From 2000 to 2013, Colombia succeeded in reducing coca cultivation from 160,000 hectares to 48,000 hectares.
- Similarly, the estimated value of Colombia's drug-related economy shrank from US$7.5 billion in 2008 to US$4.5 billion in 2013.
- Manual eradication of coca cultivation has proven to be considerably more cost effective than aerial spraying with pesticides, and it has fewer harmful side effects on the environment and inhabitants.
- Interdiction of coca-producing laboratories and related facilities, first initiated in 2007, has proven to be the most effective counternarcotics strategy used by Colombia.
- Alternative livelihood programs for coca-producing regions, while theoretically useful, have with few exceptions been poorly implemented by the Colombian government.

Policy Recommendations

- The government of Colombia should declare a moratorium on the use of aerial spraying campaigns against coca production.
- Colombia's improved security conditions now permit additional reliance on manual eradication programs.
- Policies aimed at reducing illicit crops cultivation should be centered upon alternative livelihood programs.
- The Colombian government should focus its anti-drug strategies on those stages of production where the greatest value-added is produced, such as large cocaine production facilities and large cocaine shipments.

Introduction

No one can deny that Colombia has worked tirelessly to fight illegal drug production, trafficking, and organized crime groups linked to these activities. Since 1994, more than two million hectares of coca have been sprayed with glyphosate, 1,890 metric tons of cocaine have been seized, and 28,344 coca leaf processing laboratories have been destroyed. The costs that Colombia has paid in this "war" are very high. Since 2000, the country—with partial funding from the U.S. government—has invested more than US$1.2 billion, or about 1 percent of the country's gross domestic product (GDP), per year into the military component of Plan Colombia.[1] However, the costs have not solely been public financial resources. More than 57,000 Colombians are estimated to have been killed between 1994 and 2008 as a consequence of growing illegal drug markets and resulting confrontations between drug trafficking organizations (DTOs) and the Colombian government during the war on drugs.[2] This translates into approximately 3,800 additional homicides (or about 25 percent of total homicides) per year from drug-related violence alone. Yet despite such enormous investments and costs, Colombia continues to be a key producer and trafficker of illicit drugs, and in particular of cocaine.

According to the latest United Nations Office on Drugs and Crime (UNODC) *World Drug Report*, Colombia continues to be the world's main producer of cocaine and the second largest producer of coca leaves after Peru.[3] About 60 percent of the cocaine consumed in the world is still produced in Colombia. Likewise, most of the cocaine produced in Colombia is exported, with about 55 percent of production sold in North America, and the remaining 45 percent exported to European markets, increasingly via Venezuela and West Africa.

This paper describes cocaine production and trafficking in Colombia and provides an analysis of the main anti-drug policies implemented under Plan Colombia aimed at curbing the supply of drugs. In particular, it presents the results of academic evaluations on the effectiveness, costs, and efficiency of different anti-drug strategies such as aerial spraying campaigns, interdiction efforts, and alternative livelihood programs. The last section briefly describes the effects of illegal drug markets on violence in Colombia.

Evolution of Drug Production and Trafficking in Colombia

Before 1994, Colombia was a minor player in the production of coca leaves, but an important player in cocaine trafficking. Although the world's largest DTOs—the Medellín and Cali cartels—were based in Colombia, coca cultivation and the initial processing stages were concentrated in Peru and Bolivia. Coca paste and base were transported to Colombia using small airplanes and then processed into cocaine hydrochloride and exported to the main consumer markets located in North America. The Medellín and Cali cartels controlled the cocaine processing facilities and trafficking and distribution channels all the way from Colombia to consumer markets. Things started to change, however, in the first half of the 1990s during the administration of Peruvian President Alberto Fujimori, when the "air-bridge" that connected coca cultivation centers in Peru and Bolivia with cocaine processing facilities in Colombia was closed. Coca cultivation rapidly increased in Colombia in the second half of the 1990s; by 2000, Colombia had become the lead producer of coca leaves, producing more than 70 percent of the world's coca (and cocaine).[4]

[1] As a benchmark, public expenditures on *Familias en Acción*, the largest conditional cash transfer program in Colombia to alleviate extreme poverty, accounts for about 0.37 percent of Colombia´s GDP.
[2] Daniel Mejía and Pascual Restrepo, *Bushes and Bullets: Illegal Drug Markets and Violence in Colombia*, Documento CEDE 2013-53 (Bogotá, Colombia: Ediciones Universidad de los Andes, 2014).
[3] United Nations Office on Drugs and Crime (UNODC), *World Drug Report 2010* (Vienna: United Nations, 2010), http://www.unodc.org/documents/wdr/WDR_2010/World_Drug_Report_2010_lo-res.pdf.
[4] UNODC, *The Globalization of Crime: A Transnational Organized Crime Threat Assessment* (Vienna, UNODC, 2010), 81, https://www.unodc.org/documents/data-and-analysis/tocta/TOCTA_Report_2010_low_res.pdf. Calculations by author.

The War on Drugs in Colombia

Dating back to the 1980s, Colombia has been the battleground for U.S. efforts to curb the cocaine supply at the source. Difficult economic conditions in the 1980s and a debilitated agricultural sector pushed thousands of *campesinos* toward the cultivation of illicit crops. In 1986, when the U.S. proclaimed drug production and trafficking activities a threat, Washington started to devote a great deal of resources toward thwarting the supply of Colombian cocaine. U.S.-funded eradication efforts, although then less common and intense, were put in place in Colombia. This provoked peasant protests and led to the co-option of some *cocalero* movements by the Revolutionary Armed Forces of Colombia (FARC). However, instead of reducing the cocaine supply, the militarized approach led by the U.S. resulted in a rapid increase in the size of the drug trade and essentially strengthened the Colombian cartels.

By 1990, the amount of power accumulated by Pablo Escobar and the Medellín cartel came to challenge the very existence of the Colombian state. Escobar ordered the killings of thousands of Colombians, including judges, policemen, and journalists, as well as three presidential candidates during the 1990 presidential elections. After failed efforts to negotiate a deal with the Colombian government and many attempts to capture him, in December 1993 Escobar was finally killed by the Colombian police in a middle class neighborhood of his hometown, Medellín.[5] Many of his middlemen were soon after captured or killed, and the Medellín cartel was finally dismantled shortly thereafter. However, the Cali cartel then quickly took full control of the drug trade. Although the fight against the Rodríguez Orejuela brothers was less violent, the two leaders of the Cali cartel used a combination of strategies to avoid getting captured by Colombian authorities, including bribes, coercion, and less visible forms of violence. In June 1995, Gilberto Rodríguez was captured by Colombian authorities, and soon after, in August of the same year, his brother Miguel was also captured.

