UNODC
United Nations Office on Drugs and Crime

Government of Colombia

Colombia

Coca cultivation survey 2009

June 2010

COLOMBIA
Coca cultivation Survey

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Abbreviations

COL$	Colombian peso
DANE	National Department of Statistics
DEA	US Drugs Enforcement Agency
DIRAN	Colombian Anti-narcotics Police
DNE	National Narcotics Office
DNP	National Planning Department
GME	Mobile Eradication Groups
IGAC	Instituto Geografico Agustin Codazzi
INCB	International Narcotics Control Board
OAS	Organization of American States
PCI	Presidential Management against Illicit Crops
GDP	Gross Domestic Product
ICMP	Illicit Crop Monitoring Programme
SIMCI II	Integrated Illicit Crops Monitoring System II
m.t.	Metric tons
USAID	United States Agency for International Development
UNODC	United Nations Office on Drugs and Crime
US$	United States Dollar

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Unless another source is specified, the source of all the graphs of this report is the Colombian Government, within the context of the Monitoring System supported by UNODC.
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PREFACE

In 2009, there was a further significant decline in the amount of coca cultivation and cocaine production in Colombia. Cultivation dropped to 68,000 hectares, a 16% decline over 2008, and a decline of almost 60% since the peak of a decade ago. Potential cocaine production fell to 410 metric tons, a 9% year-on-year reduction.

The principal factors accounting for the major decline include effective crop elimination campaigns, increasing government presence and social development programmes in previously isolated coca regions. Dry weather conditions in 2009 also played a role.

Cultivating coca in Colombia has clearly become riskier and less profitable for organized crime. Coca farmers barely earn over one US dollar a day. The total farm-gate value of coca production has dropped by 21%, to below half a billion dollars (US$496 million), which is 0.2% of GDP. Coca plots are becoming smaller, more dispersed and less productive, thus increasing the demand of local communities for legal sustainable livelihood initiatives, including the successful Forest Warden Families and Productive Projects programmes which to date have reached over 110,000 families.

Colombia's frontal action against coca cultivation and cocaine production is matched by effective anti-trafficking policies. Cocaine seizures within Colombia reached 200 metric tons in 2009 which represents a significant percentage of the total cocaine produced (between 25% and 50%, depending on purity).

As it deals with its own internal drug abuse problem, Colombia's continued efforts to contain coca cultivation and cocaine production at the source is of enormous value for its citizens and the international community. The country's principal challenge in the years ahead is to ensure that the current downward trend is sustainable. This can be achieved only if robust social programmes are implemented in the handful of areas where most of Colombia's coca crop has been grown in the past 10 years.

Of course, cocaine consuming countries must also do their part in order to reduce demand, particularly by providing drug treatment. This is needed, both for improving the health of their citizens, and for taking their share of responsibility for reducing the drug problem.

Antonio Maria Costa
Executive Director
United Nations Office on Drugs and Crime

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SUMMARY FACT SHEET – COLOMBIA COCA CULTIVATION SURVEY, 2009

	2008	Variation	2009
Area cultivated with coca (rounded total)	81,000 hectares	-16%	68,000 hectares
Pacific Region	29,920 hectares	-16%	25,170 hectares
Central Region	18,730 hectares	-14%	16,130 hectares
Meta-Guaviare Region	12,150 hectares	+4%	12,620 hectares
Putumayo-Caqueta Region	13,960 hectares	-35%	9,070 hectares
Elsewhere	6,240 hectares	-20%	5,010 hectares
Cumulative aerial spraying area	133,496 hectares	-22%	104,771 hectares
Reported manual eradication	96,115 hectares	-37%	60,544 hectares
Average farm-gate price of coca paste	US$ 963/kg COL$ 1,878 /kg	-1% 9%	US$ 956/kg COL$ 2,048/kg
Total farm-gate price of coca leaf and its derivatives.	US$ 623 million	-21%	US$ 496 million
In GDP percentage[1]	0.3%		0.2%
In agricultural sector GDP percentage	3%		3%
Number of households involved in coca cultivation	59,328 households	-4%	56,910 households
Annual household gross income from the production of coca leaf and its derivatives	US$ 10,508	-17%	US$ 8,710
Potential production of cocaine	450 m.t	-9%	410
Average Price of cocaine	US$ 2,348 /kg COL$ 4,580,000/kg	-9% 0,2%	US$2,147/kg COL$4,587,000/kg
Area cultivated with opium poppy	394 hectares	-10%	356 hectares
Potential production of opium latex	10.3 m.t	+7%	11 m.t
Potential production of heroin	1.3 m.t	0%	1 m.t
Average farm-gate price of opium latex	US$ 318/kg	+13%	US$ 358/kg
Average price of heroin	US$ 9,950/kg	0,4%	US$ 9,993/kg
Seized cocaine	198,366 kg	+3%	203,416 kg
Seized heroin	646 kg	13%	732 kg
Illegal laboratories destroyed[2]	3,209	-10%	2,888

[1] GDP of the year according to Colombian government.

[2] Includes laboratories where the following are processed: coca base and paste, cocaine chlorhydrate, heroine, morphine, potassium permanganate, ammonia and others.

EXECUTIVE SUMMARY

The Illicit Crops Monitoring Global Programme of UNODC has been assisting the Colombian Government in the implementation and improvement of a Coca Cultivation Monitoring System since 1999. Annual surveys have been carried out since 2001, covering the entire Colombian territory; this report presents the coca survey results for 2009.

The methodology used by the Project is based on the interpretation of medium resolution satellite images and field verification. With this verification, the office interpretation is edited and the extension of coca cultivation is calculated; for the areas in which the images do not provide information (covered by clouds or other factors), corrections are estimated based on vicinity criteria.

The results of the survey show that in December 2009, Colombia had 68.000 hectares planted with coca, distributed in 22 out of the 32 departments of the country. This represents a reduction of 13.000 hectares (-16%) as compared to 2008, and this is the lowest level of coca cultivation in this century until now.

The most important reduction between 2008 and 2009 took place in the regions of most concentration: Putumayo-Caqueta (-35%) and Pacific (-16%). The majority of the cultivated area (79%) is still distributed in eight departments: Nariño, Guaviare, Cauca, Putumayo, Bolivar, Antioquia, Meta and Caqueta.

The estimation of the precision of the interpretation results is part of quality control. As from September 2004, the Natural Resources and Applied Sciences Institute of the BOKU University in Vienna (Austria) has carried out technical evaluations on the methodology used for the measurement of the areas cultivated with coca plants.

It is worth noting that the average size of the coca fields stayed the same as in 2008 (0.66 hectares). Between 2008 and 2009, the Colombian Government reported the manual eradication of 60.544 coca hectares and the aerial spraying of 104,771 hectares. The total eradicated area (manual and aerial spraying) is 165,315 hectares in 2009, 28% less than the previous year.

UNODC/SIMCI have been carrying out studies on the production and yield of the coca leaf since 2005. So far, the results show a reduction in the capacity of the coca fields to produce coca leafs. However, the estimation made in 2009 in the Pacific region shows that both the number of crops and the yield per crop grew in 50%. This had an incidence on the fact that for 2009 the reduction in the production (-9%) is less than the reduction in the area (-16%).

In this year, the total cocaine production was 410 tons, which represents a reduction of (9%.) as regards to 2008[3].

The illegal coca leaf and its derivatives market has a gross farm-gate value of US$ 496 million, equivalent to 0.2% of the 2009 GDP or to 3% of the agricultural GDP. It is important to consider that these values do not include the costs of herbicides, pesticides, fertilizers and salaries. The study of the coca leaf yield in 2009 also enabled to estimate the total number of households involved in coca cultivation, which was around 56.900 (without floating population). These values represent a gross annual household income of US$ 8.700, equivalent to a gross per capita income of US $2.120. As a comparison, the per capita GDP in Colombia was estimated to be approximately US $4.900 in 2009.

[3] *The production data have been updated considering new available information.*

1. INTRODUCTION

Among the objectives of the Illicit Crops Monitoring Programme (ICMP) there is to establish methodologies for data collection and analysis. The object of such methodologies is to increase the ability of the governments to monitor illicit crops in their territories and assist the international community in the monitoring of the extension and evolution of illicit crops. This is in line with the strategy of elimination adopted by the Member states in the United Nations General Assembly Session on Drugs, in June 1998. Currently, the ICMP is covering seven countries: Colombia, Bolivia and Peru for coca, Afghanistan, Laos and Myanmar for opium poppy and Morocco for marihuana; UNODC has recently begun monitoring coca cultivation in Ecuador..

During the 80's and 90's, Colombia became the country with the largest area of coca cultivation and the highest production of cocaine in the world; coca cultivations constantly grew in the country, especially in remote areas of the Amazon basin, although these cultivations started to decrease in 2001.

UNODC supports the monitoring of coca cultivations since 1999, and has produced eleven annual surveys based on the analysis of satellite images. The two first surveys (1999 and 2000) did not cover the entire country but since 2001, the survey covers the entire national territory to assure the monitoring of the possible expansion of illicit crops.

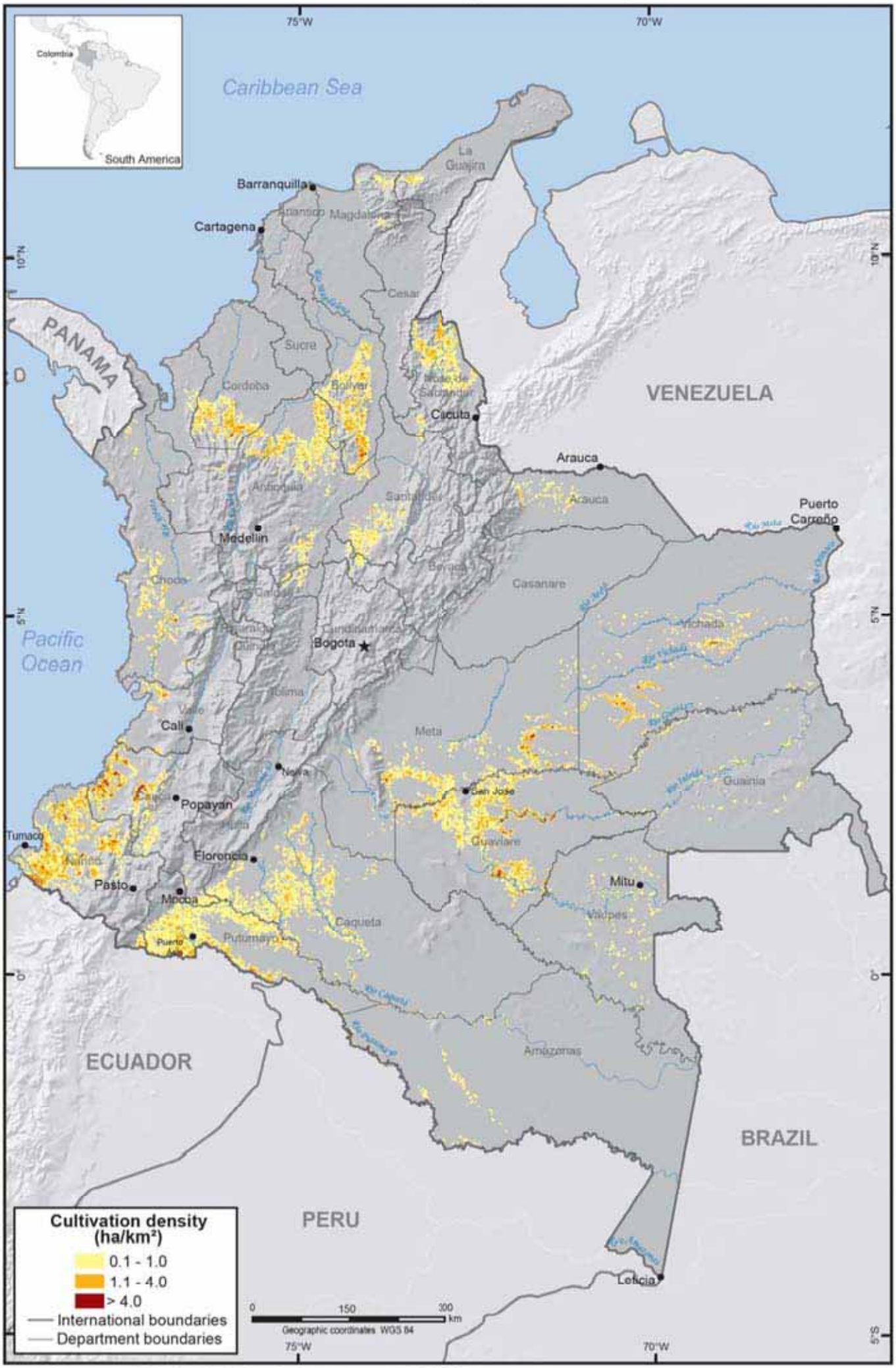
In October 2006 UNODC signed an agreement with the Colombian Government to continue and increase the monitoring and analysis tasks, and to assure the sustainability of the project. On these grounds, SIMCI II was required to carry out additional tasks within the framework of a comprehensive approach to the analysis of the drug problem in Colombia. Moreover, they must assist in the monitoring of special areas, such as fragile eco-systems, National Natural Parks, Indigenous Territories, expansion of agricultural boundaries, deforestation processes; this is in addition to providing direct support to the Productive Projects and Forest Warden Families Programmes executed by the Colombian Government.

The project operates with an interinstitutional group permanently appointed to work in the project, in charge of assuring the transfer and adoption of the technologies in the benefited national institutions. SIMCI II is a joint project within UNODC and the Colombian Government, represented by the Ministry of the Interior and Justice and the Colombian Agency for International Cooperation. The national counterpart is the Ministry of the Interior and Justice, President of the National Board of Narcotics.

The Project is managed by a technical coordinator and comprised by the following engineers and technicians: four experts in digital processing, one field engineer, one cartographic edition engineer, one specialist in analysis and research, two engineering assistants and one technician in logistics and databases. In 2009, one expert in digital processing, one statistician and a chemist joined the team to do two annual estimations between the two cut dates of each survey, and to carry out specific studies in the chemical characterization of the coca leaf transformation process. In addition, the team is permanently assisted by technicians from the Anti-narcotics Police (DIRAN) and the National Natural Parks Administration. It has cooperated in several studies of the Colombian Government and private entities related to land use, environment, illicit crops, etc. Moreover, the SIMCI project gives other entities access to their Spatial Data Bank -BIE-, provides technical training and technology transfer to achieve their objectives. Some of these entities are: the National Statistics Administration Department (DANE), local governments, the National Coffee Growers Federation, several NGO's, as well as other agencies and projects from the United Nations System in Colombia and other countries.

The Project has established agreements for mutual cooperation with several national and foreign universities to exchange and share knowledge, training and joint projects. Among these, there are the BOKU University in Vienna, Austria; Zaragoza University in Spain; Harvard, Michigan and Maryland Universities in the United States; los Andes, Antonio Nariño and other local universities.

Coca cultivation density in Colombia, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

2. FINDINGS

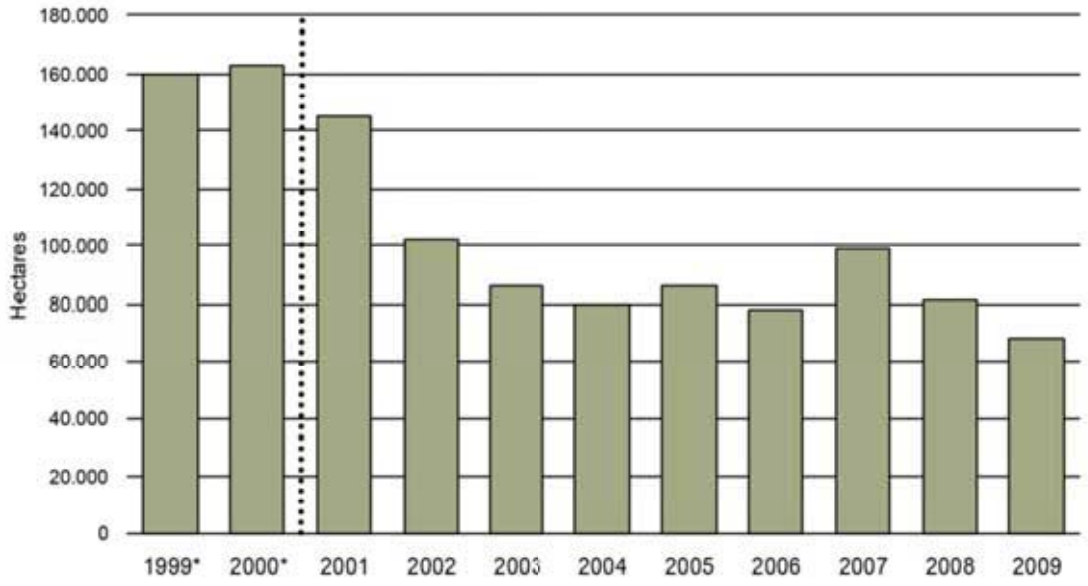
2.1 Coca Cultivation

Total national cultivation

In the period 2008 - 2009, the total area of coca cultivation decreased to 68,000 hectares; this maintains the reduction trend that started in the period 2007 - 2008. This reduction was 16% of the 81,000 hectares of the previous year and is the smallest area of coca cultivation recorded ever since UNODC has been measuring this phenomenon.

Similarly to the previous ten surveys, this one represents the situation of coca cultivation as of 31 December 2009. It covered the entire country and detected coca cultivation in 22 out of the 32 departments of the country; this is two departments less than in 2008. In 2009, the area cultivated with coca was 1.6 % of the total agricultural land in Colombia.

Figure 1: Coca cultivation in Colombia, 1999 – 2009



* In the period 1999-2000, only coca growing areas previously detected were evaluated. Since 2001 all the territory has been monitored, including areas without coca where preventive monitoring are made. Acording with UNODC data, in not evaluated areas during 1999 and 2000 there were 1.9% of 2001 coca cultivation and 3.3% of coca cultivation in 2009.

During 2009, 60,544 hectares of coca cultivation were manually eradicated and 104,771 hectares were object of aerial spraying. This level of manual eracication is 35,571 hectares lower than the record of 96,115 hectares reached in 2008. The aerial spraying of coca cultivation also dropped from 133,496 hectares in 2008 to 104.771 hectares in 2009.

During this same year, 58,491 beneficiaries joined the Forest Warden Family Programme in 1,650 rural settlements, 19 departments and 77 municipalities, with an investment of $92,594 million; likewise, $504,718 million were invested in alternative development projects, from which 55% were local resources (savings from the farmers, private sector, local and regional public sector). The Consolidation Plan in La Macarena has an investment of $231,242 million pesos for 2009.

Analysis of changes in coca cultivation

Coca cultivation is very dynamic in Colombia. Within a one-year period, there are different variations that have incidence on the reduction or increase of the area under cultivation. Factors such as favourable prices, pressure on farmers by illegal armed groups, legal economy and temporary crises contribute to the increase of the cultivated area. On the other hand, factors such as forced manual eradication, aerial spraying, interdiction, public order, illnesses of the plants, are key for the reduction. These conditions have an impact in different moments of the year and although the survey does not show the particular effect of each one of them, it does show the situation on a specific date (31 December of every year).

In 2009, the area under the influence of coca cultivation increased in 48.524 hectares, from which 145 hectares were cultivated with coca. These areas were included in the survey as from 2009, due to which they were excluded from the changes analysis.

The multitemporal analysis of coca cultivation corresponds to a time period between January and December 2009. Hence, the definitions of "abandoned" or "new" fields refer exclusively to this period. The comparison of the location of coca fields identified in 2009 with those identified in 2008 revealed that 29% of the cultivated area by the end of 2009 was in the same place than it was at the beginning of the year, which means it is "stable". 13% of the area under coca cultivation replaced primary forests, so it may be considered "new" for this period. The remaining 58 % replaced other types of vegetation, such as grass or bare soil; from these, 28% have been under coca cultivation in previous years, and no coca cultivation had been found in 30% of them since 2001.

Table 1.New and stable coca fields in 2009

	Stable area 2008-2009	New areas in 2009			Total
		Primary forest in 2008	Other type of vegetation 2009		
			No coca cultivation found before 2009	Under coca cultivation before 2008	
Area (hectares)	19,920	8,730	20,313	18,917	67,879[4]
Percentage	29%	13%	30%	28%	100%

The multitemporal analysis in the past eight years shows that 57% of the coca fields identified in 2009 have been previously under coca cultivation for one or more years throughout this period.

The analysis of the survey information also shows that the average size of the coca field did not change as compared to 2008; it remained stable in 0.66 hectares after a continuous decrease since 2001, when the average size was 2.05 hectares. The decrease in the size of the coca fields may be viewed as a strategy of the coca growers to prevent manual eradication and aerial spraying.

The ten municipalities shown in the following table are classified as having the largest areas under coca cultivation in 2009. Together, they represent 37% of the area cultivated with coca and 37% of the cocaine production at the national level. The municipalities of Magui and El Charco (Nariño), and Puerto Asis (Putumayo) were replaced by Timbiqui and Olaya Herrera (Nariño), and Miraflores (Guaviare) in the list of the 10 municipalities with the largest extensions of coca cultivation in 2009.

The municipality of Tumaco (Nariño) has the greatest area under coca cultivation in the country (6.9% of the country total) and Cumaribo (Vichada) has the greatest production of cocaine (7.5% of the country total).

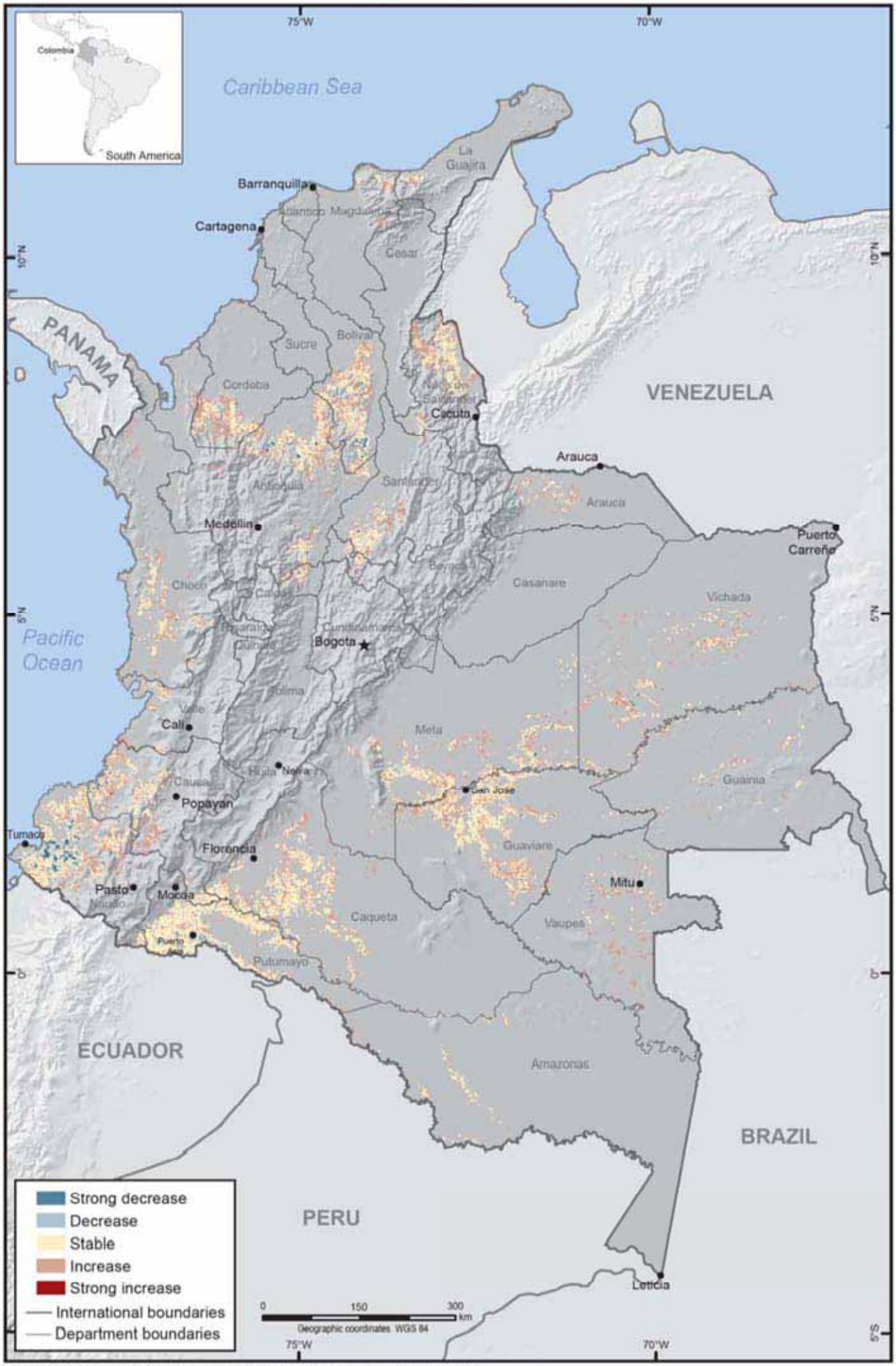
[4] *145 hectares located on recently added coca growing regions, were excluded.*

Table 2.The ten municipalities with the greatest area under coca cultivation and the highest production of cocaine, 2009

Municipality	Department	Area under coca cultivation (hectares)	% of the area under coca cultivation in Colombia	Production of pure cocaine (in m.t)
Tumaco	Nariño	4,681	6.9%	27
Cumaribo	Vichada	3,093	4.5%	31
Barbacoas	Nariño	2,928	4.3%	15
San Jose del Guaviare	Guaviare	2,906	4.3%	15
El Retorno	Guaviare	2,371	3.5%	14
Miraflores	Guaviare	2,325	3.4%	11
Mapiripan	Meta	2,123	3.1%	13
Timbiqui	Cauca	1,699	2.5%	7
Roberto Payan	Nariño	1,539	2.3%	10
Olaya Herrera	Nariño	1,452	2.1%	7
Total		**25,117**	**36.9%**	**150**

Coca growing field.