The breakup of the Medellín and Cali cartels during the early and mid-1990s atomized the drug trade into smaller and less powerful groups.[6] On the positive side, no group was powerful enough to challenge the state like Pablo Escobar had done a few years earlier, but on the negative side, the fall of the Medellín and Cali cartels generated power gaps that caused smaller and more fragmented groups to engage in violent disputes over the control of drug trafficking rents. As a result, Colombia's homicide rate reached a new peak in 1999 of more than 70 homicides per 100,000 inhabitants.[7]

During the second half of the 1990s, the dismantling of the Medellín and Cali cartels and the dissolution of the Soviet Union (which represented a loss of international funding for guerrilla groups in Colombia) triggered the entrance of the FARC into the drug trafficking business. Paramilitary groups also began to participate in drug trafficking activities to finance their criminal operations, and drug traffickers bought positions of power inside the paramilitary groups. Paramilitary groups and drug traffickers became so entangled that it became very difficult to distinguish one from the other.

In response to the large increase in cocaine production activities and the rapid deterioration of security conditions, in 1999 the Colombian government announced a joint U.S.-Colombia strategy for the fight against illegal drugs and organized crime, known as Plan Colombia. The main objectives of this strategy were to (1) reduce the production and trafficking of illegal drugs (mainly cocaine) by 50 percent within a period of six years; and (2) improve security condi-

[5] According to official figures, the homicide rate in Medellín in 1993, at the peak of the war against Pablo Escobar and the Medellín cartel, reached unprecedented levels at 420 homicides per 100,000 inhabitants.
[6] These groups came to be called "baby cartels" by General Óscar Naranjo, a former director of the Colombian National Police.
[7] Jurgen Brauer and Alejandro Gustavo Gomez-Sorzano, "Homicide Cycles in Colombia, 1950-1999," *International Journal of Applied Econometrics and Quantitative Studies* 1, no. 1 (2004): 29-50, http://stonegardeneconomics.com/pubs/2004_Brauer_GomezSorzano_IJAEQS_v1n1.pdf.

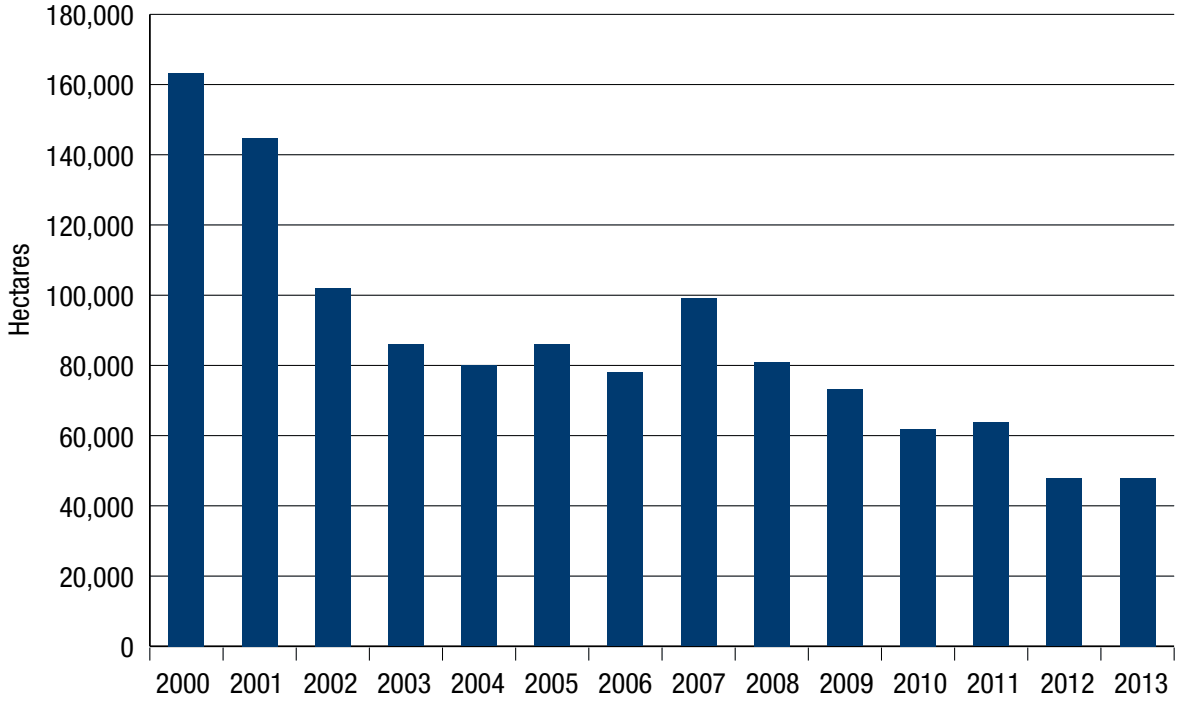
tions in Colombia by re-gaining control of the large areas of the country that were in the hands of illegal armed groups.[8]

According to an official report from the U.S. Government Accountability Office, U.S. funding for the military component of Plan Colombia was on average US$540 million per year between 2000 and 2008. The Colombian government, for its part, invested approximately US$812 million per year in the fight against drugs and drug-related organized crime groups. Taken together, these expenditures represented approximately 1.2 percent of Colombia's average annual GDP between 2000 and 2008.[9]

Despite the significant resources invested, the results of Plan Colombia are mixed. According to UNODC estimates, the number of hectares devoted to coca cultivation fell rapidly between 2000 and 2003, from approximately 160,000 to 80,000 hectares.[10] From 2004 to 2008, the number of hectares under coca cultivation was relatively stable, at an average of about 85,000 hectares. Starting in 2008, coca cultivation decreased again, falling to about 48,000 hectares according to the latest estimates for 2013 (see Figure 1).[11]

In the last few years, coca crops have been found in approximately 200 Colombian municipalities (18 percent of the country's total municipalities), com-

Figure 1. Estimates of Coca Crop Cultivation in Colombia, 2000–2013



Source: UNODC, 2013

[8] Departamento Nacional de Planeación (DNP), Dirección de Justicia y Seguridad (DJS), *Balance Plan Colombia 1999-2005* (Bogotá, Colombia: Departamento Nacional de Planeación, 2006), https://www.dnp.gov.co/programas/justicia-seguridad-y-gobierno/Paginas/plan-colombia.aspx; and U.S. Government Accountability Office, "PLAN COLOMBIA: Drug Reduction Goals Were Not Fully Met, But Security Has Improved: U.S. Agencies Need More Detailed Plans for Reducing Assistance," GAO-09-71 (Washington, DC: U.S. Government Accountability Office, 2008), http://www.gao.gov/assets/290/282511.pdf.

[9] U.S. Government Accountability Office, "PLAN COLOMBIA: Drug Reduction Goals Were Not Fully Met, But Security Has Improved."