Coca cultivation density change in Colombia, 2008 - 2009



Source: Government of Colombia - National monitoring system supported by UNODC

The most important reductions in coca cultivation between 2008 and 2009 took place in the departments of Putumayo (-4,342 hectares) in the south of the country, Nariño (-3,184 hectares) in the southwest, and Antioquia (-1,502 hectares) in the Central region. The reduction in the area under coca cultivation in Putumayo is 33% of the total reduction in the area under coca cultivation in 2009. Coca cultivation in Putumayo has had three different periods; in the first one, between 1999 and 2004, there was a trend to decrease, dropping from a peak of 66,022 hectares in 2000 to 4,386 hectares in 2004, which was the smallest area of coca cultivation so far. As from this year, the trend was to increase, and the cultivation went up until it reached 14,800 hectares in 2007; finally, there is another reduction period that remains in 2009 dropping to 5,316 hectares.

Likewise, it is worth highlighting the constant reduction of the area cultivated with coca in the Meta department, dropping from 18,740 hectares in 2004 to 4,295 hectares in 2009, which represents a reduction of 77 % between 2004 and 2009.

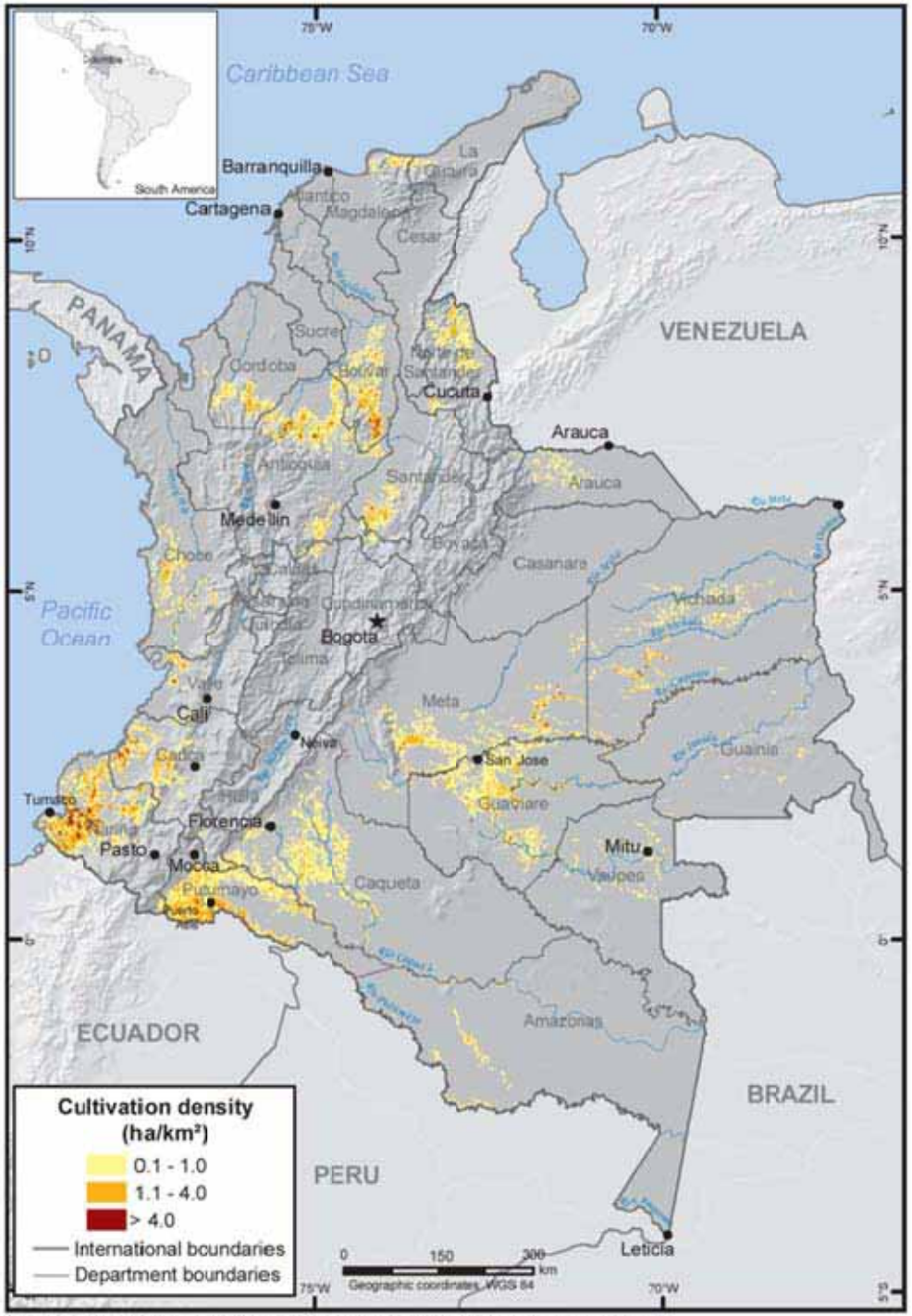
Three departments reported an increase in the area under coca cultivation, namely Guaviare (+1,694 hectares), Cordoba (+1,072 hectares) and Cauca (+722 hectares). It is worth noting the permanent increase of coca cultivation in the department of Cauca, where the cultivated area has grown 385% since 2004, reaching 6,144 hectares in 2009.

Nariño and Guaviare are the departments with the greatest extension of coca fields, with 36% of the country total. Putumayo went from the second to the fourth place in area under coca cultivation. 45% of the country total is only in three departments: Nariño, Guaviare and Cauca.

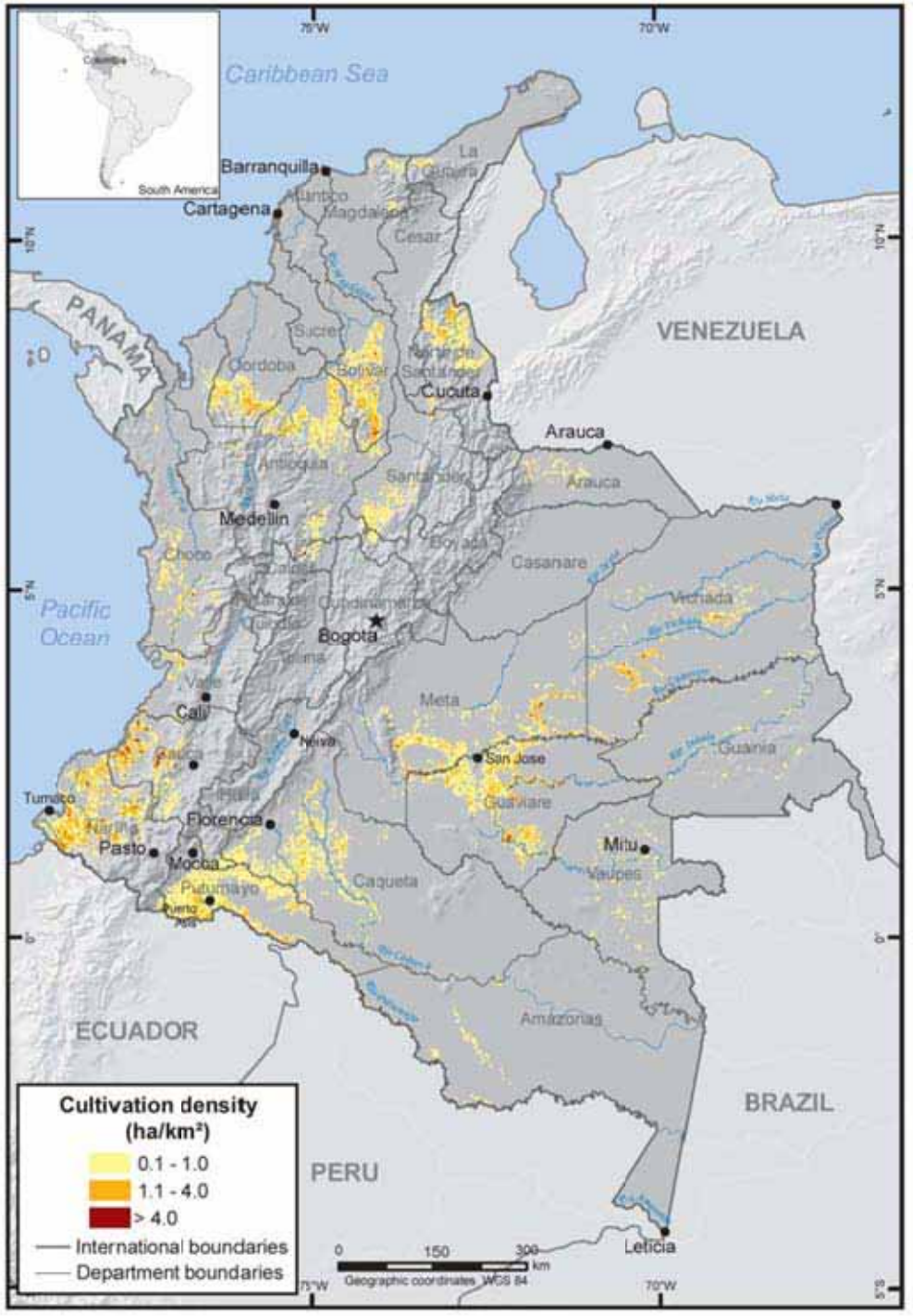
Table 3.Coca cultivation by department in Colombia, 2004 – 2009 (hectares)

Department	Dec.-2004	Dec.-2005	Dec.-2006	Dec.-2007	Dec.-2008	Dec.-2009	Change % 2008-2009	% of the 2009 total
Nariño	14,154	13,875	15,606	20,259	19,612	16,428	-16%	24%
Guaviare	9,769	8,658	9,477	9,299	6,629	8,323	+26%	12%
Cauca	1,266	2,705	2,104	4,168	5,422	6,144	+13%	9%
Putumayo	4,386	8,963	12,254	14,813	9,658	5,316	-45%	8%
Bolívar	3,402	3,670	2,382	5,632	5,847	4,777	-18%	7%
Antioquia	5,168	6,414	6,157	9,926	6,096	4,554	-25%	7%
Meta	18,740	17,305	11,063	10,386	5,525	4,295	-22%	6%
Caquetá	6,500	4,988	4,967	6,318	4,303	3,760	-13%	6%
Vichada	4,692	7,826	5,523	7,218	3,174	3,139	-1%	5%
Córdoba	1,536	3,136	1,216	1,858	1,710	2,782	+63%	4%
N. de Santander	3,055	844	488	1,946	2,886	2,713	-6%	4%
Chocó	323	1,025	816	1,080	2,794	1,666	-40%	2%
Santander	1,124	981	866	1,325	1,791	953	-47%	1%
Valle del Cauca	45	28	281	453	2,089	929	-56%	1%
Guainía	721	752	753	623	625	538	-14%	1%
Arauca	1,552	1,883	1,306	2,116	447	418	-6%	1%
Vaupés	1,084	671	460	307	557	351	-37%	1%
Amazonas	783	897	692	541	836	277	-67%	0.4%
Boyacá	359	342	441	79	197	182	-8%	0.3%
Caldas	358	189	461	56	187	166	-11%	0.2%
La Guajira	556	329	166	87	160	163	+2%	0.2%
Magdalena	706	213	271	278	391	151	-61%	0.2%
Cundinamarca	71	56	120	131	12	0	-100%	n.a
Cesar	0	0	0	0	5	0	-100%	n.a
TOTAL	80,350	85,750	77,870	98,899	80,953	68,025	-16%	100%
Rounded total	**80,000**	**86,000**	**78,000**	**99,000**	**81,000**	**68,000**	**-16%**	
Number of affected departments	23	23	23	23	24	22		

Coca cultivation density in Colombia, 2008



Coca cultivation density in Colombia, 2009



Source: Government of Colombia - Naticnal monitoring system supportec by UNODC
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

Coca cultivation density in the Andean Region, 2009

Sources: National monitoring systems supported by UNODC - Governments of Bolivia, Colombia, Ecuador and Peru

The area under coca cultivation in Colombia is 43% of the world total, while the cultivated areas in Peru and Bolivia are 38% and 19% respectively.