[10] The U.S. Department of State also produces estimates for coca cultivation in Colombia; however, the author prefers to use UNODC estimates because the methodology for measuring coca cultivation is more transparent and based on a census that covers the entire country through satellite images rather than samplings.

[11] UNODC, Colombia: Coca Cultivation Survey 2013 (Bogotá, Colombia: UNODC, 2014), 17, http://www.unodc.org/documents/crop-monitoring/Colombia/Colombia_coca_cultivation_survey_2013.pdf.

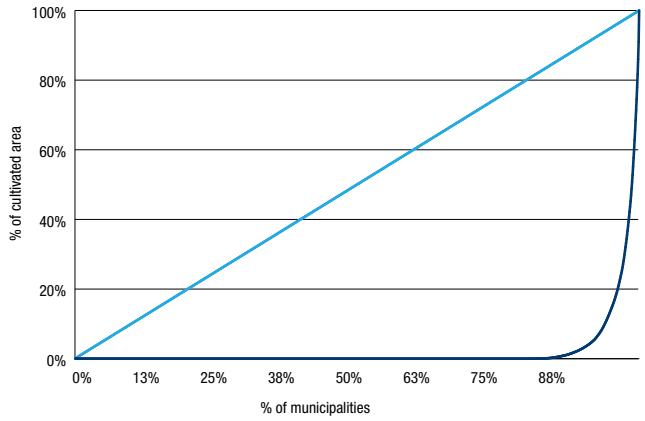
prising altogether an area of approximately 225 thousand square kilometers (19 percent of the country's total land mass). The available data indicates that coca crops are highly concentrated, with almost half of all coca cultivation (47 percent) located within only 10 municipalities; this is equivalent to less than 1 percent of all Colombian municipalities, or 5 percent of the municipalities that contain coca crops. Despite such high concentrations of coca crops, the Gini coefficient (an indicator of coca cultivation concentration with values closer to zero indicating greater dispersion) has been declining over the past decade (with small increases recorded over the past two years, see Figure 2).

According to UNODC, the potential production of cocaine remained relatively stable between 2000 and 2006, and it was only in 2007 and 2008 that significant reductions started to be seen.[12] As shown in Figure 3, potential cocaine production decreased from an average of 600 tons in 2006-2007 to about 430 tons in 2008. As a result of the continuous decrease in the supply, prices have increased. For example, in 2000 the price of one kilogram of cocaine was approximately $1,485, while in 2011 the same amount of cocaine cost $2,468 (an increase of 66 percent).[13]

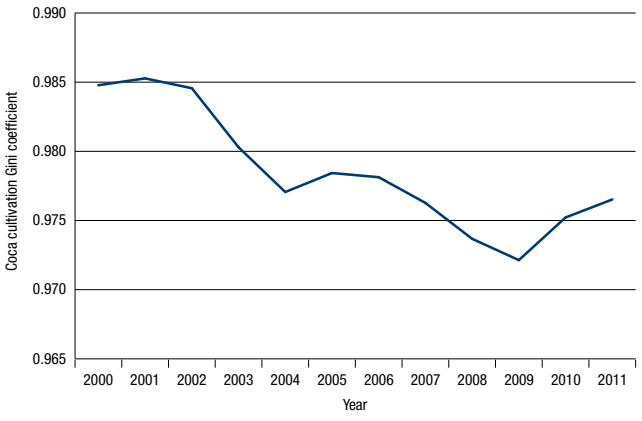
Since the start of Plan Colombia, the main strategy for reducing cocaine production has been the aerial spraying of coca plantations with herbicides. Spraying, however, has shown to be both ineffective and costly (directly and indirectly); thus, manual eradication campaigns of illegal crops have also been implemented where squads of workers (who have to be protected by the Armed Forces and the National Police) move to different coca-growing zones and manually uproot and destroy the crops. Since 2000 more than 1,600,000 hectares of coca crops have been sprayed and more than 413,000 have been manually eradicated. Figure 4 shows the number of hectares of coca grown, the number of hectares sprayed in aerial eradication campaigns, and the number of hectares subjected to manual eradication between 2000 and 2013.[14] It illustrates that despite strong efforts to reduce coca cultivation through intensive eradication campaigns, the total number of hectares of coca grown each year did not significantly fall, especially between 2005 and 2008.

Figure 2: Concentration of Coca Crops in Colombia, 2000-2011

(A) Lorenz Curve – Coca Crops (2011)



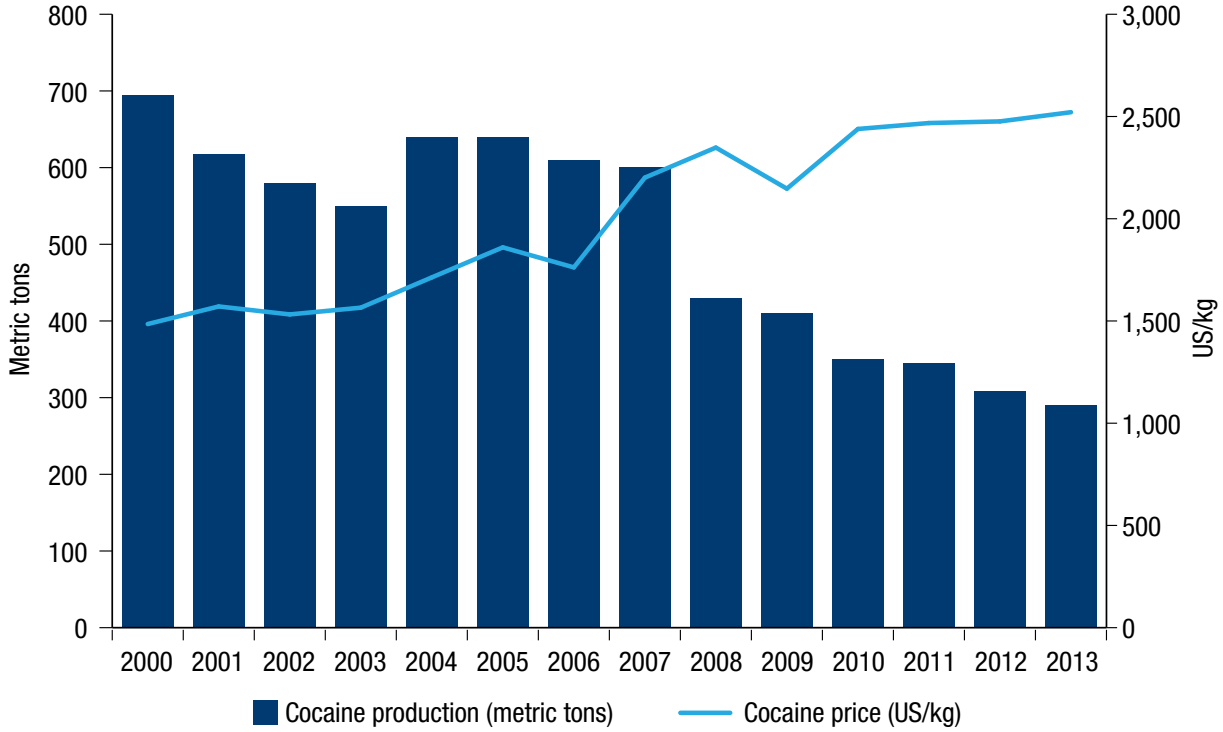
(B) Gini Coefficient of Coca Crops (2000-2011)



Source: Author's calculations based on data from the Integrated Illicit Crops Monitoring System (SIMCI)

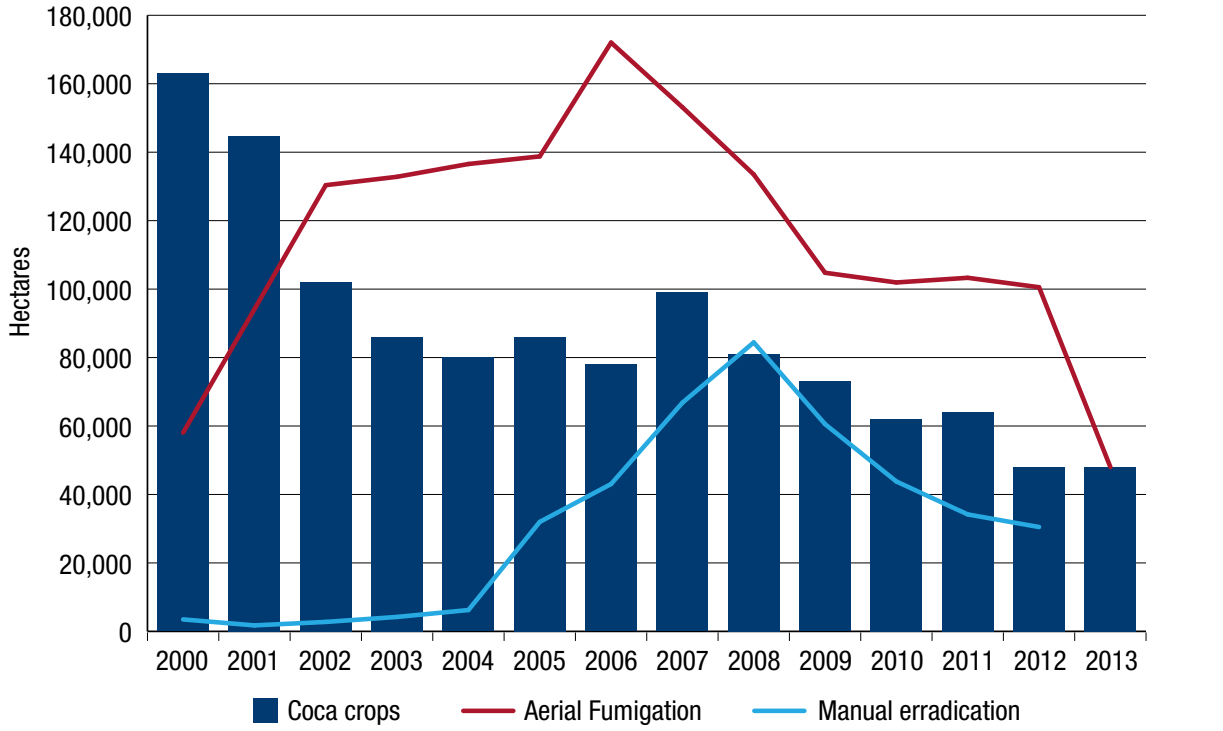
[12] UNODC, *Colombia: Coca Cultivation Survey 2013.*
[13] Ibid., 57.
[14] Ibid., 92.

Figure 3. Estimates of Potential Cocaine Production in Colombia, 2000-2013



Source: UNODC, 2013

Figure 4. Coca Crops, Aerial Spraying, and Manual Eradication in Colombia, 2000-2013



Source: UNODC, 2013

Other strategies for reducing Colombia's cocaine supply include: (1) imposing stricter state controls on sale of the precursor chemicals needed to convert coca leaves into coca base; (2) interdicting the labs and *cristalizaderos* where cocaine is processed; and (3) disrupting cocaine shipments en route to primary consumer markets in North America and Europe.

The (Simple) Economics of Cocaine Production and Trafficking in Colombia

The economic flows associated with the production and trafficking of Colombian cocaine vary according to the stage of production, which range from coca cultivation to wholesale cocaine trade.

Coca is a small bush that grows at elevations between zero and 1,700 meters above sea level. The time until harvest varies between two and six months, depending on the variety of the coca plant, its age, and geographic and climatic conditions. Between 2002 and 2008, coca field ownership decreased from approximately 2.2 to 0.6 hectares per family per family. In 2008, the average annual output for each hectare of coca was approximately 5.5 tons of coca leaves. While around 160,000 rural households were directly or indirectly involved in coca cultivation activities in 2008, by 2013 the number had decreased by almost half to about 82,000 rural households.[15]

The annual gross income for farmers who only sell coca leaves is approximately 8,103,000 pesos (or about US$4,000) per hectare of coca. Subtracting the costs of production from the total income and assuming that coca crops are not destroyed by government anti-drug strategies or by natural disasters, the average farmer receives a net profit of approximately 47 percent (i.e., 3,950,000 pesos per year, or US$2,000).[16]

Approximately one third of coca growers sell coca leaves directly to cocaine producers. The remaining two thirds convert the coca leaves into coca paste or base and then sell it to large-scale cocaine producers. Evidence indicates that this market behaves as a monopsony where, depending on the region, the only buyer is the FARC, a paramilitary group, or another illegal armed group that holds territorial control.[17]

The total value of Colombian coca production in 2008 was estimated to be about US$600 million (or about 0.21 percent of the country's GDP). The total value of the coca leaves traded is about US$200 million per year. If we subtract the costs of production (labor and agricultural inputs) from the total revenues, the expected return from the sale of coca leaves is about US$360 million per year (or US$2,250 per household per year).[18]

After they are harvested, coca leaves are chopped and mixed with cement, urea, or lime in order to "basify" the coca leaves. This part of the process is informally referred to as "salting." The chopped coca leaves are then decanted in a mixture of gasoline and an acidic solution that reduces its lead content. The mixture rests for several hours, is later drained, and then organic residues are removed using one or more oxidizing agents through traditional processes of acidification-basification. The process allows producers to extract the alkaloid (cocaine sulfate) from the coca leaves. The result is a brown, gelatinous mix known as coca paste. The coca paste is then mixed with large amounts of gasoline and sulfuric acid and, to a lesser extent, sodium carbonate, potassium permanganate (or ammonium), and other inputs for the whitening of the coca base and the elimination of impurities. The resulting intermediate product is known as coca base.