Figure 2: Coca cultivation in the Andean Region 2001 – 2009

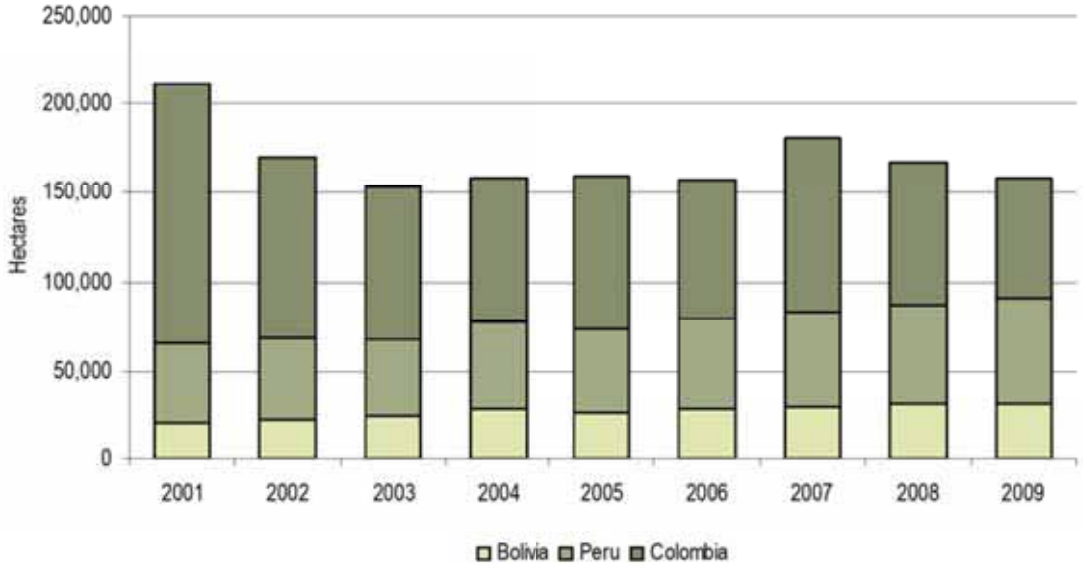
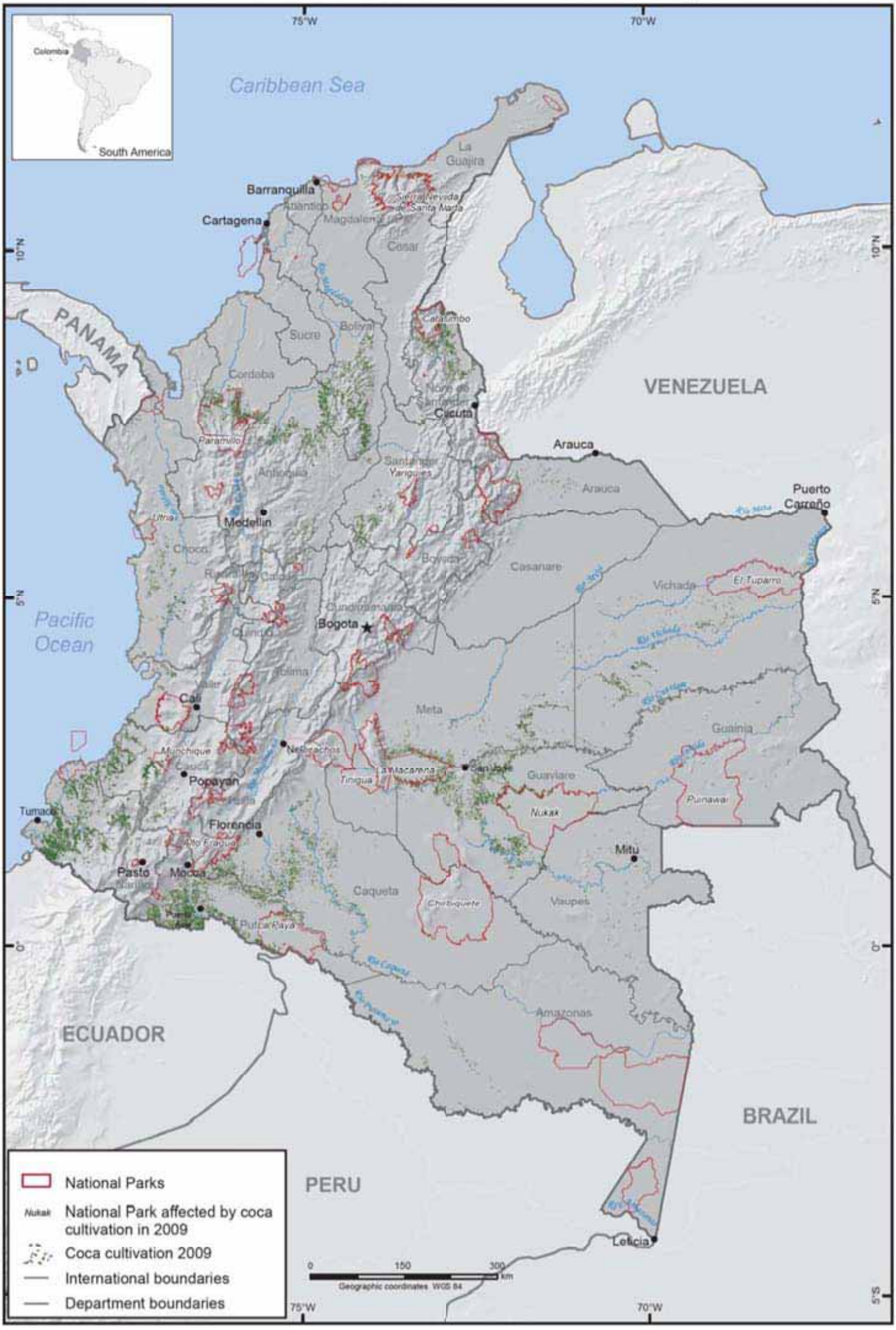


Table 4.Coca cultivation in the Andean Region 2001 - 2009 (in hectares)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	% Cambio 2008-2009
Bolivia	19,900	21,600	23,600	27,700	25,400	27,500	28,900	30,500	30,900	+1,3%
Perú	46,200	46,700	44,200	50,300	48,200	51,400	53,700	56,100	59,900	+6,8%
Colombia	145,000	102,000	86,000	80,000	86,000	78,000	99,000	81,000	68,000	-16%
Total	211,100	170,300	153,800	158,000	159,600	156,900	181,600	167,600	158,800	-5.3%

Sources US State Department National Monitoring System –SIMCI- assisted by UNODC

National Parks and coca cultivation in Colombia, 2009



Sources: Government of Colombia; for coca cultivation National monitoring system supported by UNODC; for national parks UAESPNN
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

Coca cultivation in national natural parks

The presence of illicit crops both in National Natural Parks and in Indigenous Territories has been monitored by SIMCI since the 2001 survey. The data has been delivered to the relevant authorities as a support to the identification of actions and projects for the preservation of the social and environmental characteristics, causing the least harm possible.

The boundaries of the National Natural Parks and Indigenous Territories have been determined by the official entities in charge of preserving and maintaining them. In 2005, the limits of the National Natural Parks were revised by the project, in cooperation with the technicians of the National Parks Administrative Unit. The editing improved the coherence between SIMCI cartographic material and the official boundaries of the Parks. The boundaries of the National Parks are not always accurate; hence, the coca cultivation estimated in each one of them depends on the accuracy of their delimitation[5].

In 2009, coca cultivation was found in 18 de out of 55 National Natural Parks in Colombia; this was 4 more than the reported in 2008. The Yaigoje Apaporis, Los Katios, Plantas Medicinales Orito Ingi Ande and Churumbelos parks were included for the first time in the list of parks affected by coca cultivation. The El Tuparro, Los Picachos, Selva de Florencia and Utria parks, where coca cultivation had been found in previous years, were free in 2009.

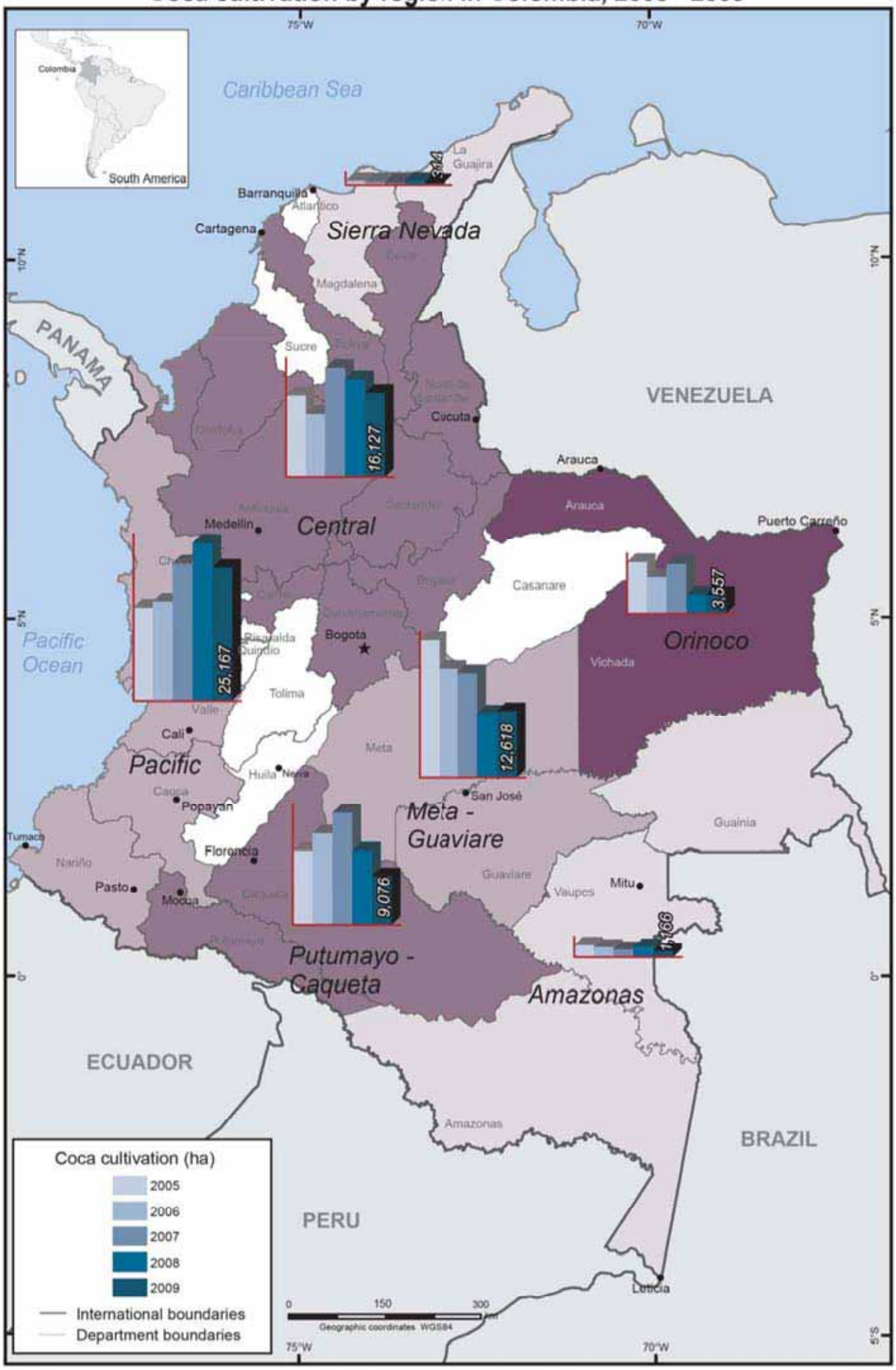
The area under coca cultivation in National Parks (4,048 hectares) represents el 0.03% of the total area of National Natural Parks and 6% of the country coca cultivation total for this year. Opposite to the national tendency, the coca cultivation in National Parks increased in 17%. This growth is strongly concentrated in the Paramillo (+748 hectares), Macarena (+95 hectares) and Nukak (+69 hectares) parks. The findings on Indigenous Territories are presented in the Appendix 3.

Table 5.Coca cultivation in National Natural Parks 2005 – 2009

National Parks	2005	2006	2007	2008	2009	Change % 2008-2009
Paramillo	686	236	420	464	1,212	+161%
Nukak	930	779	1,370	1,033	1,102	+7%
Sierra de la Macarena	3,354	1,689	1,258	581	676	+16%
Catatumbo - Barí	55	22	38	477	339	-29%
La Paya	728	527	358	377	293	-22%
Munchique	13	6	55	96	147	+53%
Sierra Nevada de Santa Marta	95	119	94	170	95	-44%
Puinawai	60	41	26	67	67	0%
Los Farallones de Cali	-	-	-	44	44	0%
Sanquianga	-	-	41	33	17	-48%
Yaigoje Apaporis	na	na	na	na	15	-
Yariguies	2	4	12	-	15	-
Los Katios	-	-	-	-	8	-
Tinigua	155	122	63	37	8	-78%
Plantas Medicinales Orito Ingi Ande	na	na	na	na	4	-
El Cocuy	-	2	1	3	3	0%
Alto Fragua	25	1	5	4	2	-50%
Churumbelos	-	-	-	-	1	-
El Tuparro	-	-	14	18	-	0%
Los Picachos	7	6	3	-	-	-
Selva de Florencia	-	2	-	-	-	-
Utria	-	-	12	44	-	0%
TOTAL	6,110	3,556	3,770	3,448	4,048	+17%
Rounded total	6,100	3,600	3,800	3,400	4,000	

[5] *The analysis was made following the delimitation of National Natural Parks supported by SIMCI in 2005. New data will be avaliable soon.*

Coca cultivation by region in Colombia, 2005 - 2009



Source: Government of Colombia - National monitoring system supported by UNODC
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