[15] Ibid.; and calculations by author.
[16] Calculations by author.
[17] Carlos Gustavo Cano, *Reinventando el Desarrollo Alternativo,* Colección Puntos de Vista (Bogotá, Colombia: Corporación Colombia Internacional, 2002).
[18] Daniel Mejía and Daniel M. Rico, "La microeconomía de la producción y tráfico de cocaína en Colombia," in *Políticas antidroga en Colombia: éxitos, fracasos y extravíos*, ed. Alejandro Gaviria Uribe and Daniel Mejía (Bogotá, Colombia: Ediciones UniAndes, 2011).

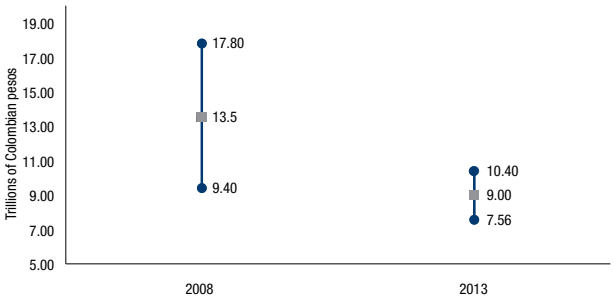
The total cost of the chemical inputs needed to process one kilogram of coca base is about US$530. In 2008, a ton of coca leaves produced on average about 1.3 kilogram of coca base. The total value of the coca base produced in Colombia in 2008 was about US$1 billion (or 0.35 percent of the country's GDP). If we then subtract the total value of produced coca leaves, the value added at this stage is approximately 400 million dollars per year.[19]

The transformation of coca base into cocaine is a relatively simple process that takes about six hours if the facilities and necessary precursor chemicals are available (and security conditions are guaranteed). The laboratories used to convert coca base into cocaine require a significant investment in physical infrastructure; the cost can be anything between five hundred to one million dollars per lab. These production units have a "chief chemist" and about a dozen workers whose salaries depend on the quantity of cocaine processed. The total labor costs are about 400,000 pesos (US$200) per kilogram of cocaine processed.[20]

Data from illegal armed groups indicates that in 2008, the price of one kilogram of facility-produced cocaine ranged between 5.4 million and 7.2 million pesos (or US$2,700 to US$3,600). Based on this, the total market value of Colombian-produced cocaine was approximately two billion dollars per year (or 0.7 percent of the country's GDP, with a maximum of 1 percent and a minimum of 0.41 percent of GDP).[21]

Finally, the last stage is cocaine trafficking; approximately 55 percent of Colombian cocaine goes to markets in North America, and the remaining goes to Europe. It is estimated that in 2008, Colombia's cocaine production and trafficking business produced 13,500 billion pesos (approximately US$7.5 billion), an amount equivalent to 2.3 percent of the country's GDP. While by 2013 this figure had decreased significantly, it is estimated that the value of this illegal business is still about nine trillion pesos (or about US$4.5 billion) (see Figure 5).[22]

Figure 5. Value of Colombia's Cocaine Production and Trafficking Business, 2008 and 2013



Source: Mejía and Rico, 2013

Effectiveness, Costs, and Efficiency of Anti-Drug Strategies Under Plan Colombia

To simplify the analysis of the effectiveness and costs of the main anti-drug strategies implemented under Plan Colombia, policies are divided into two main categories: those aimed at disrupting cocaine production by attacking the first step in the production chain (coca cultivation), and policies aimed at attacking the later stages of production and trafficking (e.g., labs, cocaine shipments, and distribution of precursor chemicals).

Aerial Spraying of Illicit Crops

Since the beginning of Plan Colombia, the aerial spraying of coca crops has been one of the main strategies used to control the cocaine supply. Over the past decade, an average of 128,000 hectares have been sprayed annually,[23] with nearly half of the spraying taking place in the Putumayo and Nariño departments, along the southwest border with Ecuador.

[19] Ibid.
[20] Ibid.
[21] Ibid.
[22] Ibid.
[23] Adriana Camacho and Daniel Mejía, "Consecuencias de la aspersión aérea en la salud: evidencia desde el caso colombiano," in *Costos Económicos y Sociales del Conflicto en Colombia*, ed. María Alejandra Arias et al. (Bogotá, Colombia: Ediciones UniAndes, 2014).

The effectiveness of aerial spraying has been analyzed through structural evaluations (e.g., calibrations of structural models of the war on drugs) and econometric evaluations. Results from a structural-general equilibrium model indicate that eradication through aerial spraying is one of the most expensive strategies in reducing coca production. For example, the estimates indicate that for each kilogram of cocaine ultimately removed from the retail market through aerial spraying, the marginal cost is approximately US$240,000.[24]

Impact evaluations measuring the effectiveness of spraying campaigns have found positive or no effects of spraying campaigns on coca cultivation.[25] However, most of these studies are plagued by endogeneity issues that make it very hard to interpret their results as causal. For example, aerial spraying campaigns target areas containing high concentrations of coca crops. This very fact biases the results, as such coca-rich areas could therefore end up being sprayed more than others.

Other empirical evaluations that have more carefully tackled these endogeneity issues have found that aerial spraying has only a very small effect on coca cultivation,[26] and that these effects are not sustainable over time.[27] The most conservative evaluation shows that for each hectare sprayed with glyphosate, coca crops are reduced by about 0.02 to 0.065 hectares. Therefore to eliminate just one hectare of coca through aerial spraying, 32 hectares of coca need to be sprayed. The cost of spraying one hectare with glyphosate is approximately US$2,400 (this includes the costs of airplanes, herbicide, protection, *et cetera*). With an effectiveness rate of approximately 4.2 percent, the cost of eradicating one hectare of coca through aerial spraying is about US$57,150. This cost significantly exceeds the price of the coca leaves from one hectare of coca (about US$450).[28]

The ineffectiveness of aerial spraying in reducing coca cultivation is explained by the fact that coca growers have developed various methods to protect coca crops from herbicide: (1) spraying molasses over the foliage of the coca plant prevents herbicide from penetrating the leaves and destroying the plant; (2) if coca growers cut the stem of a coca bush a few hours after an aerial spraying mission, the herbicide does not have enough time to kill the plant, which can quickly recover and produce again within just three or four months; and (3) even if the plants are killed by aerial spraying campaigns, coca growers often have additional seed beds prepared, ready to be planted.

Other studies have shown that aerial spraying has a negative impact on the environment, causing deforestation, pollution of water sources, and harm to amphibian populations.[29] Additionally, the use of glyphosate negatively affects human health, with exposure leading to skin problems and miscarriages.[30] Moreover, studies have found that its use can reduce citizen confidence in state institutions.[31]

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[24] Adriana Camacho and Daniel Mejía, "Consecuencias de la aspersión aérea en la salud: evidencia desde el caso colombiano," in *Costos Económicos y Sociales del Conflicto en Colombia*, ed. María Alejandra Arias et al. (Bogotá, Colombia: Ediciones UniAndes, 2014).

[25] Daniel Mejía and Pascual Restrepo, *The Economics of the War on Illegal Drug Production and Trafficking*, Documento CEDE 2013-54 (Bogotá, Colombia: Universidad de los Andes, 2013), doi: 10.2139/ssrn.2353939.

[26] A. Moya, "Impacto de la Erradicación Forzosa y el Desarrollo Alternativo Sobre los Cultivos de Hoja de Coca" (master's thesis, Department of Economics, Universidad de Los Andes, Bogotá, Colombia, 2005); Rocio Moreno-Sanchez, David S. Kraybill, and Stanley R. Thompson, "An Econometric Analysis of Coca Eradication Policy in Colombia," *World Development* 31, no. 2 (2003): 375-383, doi: 10.1016/S0305-750X(02)00192-4; Michelle L. Dion and Catherine Russler, "Eradication Efforts, the State, Displacement and Poverty: Explaining Coca Cultivation in Colombia During Plan Colombia," *Journal of Latin American Studies* 40, no. 3 (2008): 399-421, doi: 10.1017/S0022216X08004380; and Luis Carlos Reyes, "Estimating the Causal Effect of Forced Eradication on Coca Cultivation in Colombian Municipalities," *World Development* 61 (2014): 70-84, doi: 10.1016/j.worlddev.2014.03.024.

[27] Daniel Mejía, Pascual Restrepo, and Sandra V. Rozo, "On the Effects of Enforcement on Illegal Markets: Evidence from a Quasi-experiment in Colombia" (working paper, Universidad de los Andes, Bogotá, Colombia, 2015).

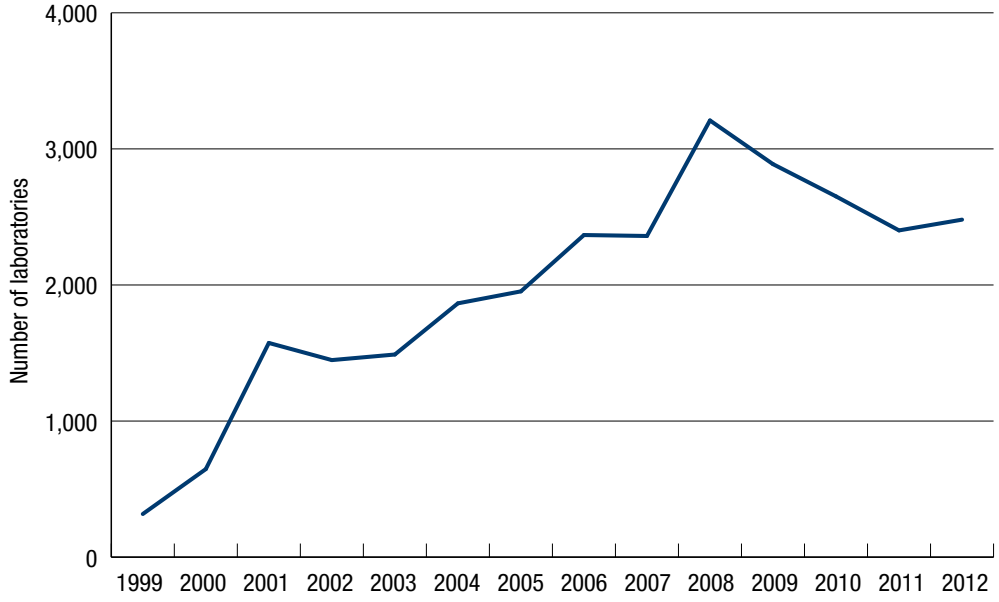
[28] For details on these estimations see Daniel Mejía and Pascual Restrepo, "Why is Strict Prohibition Collapsing?" in *Ending the War on Drugs: Report of the LSE Expert Group on the Economics of Drug Policy*, ed. John Collins (London: London School of Economics, 2014), http://www.lse.ac.uk/IDEAS/publications/reports/pdf/LSE-IDEAS-DRUGS-REPORT-FINAL-WEB.pdf.

Heavy reliance on the aerial spraying programs, despite their ineffectiveness and high costs, is explained in part by the difficulty of carrying out manual eradication campaigns in regions where land mines are used by the FARC to protect coca crops, or where manual eradication teams would encounter too much firepower from the FARC. As a result, the Colombian government has long argued that aerial spraying is one of the only feasible methods to control coca cultivation. Unfortunately, no evaluations on the effectiveness of manual eradication campaigns have thus far been carried out. As such, it is impossible to compare the relative effectiveness of manual eradication.

Interdiction Strategies

Since 2000, 1,842 metric tons of cocaine have been seized, with an average seizure rate of 27 percent of potential cocaine production. More than 27,000 cocaine processing laboratories have been destroyed (see Figure 6).[32]

Figure 6. Number of Cocaine Processing Facilities Destroyed in Colombia, 1997-2012



Source: UNODC, 2013

[29] Rick A Relyea, "The Impact of Insecticides and Herbicides on Biodiversity and Productivity of Aquatic Communities," *Ecological Applications* 15, no. 2 (2005): 618-27, http://www.usfca.edu/fac-staff/dever/roundup_paper.pdf; Connie Veillete and Carolina Navarrete-Frías, *Drug Crop Eradication and Alternative Development in the Andes* (Washington, DC: Congressional Research Service, 2005), http://fpc.state.gov/documents/organization/61022.pdf; Caroline Cox, "Corn Gluten Meal – A Natural Lawn Care Herbicide," *Journal of Pesticide Reform* 25, no. 4 (2005): 6-7, http://www.pesticide.org/Alternatives/home-and-garden-toolbox/landscape-and-plant-solutions/corn-gluten-meal; and Jo Imming, "Glyphosate : Safe or Sorry" *Organic Gardener* (May/June 2010).

[30] Margaret Sanborn et al., *Systematic Review of Pesticide Human Health Effects* (Toronto, Canada: Ontario College of Family Physicians, 2004), http://ocfp.on.ca/docs/pesticides-paper/pesticides-paper.pdf; Laurel Sherret, "Futility in Action: Coca Fumigation in Colombia," *Journal of Drug Issues* 35, no. 1 (2005): 151-68, doi: 10.1177/002204260503500107; E. Regidor et al., "Paternal Exposure to Agricultural Pesticides and Cause Specific Fetal Death," *Occupational and Environmental Medicine* 61, no. 4 (2004): 334-9, doi: 10.1136/oem.2003.009043; and Camacho and Mejía, "Consecuencias de la aspersión aérea en la salud: evidencia desde el caso colombiano."