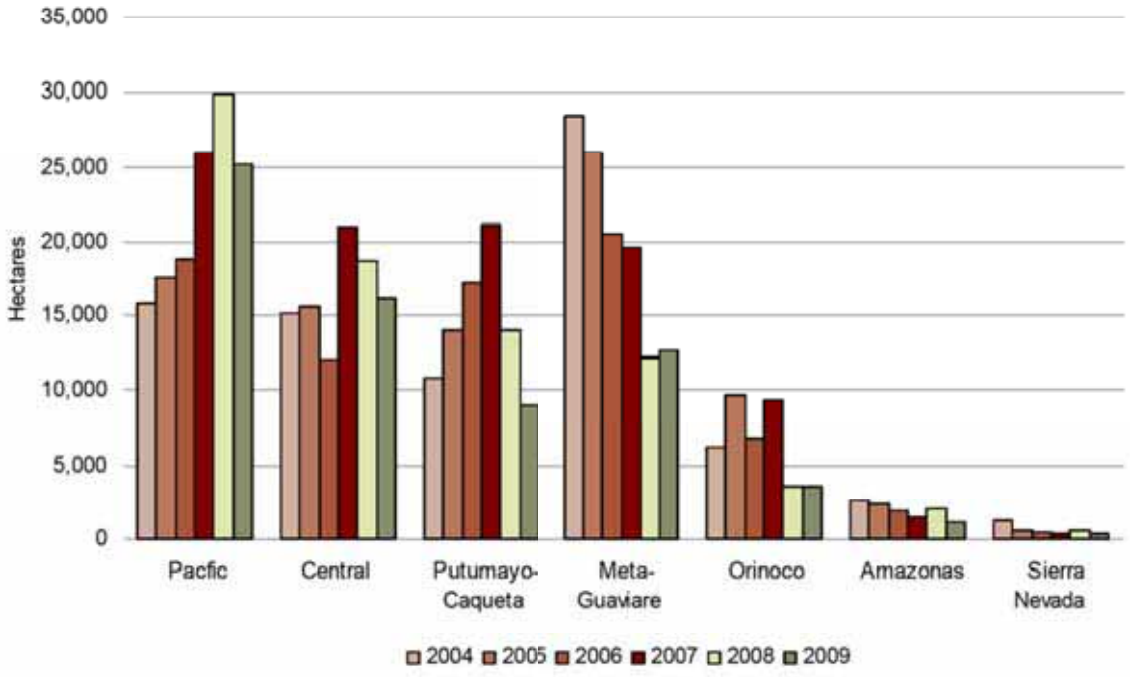
Regional Analysis

According to the 2009 survey, 80% of the coca fields are in the Pacific, Central and Meta – Guaviare regions. Most reduction has occurred in the Putumayo-Caqueta region (-4,885 hectares) and in the Pacific region (-4,750 hectares) in the south and south west respectively. The only place where there was an increase was the Meta - Guaviare region (+464 hectares)

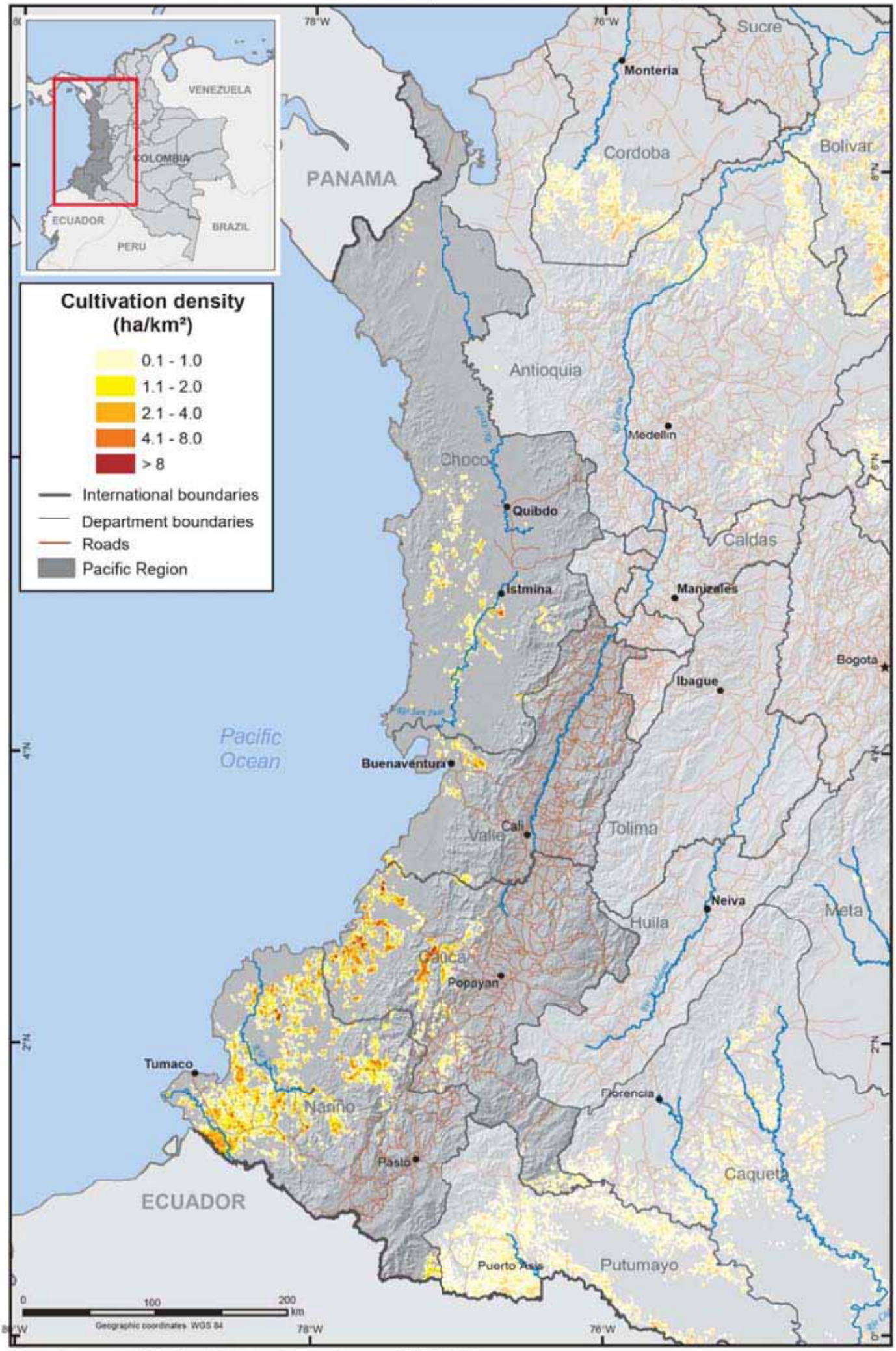
Table 6.Coca cultivation in Colombia by region 2004 - 2009 (in hectares)

Region	2004	2005	2006	2007	2008	2009	Change % 2008 – 2009	% from the 2009 total
Pacific	15,789	17,633	18,807	25,960	29,917	25,167	-16%	37%
Central	15,081	15,632	12,131	20,953	18,731	16,127	-14%	24%
Meta-Guaviare	28,507	25,963	20,540	19,685	12,154	12,618	4%	19%
Putumayo-Caqueta	10,888	13,951	17,221	21,131	13,961	9,076	-35%	13%
Orinoco	6,250	9,709	6,829	9,334	3,621	3,557	-2%	5%
Amazon	2,588	2,320	1,905	1,471	2,018	1,166	-42%	2%
Sierra Nevada	1,262	542	437	365	551	314	-43%	0.50%
Rounded total	80.000	86.000	78.000	99.000	81.000	68.000	-16%	100%

Figure 3: Coca cultivation per region 2004– 2009



Coca cultivation density in the Pacific region, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

Pacific region

This region is located in the south west of the country, from the border with Ecuador, following the pacific coast up to the border with Panama. Its relief goes from the highest lands in Colombia up to the Pacific Ocean coast. The constant presence of clouds in that area makes it difficult to measure the land coverage, including coca cultivation.

Table 7.Coca cultivation in the Pacific region, 2004-2009 (in hectares)

Department	2004	2005	2006	2007	2008	2009	Change% 2008-2009
Nariño	14,154	13,875	15,606	20,259	19,612	16,428	-16%
Cauca	1,266	2,705	2,104	4,168	5,422	6,144	13%
Choco	323	1,025	816	1,080	2,794	1,666	-40%
Valle del Cauca	45	28	281	453	2,089	929	-56%
Total	15,788	17,633	18,807	25,960	29,917	25,167	-16%
Annual trend	-19%	+12%	+7%	+38%	+15%	-16%	

The coca cultivation in Nariño gained importance in 2002, when they dropped 40,000 hectares in the neighbour departments of Putumayo and Caqueta and reached 7,600 hectares in Nariño. As from 2003, Nariño has remained in the group of the three departments with the greatest area under coca cultivation; it occupied the first place in 2009 although it had a reduction of -16%. In 2009, the aerial spraying in this department reached 40,000 hectares, 35% less than in 2008. In addition, 16,822 hectares of manual eradication were reported, which is more than twice the area reported in 2008.

In 2009, coca fields were found in 25 out of the 64 municipalities of the department. With a total of 16,428 hectares under coca cultivation, Nariño is the department with the greatest extension of coca fields, accounting for 24% of the country total. It is worth noting that in 2009, 35% of all the fields smaller than ¼ of hectare in the country were found in Nariño; this shows a recent smallholding tendency in the agricultural practices in this area of the country. Nariño is the third department most benefited from productive projects.

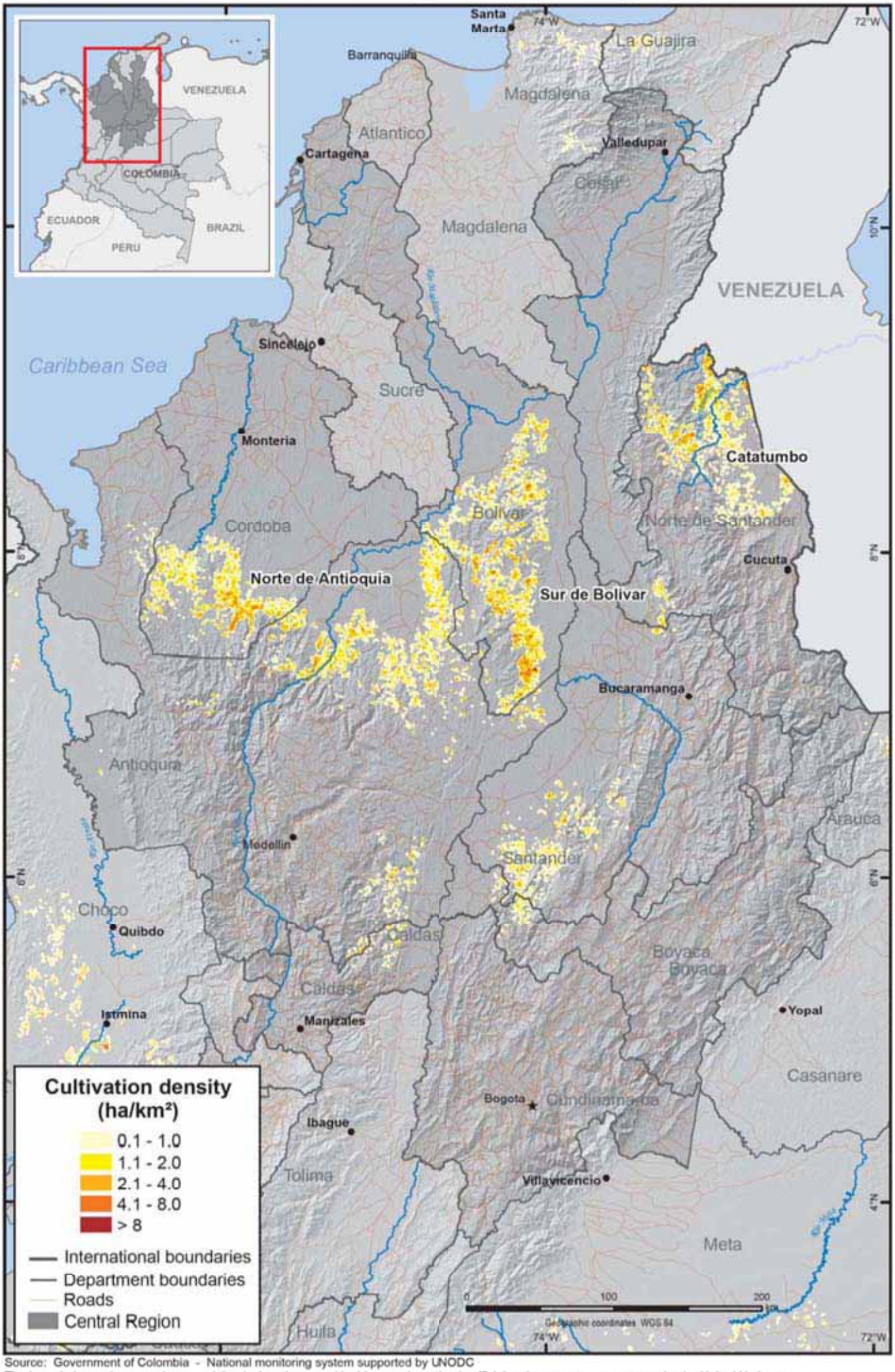
The department of Cauca shares many characteristics with Nariño, such as an extensive coast, high mountain ranges and rural economy. The coca cultivation in Cauca had been relatively low until 2006, when the area under this cultivation grew three times, reaching a total of 6,144 hectares in 2009; this growth turned Cauca into one of the three departments with greatest extensions of coca fields in the country. It is important to note that the conditions of image cloudiness improved in the 2009 survey as compared to the 2008 survey; for this reason, some coca fields were detected for the first time in 2009, although they were not new. In Cauca, 2,796 hectares were manually eradicated and 11,136 hectares underwent aerial spraying during 2009. In 2009 Cauca is in the first place regarding the investment in productive projects.

The department of Valle del Cauca had always recorded an area smaller than 300 hectares under illicit cultivation, but it had a dramatic growth in 2008, when it reached 2,089 hectares; in 2009, the area cultivated with coca dropped more than 50%, to 929 hectares.

The department of Choco had a reduction of 40%, dropping from 2,794 hectares in 2008 to 1,666 hectares cultivated with coca in 2009. The presence of clouds over this department affects the detection of the fields; for this reason, part of the reduction may be associated to lack of information. There was no aerial spraying over Chcco in 2009, but still 1,835 hectares were manually eradicated.

Coca growing field in Cauca department.

Coca cultivation density in the Central region, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

Central region

Table 8.Coca cultivation in the Central region, 2004-2009 (in hectares)

Department	2004	2005	2006	2007	2008	2009	Change % 2008-2009
Bolivar	3,402	3,670	2,382	5,632	5,847	4,777	-18%
Antioquia	5,168	6,414	6,157	9,926	6,096	4,554	-25%
Cordoba	1,536	3,136	1,216	1,858	1,710	2,782	+63%
Norte de Santander	3,055	844	488	1,946	2,886	2,713	-6%
Santander	1,124	981	866	1,325	1,791	953	-47%
Boyaca	359	342	441	79	197	182	-8%
Caldas	358	189	461	56	187	166	-11%
Cundinamarca	71	56	120	131	12	0	-100%
Cesar	0	0	0	0	5	0	-100%
Total	15,073	15,632	12,131	20,953	18,731	16,127	-14%
Annual trend	-2%	+4%	-22%	+73%	-11%	-14%	

Since 2002, the coca cultivation in the Central region of Colombia has been stable with around 16,000 hectares. In 2007, this area significantly increased to 20,953 hectares and dropped to 18,731 hectares in 2008; in 2009 the trend to decrease remained (-14%) with a total of 16,127 hectares.

The Central region is comprised by 9 departments; 58% of the illicit cultivation is in two of them: Bolivar and Antioquia. In these two departments, there was a reduction of the area under coca cultivation (-18% and -25% respectively). No coca cultivation was found in the two departments of Cesar and Cundinamarca in 2009.

In the department of Bolivar, coca fields are concentrated in the area known as *Sur de Bolivar;* they have been relatively stable between 3% and 8% of the country total from 1999 to 2006. In 2007, the coca cultivation increased 3,250 hectares (136%) with respect to 2006; then, after a slight growth in 2008 it dropped in 1,070 hectares in 2009. The aerial spraying reached 8,714 hectares in 2009; and, the manual eradication dropped to 1,887 hectares.

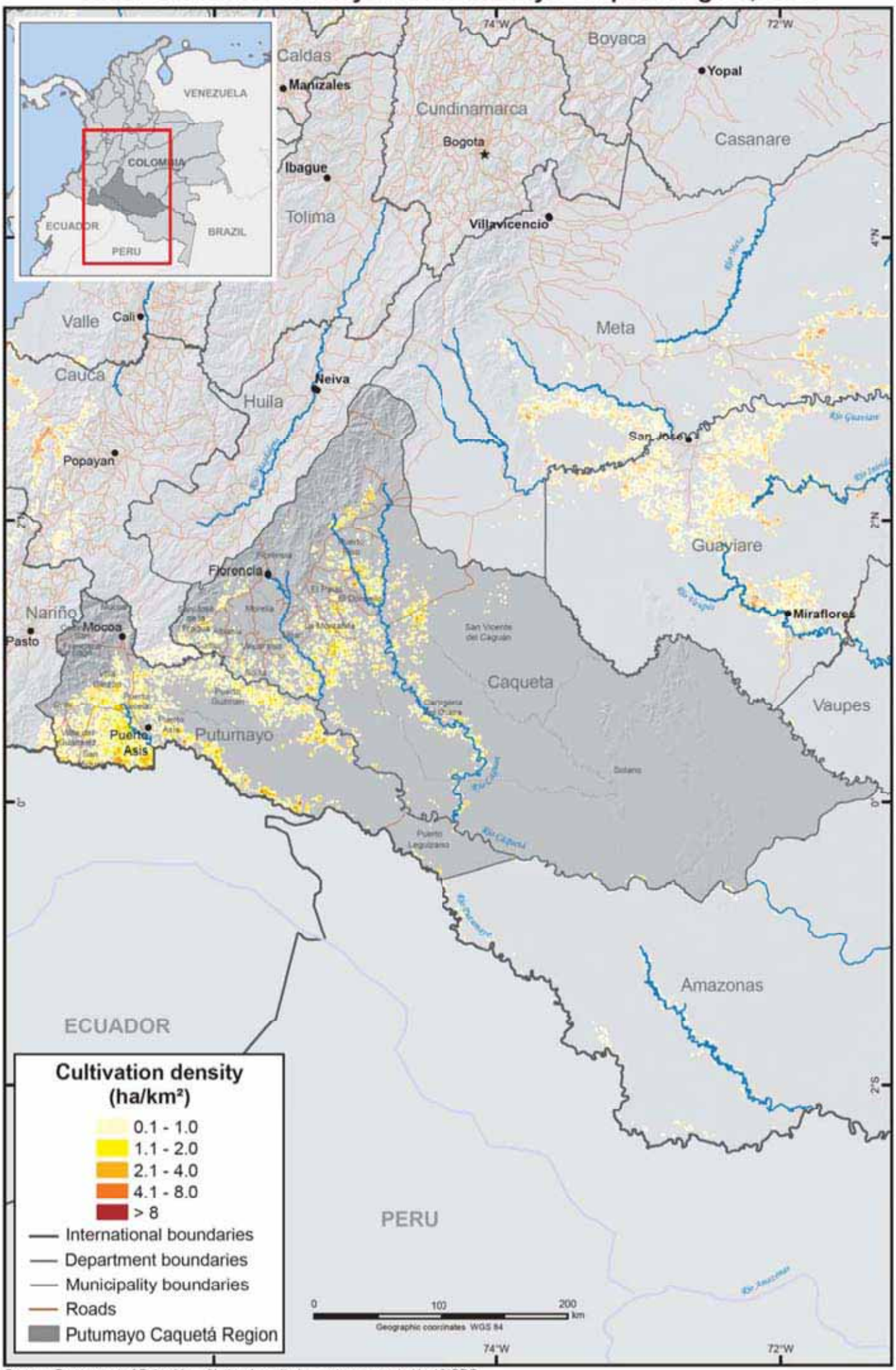
In Antioquia, the area under coca cultivation was around the average of 3,000 hectares between 1999 and 2002. However, it started to increase in 2007, going from 3,030 hectares to 9,926 hectares; from that year on, the trend changed and in 2009 there were 4,554 hectares under coca cultivation which is the smallest area reported in the last 5 years. The manual eradication was reduced to 40% compared to 2008, while aerial spraying remained the same. Antioquia receives 7% of the investment in productive projects in the country.

Cordoba is one of the three departments where the area under coca cultivation grew during 2009, going from 1,710 hectares to 2,782 hectares. Manual eradication and aerial spraying were considerably reduced; they dropped from 10,861 hectares to 2,785 hectares intervened.

After reaching the lowest level in 2006, coca fields in the department of Norte de Santander grew three times their size in 2007 and two times 2008. This tendency to growth stopped in 2009, when a slight reduction was recorded. Manual eradication was reduced in 1,245 hectares and aerial spraying in 981 hectares.

In Santander, coca cultivation reached its peak in 2008, with 1,791 hectares. In 2009, they went back to their historical average with 953 hectares. Both aerial spraying and manual eradication increased, going from 2,034 to 3,352 intervened hectares. The area under coca cultivation in Caldas and Boyaca remained the same as in 2008.

Coca cultivation density in the Putumayo-Caqueta region, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

Putumayo-Caqueta region

Table 9.Coca cultivation in the Putumayo-Caqueta region, 2004-2009 (in hectares)

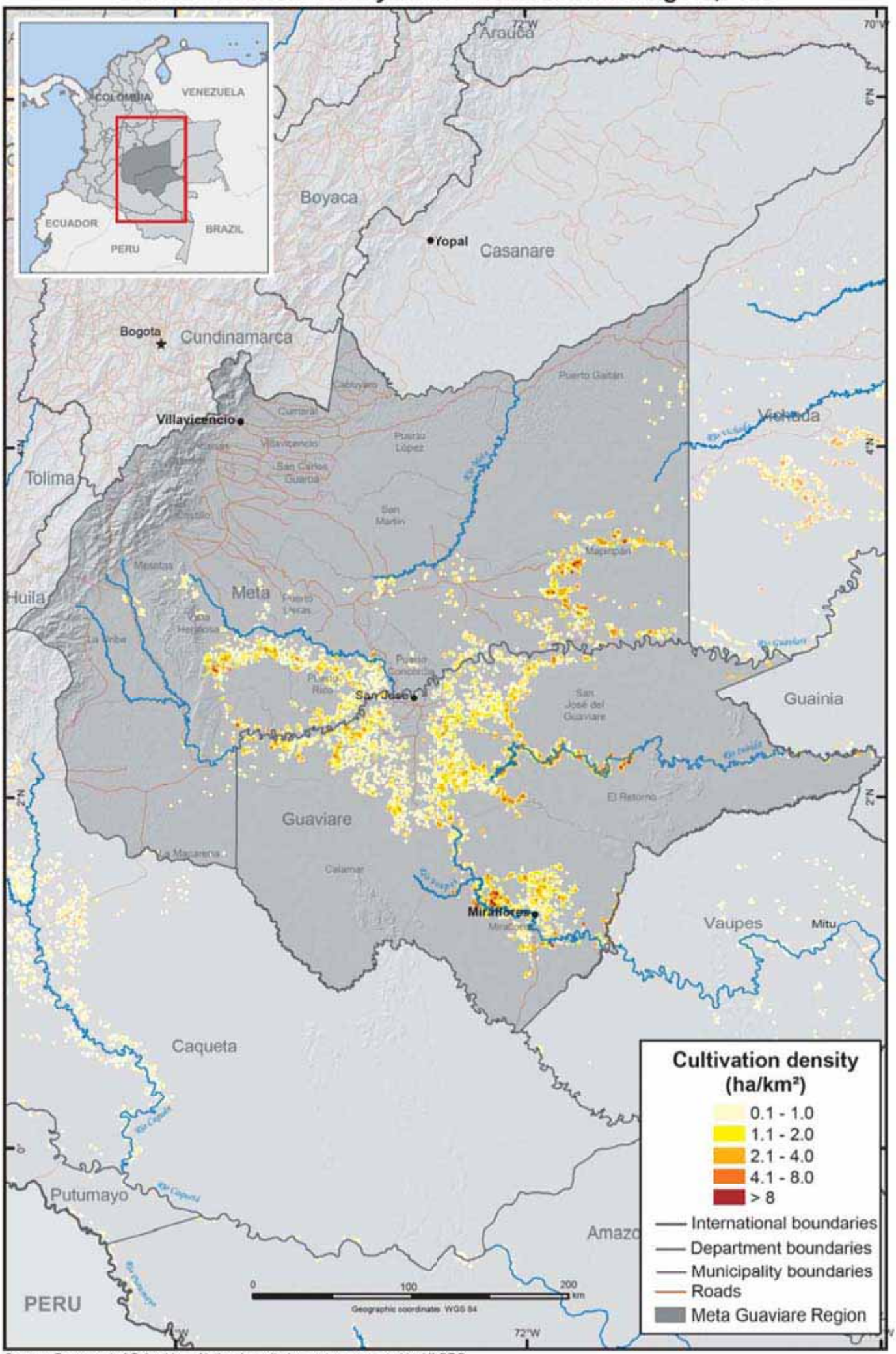
Department	2004	2005	2006	2007	2008	2009	Change % 2008-2009
Putumayo	4,386	8,963	12,254	14,813	9,658	5,316	-45%
Caqueta	6,500	4,988	4,967	6,318	4,303	3,760	-13%
Total	10,886	13,951	17,221	21,131	13,961	9,076	-35%
Annual trend	-26%	+28%	+23%	+23%	-34%	-35%	

Coca cultivation in the department of Putumayo reached a peak of 66,000 hectares (40% of the country total) in 2000. After four consecutive years of important decrease, it dropped to 4,386 hectares (5% of the country total) in 2004. However, this tendency changed between 2005 and 2007 with consecutive increases of 105% in 2005, 37% in 2006 and 21% in 2007; a considerable trend to decrease started on this last year, which has remained until 2009, when the area under coca cultivation was 5,316 hectares (8% of the country total). Serious interventions with aerial spraying (11,898 hectares) and manual eradication (29,284 hectares) were done during 2008 and these were considerably diminished in 2009 (3,777 sprayed hectares and 4,654 hectares manually eradicated).