[31] Daryl S Landy, "The Constitutional Implications of Government Pesticide Spraying: The Case for Limited Judicial Intervention and an Intermediate Standard of Review," *California Law Review* 76, no. 1 (1988): 221-64, http://scholarship.law.berkeley.edu/californialawreview/vol76/iss1/5; Veillete and Navarrete-Frías, *Drug Crop Eradication and Alternative Development in the Andes*; Vanda Felbab-Brown, *The Violent Drug Market in Mexico and Lessons from Colombia*, Foreign Policy Paper Series, no. 12 (Washington, DC: Brookings Institution, 2009), http://www.brookings.edu/research/papers/2009/03/mexico-drug-market-felbabbrown; and Miguel García-Sánchez, "Cultivos ilícitos, participación política y confianza institucional," in *Políticas antidroga en Colombia:* éxitos, *fracasos y extravíos*, ed. Alejandro Gaviria Uribe and Daniel Mejía (Bogotá, Colombia: Ediciones Universidad de los Andes, 2011).

[32] UNODC, *Colombia: Coca Cultivation Survey 2013.*

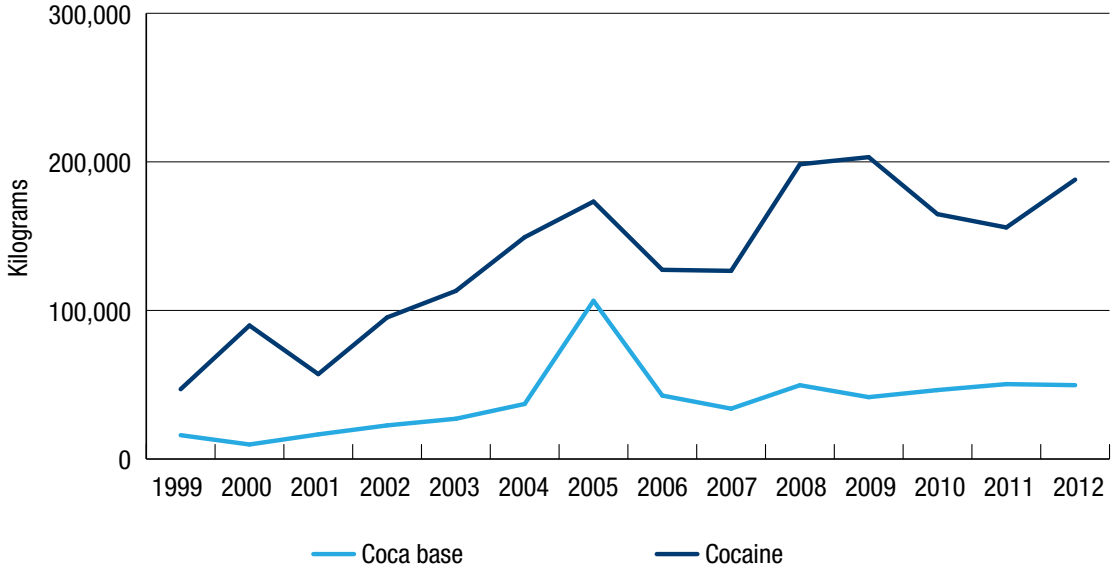
The emphasis of Colombia's anti-drug strategies shifted radically after Juan Manuel Santos became minister of defense in 2006, during former President Álvaro Uribe's second term. Santos and his team decided to put less emphasis on aerial spraying and manual eradication and more effort toward dismantling cocaine production and trafficking. As a result, the number of hectares subjected to aerial spraying decreased from 172,000 in 2006 to 104,000 in 2009 (a reduction of 40 percent), cocaine seizures increased from 127 metric tons in 2006 to 203 in 2009 (an increase of 60 percent) (see Figure 7), and the number of laboratories destroyed increased from 2,300 in 2006 to 2,900 in 2009 (an increase of 26 percent).[33]

The new anti-drug strategy reduced the net supply of cocaine by more than 50 percent, which caused a supply shock that impacted the entire region, and even the street price of cocaine in the U.S. For example, the price of a gram of pure cocaine in the U.S. increased from US$122 in 2007 to US$186 in 2009 (see Figure 8).

The interdiction of cocaine and cocaine-processing facilities seems to have had much greater effects—not only on cocaine trafficking, but also on coca cultivation—than eradication policies. When interdiction policies focus in particular on the cocaine development and trafficking stages where the greatest value added is produced, the drug business is hit much harder than when policies are aimed strictly at the early stages of production. Adaptation and substitution are more difficult at these stages of the production process, and when traffickers lose a large cocaine shipment to government interdiction efforts, it is more difficult for them to replace it simply by relying on other sources of processed cocaine. Furthermore, the amount of money lost when a cocaine shipment is captured and destroyed is significantly larger than the amount lost when a coca field is destroyed by either manual eradication or aerial spraying.

An important caveat to this interdiction strategy has to do with the so-called "balloon" (or displacement) effect. Evidence indicates that the large negative

Figure 7. Coca Base and Cocaine Seizures, 1999-2013



Source: UNODC, 2013

[33] Ibid., 94-5. Manual eradication was also carried out less often during this period; thus, the decrease in coca cultivation and cocaine production cannot be attributed to an increase in manual eradication.

Figure 8. Colombian Net Cocaine Supply and Cocaine Street Prices in the U.S.

Source: Author's calculations, based on data from UNODC and the government of Colombia

supply shock induced by this anti-drug strategy pushed DTO bases away from Colombia and toward other locations such as Central America and Mexico. Some even suggest that the sharp decline in Colombia's cocaine supply from 2006 to 2009 may account for a 10 to 14 percent spike in violence in Mexico during the same period.[34]

Regarding the effects of cocaine-laboratory interdiction on coca cultivation, one ongoing study finds that for every lab that is detected and destroyed by the authorities, coca cultivation decreases by about three hectares. In addition, and contrary to aerial spraying programs, this type of interdiction carries no negative environmental, human health, or political capital impacts. Rather, it is the intermediate inputs' markets that face negative impacts that ultimately affect cultivation. For example, once cocaine-processing labs are eliminated, there is then no way to convert coca leaves into coca base and cocaine, and without such labs, demand for coca leaves falls, and coca cultivation diminishes (at least in the short run).[35]

Another interdiction strategy regularly carried out in Colombia is the effort to dismantle DTOs by going after their top leaders. Although hundreds of DTO leaders have been captured or killed in Colombia over the past few decades, we do not know how these policies affect the amount of drugs produced and trafficked or the vitality of DTOs. However, informal evidence suggests that these strategies create organizational power gaps that may lead to pronounced cycles of violence. For example, the arrest of a cartel leader may lead to internal conflict within the organization over who should assume power. Competing organizations might also attempt to overtake the market or territory of the organization whose leader was captured or killed. And as more fragmented or atomized groups compete over control of the drug trade, levels of violence increase. Thus, this high-value targeting

[34] Juan Castillo, Daniel Mejía, and Pascual Restrepo, "Scarcity Without Leviathan: The Violent Effects of Cocaine Supply Shortages in the Mexican Drug War" (Working Paper, no. 356, Center for Global Development, Washington, DC, 2014), http://www.cgdev.org/sites/default/files/scarcity-leviathan-effects-cocaine-supply-shortages_1.pdf.