The coca fields in the department of Caqueta reached their lowest historical extension in 2009 with 3,760 hectares (6% of the country total), after a slight but constant reduction that begun in 2001, when the area under coca cultivation was 14,516 hectares (10% of the country total).

Coca fields in the Putumayo-Caqueta region

Coca cultivation density in the Meta-Guaviare region, 2009



Source: Goverment of Colombia - National monitoring system supported by UNODC

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Meta-Guaviare region

Table 10.Coca cultivation in Meta-Guaviare, 2004 – 2009 (in hectares)

Department	2004	2005	2006	2007	2008	2009	Change % 2008 - 2009
Guaviare	9,769	8,658	9,477	9,299	6,629	8,323	+26%
Meta	18,740	17,305	11,063	10,386	5,525	4,295	-22%
Total	28,509	25,970	20,540	19,685	12,154	12,618	+4%
Annual trend	-2%	-9%	-21%	-4%	-38%	4%	

The Meta-Guaviare region has traditionally been the one with the greatest coca cultivation in the country; nonetheless, since 2005 there has been a constant tendency to reduction, going from 28,509 hectares in 2004 to 12,154 hectares in 2008; in 2009, the reduction of 1,230 hectares in Meta was compensated by an increase of 1,694 hectares in Guaviare.

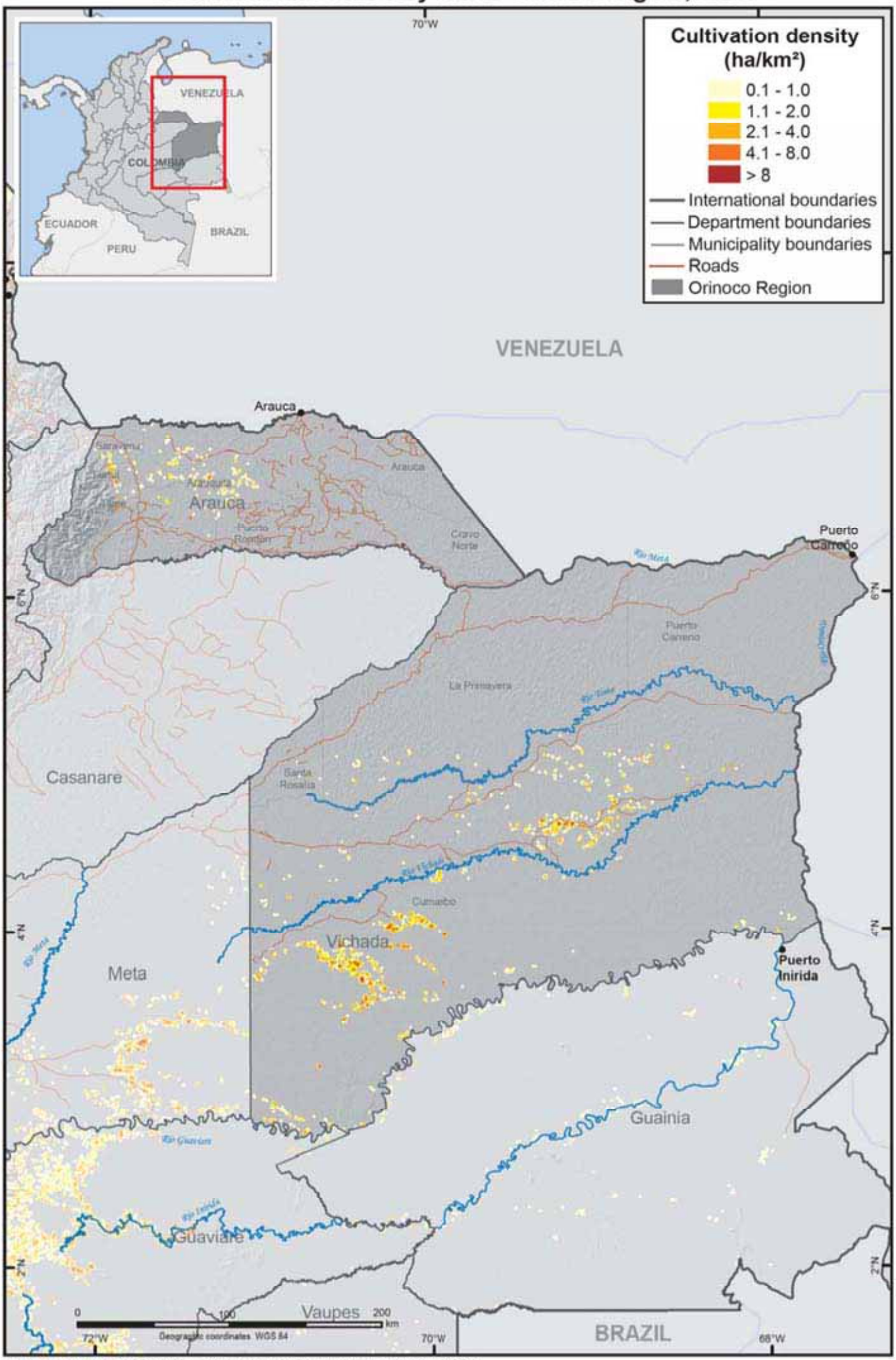
Between 2004 and 2005, the department of Meta had the highest level of coca cultivation in Colombia. In 2008 it went down to the sixth place and in 2009 to the seventh, with a reduction of 22%. This department has 6% of the total extension cultivated with coca in the country. Aerial spraying dropped from 9,057 hectares in 2008 to 6,755 hectares in 2009 (-25%), while the manual eradication increased 1,149 hectares. The execution of the Government Consolidation Plan -PCIM was maintained in this department, aimed at strengthening the presence of the state, recovering the security of the population and promoting the investment of the private and international sectors in legal agricultural production.

Guaviare is the department with the greatest increase in coca cultivation in all the country. This department is where the first coca cultivation appeared in the late 70's and since then it has been very important. Although the area under coca cultivation in 2008 (6,629 hectares) was the smallest ever, there was an increase of 26% in 2009 (8,323 hectares) and Guaviare was in the second place of the departments with the greatest areas under coca cultivation. During 2009, aerial spraying was the same than in 2008; on the other hand, while there was no manual eradication in 2008, 4,971 hectares were manually eradicated in Guaviare in 2009.

Two of the National Natural Parks most affected by coca cultivation are located in the Meta – Guaviare region, and there were increases in both of them: the Nukak National Park in the department of Guaviare with 1,102 under coca cultivation (+7%) and the Sierra de la Macarena National Park with 676 hectares (+16%).

Coca growing fields in the Meta – Guaviare region

Coca cultivation density in the Orinoco region, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

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Orinoco region

Table 11.Coca cultivation in Orinoco region, 2004- 2009 (in hectares)

Department	2004	2005	2006	2007	2008	2009	Change% 2008-2009
Vichada	4,692	7,826	5,523	7,218	3,174	3,139	-1%
Arauca	1,552	1,883	1,306	2,116	447	418	-6%
Total	6,244	9,709	6,829	9,334	3,621	3,557	-2%
Annual trend	+43%	+56%	-30%	+37%	-61%	-2%	

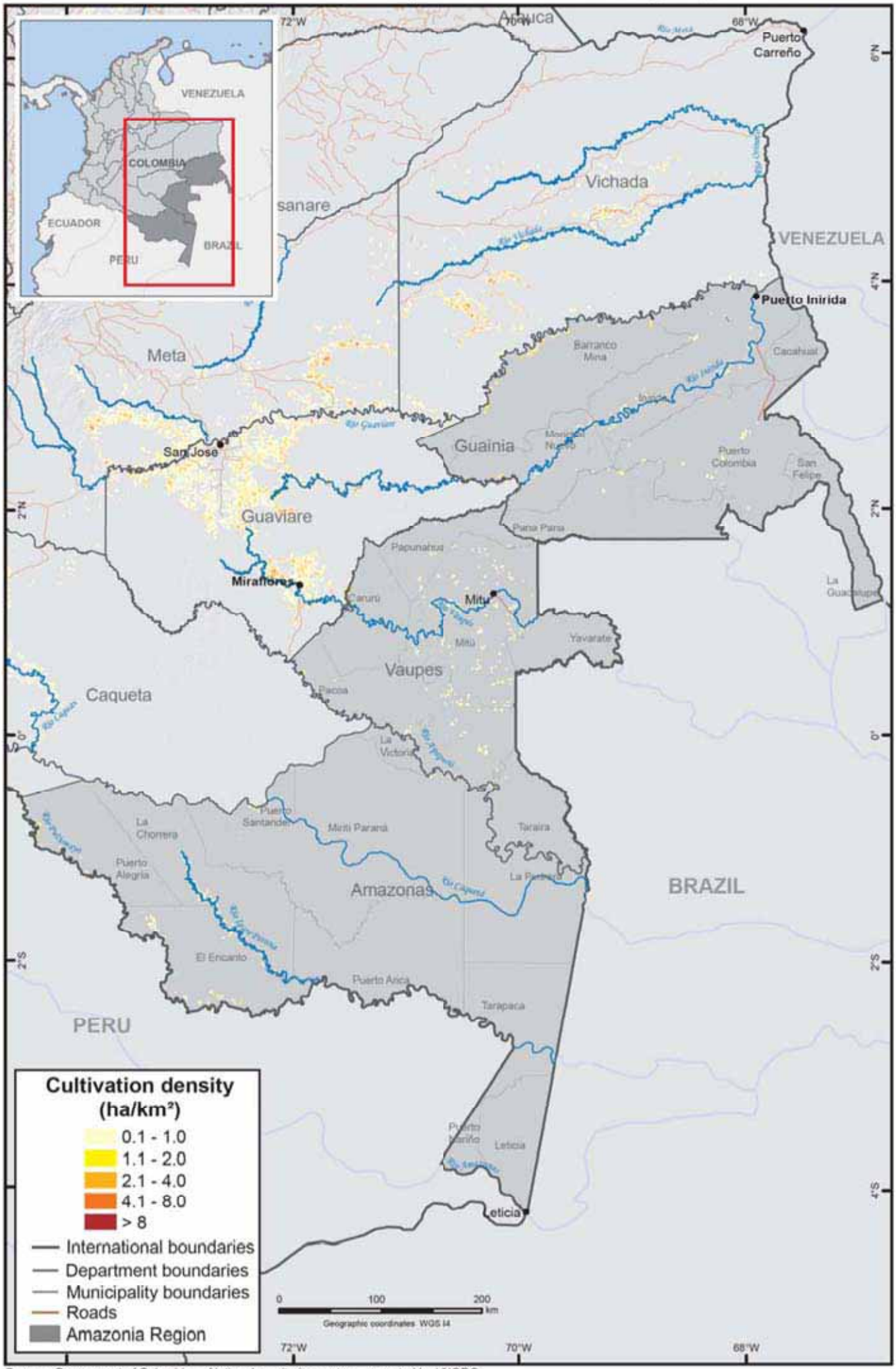
The region shows a clear tendency to stability, going from 3,621 hectares in 2008 to 3,557 hectares in 2009; this area is 5.2% of the total area under coca cultivation in the country.

In the Vichada department, limiting with Venezuela, the coca cultivation reached its peak of 9,200 hectares in 2001 and dropped to 5,523 hectares in 2006; then it increased in 2007 up to 7,218 hectares and decreased again in 2008 to the same extension of 2003, with 3,174 hectares; in 2009, the area remained stable. Manual eradication went from 7,242 hectares in 2008 to 4,758 hectares in 2009. Aerial spraying went from 5,900 hectares in 2008 to 1,699 hectares in 2009.

In the department of Arauca, around 1,000 hectares under coca cultivation were detected for the first time in 2000; it grew to its highest point in history in 2001 (2,749 hectares) and to its lowest in 2008 (447 hectares). The area cultivated with coca in 2009 (418 hectares) was a new minimum point for the department. In 2003, the greatest aerial spraying effort was made, with 12,000 hectares, while there was no aerial spraying during 2009; on the other hand, manual eradication was of 66 hectares.