[35] J. Cote and Daniel Mejía, "El efecto de las acciones de interdicción sobre los cultivos de Coca en Colombia" (CESED - Universidad de Los Andes, forthcoming 2015).

interdiction strategy often seems to generate cycles of violence that continue until the markets and territorial control of the DTOs reach a new equilibrium.

Alternative Livelihood Programs

Alternative livelihood programs are designed to provide coca-growing communities with new options for social and economic development. Programs encourage coca farmers to abandon coca cultivation for legal crops in exchange for governmental support, which includes training, monetary incentives, and assistance in commercializing new products.

Colombia has invested heavily in various alternative livelihood programs—ranging from coca crop substitution programs to Familias Guardabosques and Productive Projects—yet the effectiveness of such programs remains in question. Many of the programs have faced implementation problems, and those implemented have been limited to training or monetary incentives, without providing farmers the necessary resources to market their products and ensure that the projects are ultimately self-sustaining. Farmers that do not have the means to market legal products often end up returning to the cultivation of illicit crops. Political and economic constraints exist as well. For example, a lack of land titles in coca-growing regions discourages farmers from cultivating crops that require long-term planning and investment prior to seeing any financial returns. It is therefore critical that alternative livelihood programs be designed in a way that ensures they are self-sustaining, at the very least, in the medium term.

An alternative livelihood program in Colombia that has worked, however, is the Plan de Consolidación Integral de la Macarena (PCIM), which successfully integrated state presence into a coca-growing region through a variety of programs focused on health, education, justice reform, and police presence. The PCIM not only significantly reduced illicit crops, but also improved economic indicators, school enrollment rates, and health outcomes and reduced homicides in a very short period of time.[36] Yet for reasons that are still unknown, the Colombian government discontinued the expansion of this model.

Illicit Drug Markets, the War on Drugs, and Violence in Colombia

It is widely accepted that illegal drug markets tend to be violent. Given that drug producers and traffickers cannot resort to the judicial system and police to enforce contracts and protect property rights, they often perform these functions themselves through violence. However, levels of violence differ widely from one drug market to another. In the case of Colombia, violence has increased significantly with the growth of cocaine markets. According to one study, the 200 percent increase in the size of cocaine markets that occurred between 1994 and 2008 has produced an additional 3,800 homicides per year, with a total of 57,000 drug-related homicides occurring during this time frame. It also found that 25 percent of the country's current homicide rate can be directly attributed to aforementioned increase in cocaine.[37] In other words, if the size of the cocaine market had not increased at the rate it did, the homicide rate would now be around 24 homicides per 100,000 people, rather than the more recent 2008 rate of 32 homicides per 100,000 people.[38]

Colombia and UNGASS 2016

Colombia can play a critical role in the negotiations leading up to the 2016 Special Session of the United Nations General Assembly on the World Drug Problem (UNGASS 2016). No other country in the region, aside from Mexico, has had to confront the challenges to political stability and violence that Colombia has faced in the last three decades. Colombia

[36] Ana María Ibáñez, Daniel Mejía, and María José Uribe, *Una evaluación del Plan de Consolidación Integral de la Macarena (PCIM)*, Documento CEDE 2011-13 (Bogotá, Colombia: Universidad de los Andes, 2011).
[37] Mejía and Restrepo, *Bushes and Bullets: Illegal Drug Markets and Violence in Colombia*.
[38] The average homicide rate in Latin America in 2008 was about 23 homicides per 100,000.

has not only worked tirelessly in the counternarcotics effort, but has also accumulated an enormous stock of institutional and academic knowledge that can provide many lessons learned.

President Santos has called for a regional and worldwide debate on drug policy. Nevertheless, he has also made clear that Colombia is not willing to lead the debate and make changes by itself. However, as outlined below, Colombia can implement more effective and less costly policies without violating international drug conventions.

The recent March 2015 presentation by the Colombian Minister of Justice Alfonso Gómez Méndez before the United Nations (UN) Commission of Narcotics Drugs clearly set the stage for UNGASS 2016. Gómez emphasized the need to consider new approaches and strategies for drug policies around the world as well as the importance of bringing other UN agencies, such as the United Nations Development Program (UNDP) and the World Health Organization (WHO), into the discussion.

Policy Recommendations

Based on these findings, the government of Colombia should take the following actions to improve its drug policies:

- **Declare a moratorium on the use of aerial spraying campaigns.** Aerial spraying has been proven to be ineffective and costly in reducing coca cultivation and produces negative secondary impacts.
- **Improved security conditions now permit greater reliance on manual eradication programs.** If forced eradication programs are to be continued, the country's improved security conditions now allow for greater use of manual eradication programs, particularly in regions where the FARC and the Colombian government will soon begin the process of dismantling land mines.
- **Policies aimed at reducing illicit crop cultivation should be centered upon alternative livelihood programs.** These programs should be designed in a way that ensures they are self-sustaining. The Colombian government should also consider expanding and improving the PCIM model applied a few years ago in the Macarena region of Colombia.
- **Focus anti-drug strategies on the stages of production and trafficking where the greatest value added is produced.** The interdiction of cocaine and cocaine-processing facilities has been more effective than illicit crop eradication programs in fighting DTOs. Increased investments in intelligence capabilities will allow the Colombian government to more effectively detect and interrupt cocaine flows during these latter stages of production.

Conclusions

While relentless implementation of a decades-long counternarcotics campaign has led to significantly improved security outcomes in Colombia, the value of the country's cocaine production and trafficking business continues to be worth about US$4.5 billion a year (or about 1.2 percent of the country's GDP).

If the war on drugs is to continue to be fought, Colombia should stop aerial spraying campaigns aimed at destroying coca crops and instead focus its anti-drug strategies on those stages of production and trafficking where organized crime groups obtain the most profit. Overwhelming evidence indicates that aerial spraying campaigns have little to no effect on reducing coca cultivation, but rather have produced high direct costs and negative secondary impacts on human health, the environment, and the political capital of the state. Instead, it is the interdiction of cocaine and cocaine-processing facilities that together seem to have had significant effects on cocaine production and trafficking and even coca cultivation.

Regardless of the huge efforts made by Colombia to fight drug production and trafficking, drug policy,

like any other public policy, should be evaluated by its results and not by its intentions. Evidence-based public policies are often much more effective at producing solutions to complex problems.

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