Coca fields in Orinoco region

Coca cultivation density in the Amazonas region, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

Amazon region

Table 12.Coca cultivation in the Amazon region, 2004-2009 (in hectares)

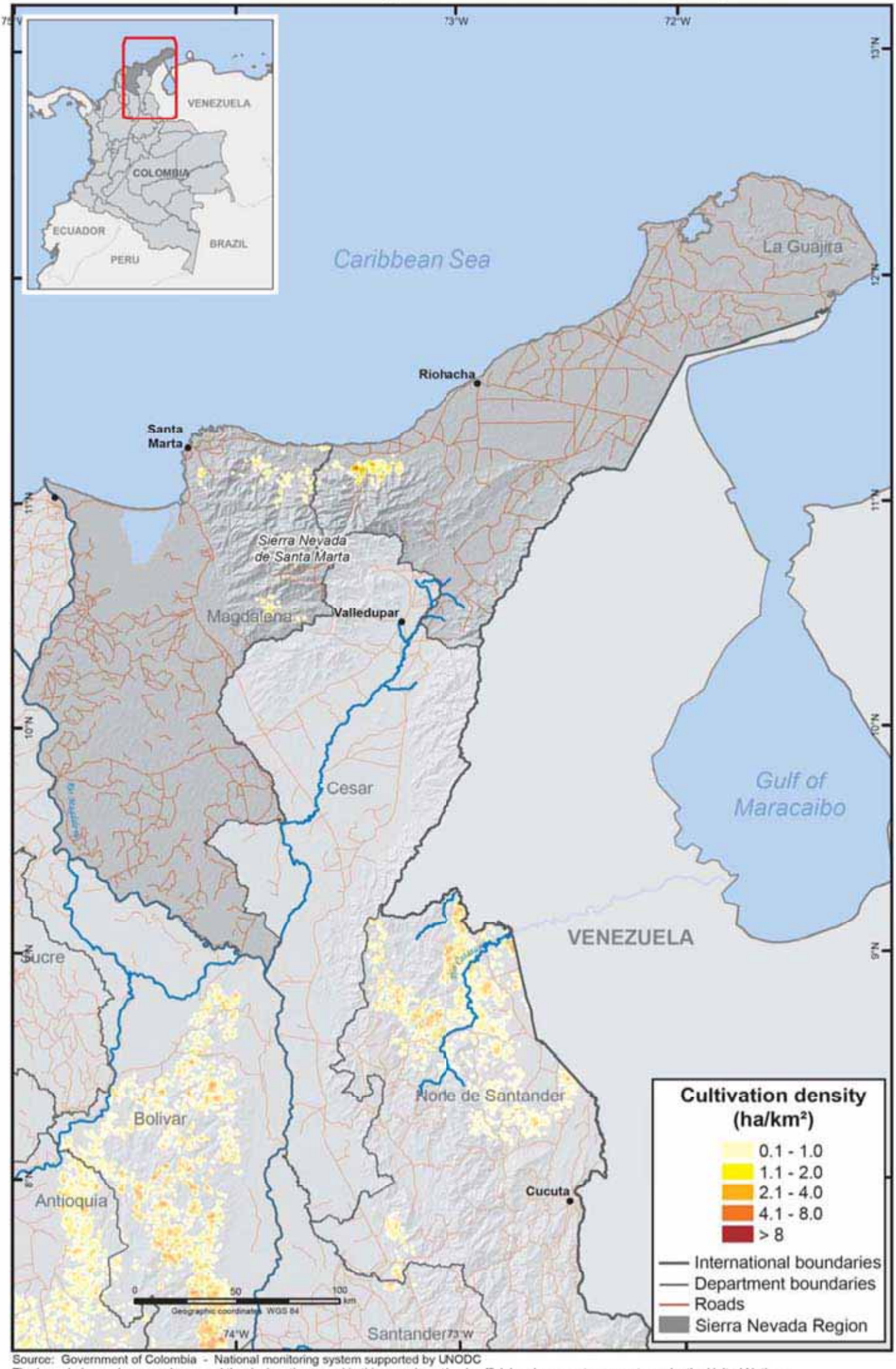
Department	2004	2005	2006	2007	2008	2009	Change % 2008-2009
Guainia	721	752	753	623	625	538	-14%
Vaupes	1,084	671	460	307	557	351	-37%
Amazonas	783	897	692	541	836	277	-67%
Total	2,588	2,320	1,905	1,471	2,018	1,166	-42%
Annual trend	+3%	-10%	-18%	-23%	+37%	-42%	

As those in the Putumayo-Caqueta region, the departments of Vaupes, Amazonas and Guainia belong to the Amazon basin. Although they share several geographic characteristics with Putumayo and Caqueta, these three departments grouped in the Amazon region have never been important centres for coca cultivation.

In 2009, 1,166 hectares under coca cultivation were reported in the region, which is around half of those reported in 2008; this reduction is strongly concentrated in the department of Amazonas, where the extension cultivated with coca went from 836 hectares in 2008 to 277 hectares in 2009. Manual eradication went from 310 hectares in 2008 to 550 hectaresin 2009 in the department of Amazonas, and 85 hectares were manually eradicated in Guainia.

Coca field in the department of Amazonas

Coca cultivation density in the Sierra Nevada region, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

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Sierra Nevada de Santa Marta region

Table 13.Coca cultivation in the Sierra Nevada region, 2004-2009 (in hectares)

Department	2004	2005	2006	2007	2008	2009	Change % 2008-2009
Guajira	556	329	166	87	160	163	2%
Magdalena	706	213	271	278	391	151	-61%
Total	1,262	542	437	365	551	314	-43%
Annual trend	+66%	-57%	-19%	-16%	+51%	-43%	

The Sierra Nevada de Santa Marta region, with the departments of Magdalena and Guajira, has never been important as regards to the extension of coca cultivation in Colombia. This extension has been between 500 and 1,300 hectares during the last eight years; there was a reduction trend that ended in the minimum of 365 hectares in 2007, and then it increased to 551 hectares in 2008; in 2009, this extension reached a new minimum of 314 hectares.

Coca fields have remained within the low lands between the high mountains of the Sierra Nevada and the Caribbean coast. No aerial spraying was reported but 921 hectares were manually eradicated in 2009.

During the last years, the region has been a bereficiary from important contributions for alternative development; for 2009, 1.2 % of the total investment in ongoing productive projects went to the Sierra Nevada de Santa Marta.

The region is an important tourist centre, and it comprises the National Natural Parks of Tayrona and Sierra Nevada which are two main ecological reserves in Latin America, known for their bio-diversity and the presence of different indigenous cultures. Coca cultivation in these parks was reduced in -44% in 2009.

Coca field in the Sierra Nevada region

Analysis of the coca cultivation dynamics

The spatial analysis of coca cultivation shows that, the areas affected by the presence of coca cultivation have been practically the same since the beginning of this century. Although there are variations in the position of the fields, these occur within a relatively small ratio. In fact, 76 % of the fields detected in 2009 are less than one kilometre away from those detected in 2001. Despite the reduction of the area cultivated with coca, the areas of most density of coca cultivation are still the same since 2001.

The comparison of the position of the coca fields in 2008 and 2009 showed that 63% of the fields (with 70% of the area under cultivation) either were in different locations or were not identified in 2008; nonetheless, 21,256 of these fields (23%) had already been detected before 2008. The average area of these fields is greater than the national average. 39% of the coca fields identified in 2009, with 56% of the area under cultivation, had not been identified in any of the previous surveys.

Table 14.New and stable coca fields in 2009 by region

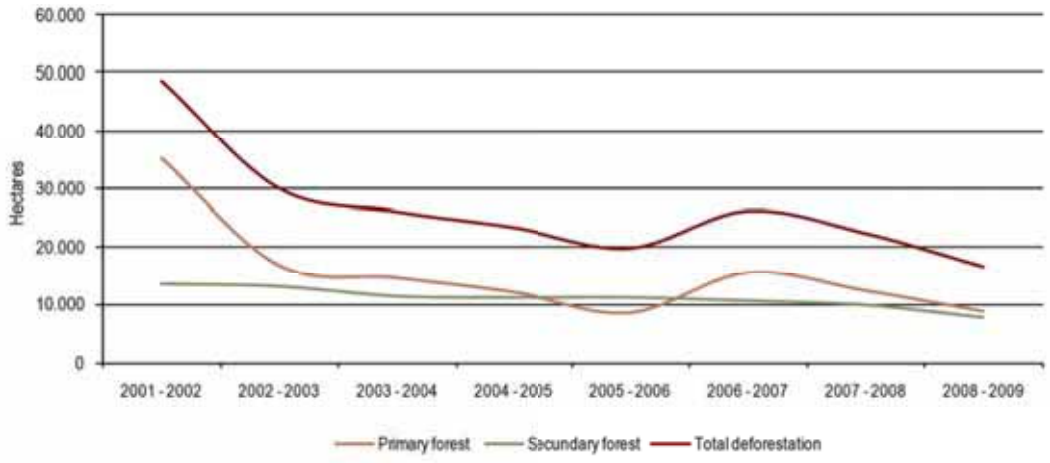
Region	Identified in 2008 and 2009				Not detected in 2008				Total 2009	
	Number of fields	Total % of fields	Area (hectares)	Total area %	Number of fields	Total % of fields	Area (hectares)	Total area %	Total fields	Total Area (hectares)
Amazon	380	28	228	22	954	72	830	78	1,334	1,057
Central	5,020	22	2,690	17	17,569	78	13,437	83	22,589	16,127
Guaviare - Meta	6,968	47	3,199	25	7,996	53	9,419	75	14,964	12,618
Orinoco	788	31	588	17	1,735	69	2,969	83	2,523	3,557
Pacific	13,994	45	10,835	43	16,810	55	14,332	57	30,804	25,167
Putumayo - Caqueta	6,278	37	2,352	26	10,811	63	6,724	74	17,089	9,076
Sierra Nevada	55	10	28	10	477	90	249	90	532	277
TOTAL	**33,483**	**220**	**19,920**	**159**	**56,352**	**480**	**47,960**	**541**	**89,835**	**67,879**

Deforestation due to coca cultivation

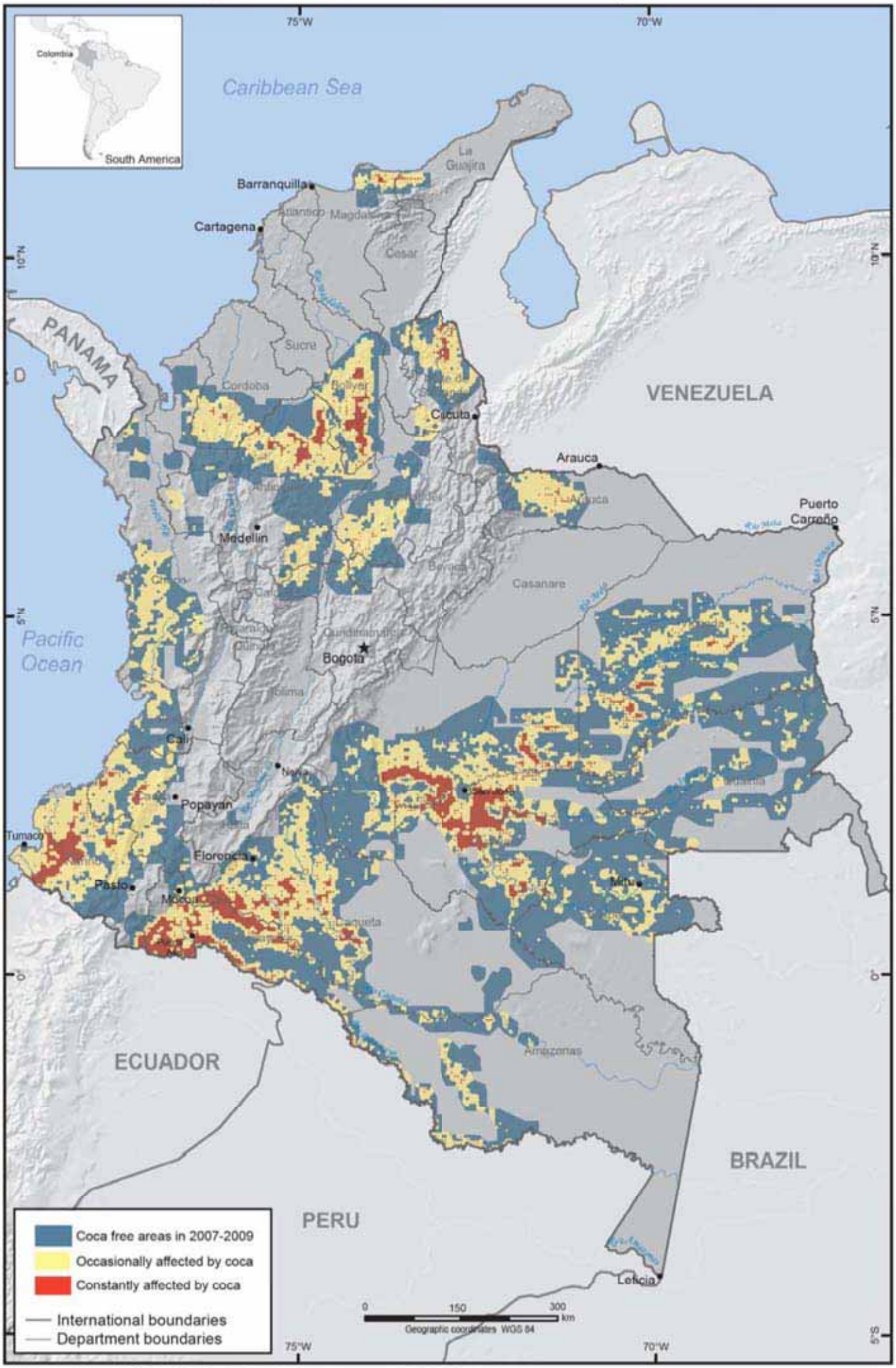
Regardless of the reduction of the area under coca cultivation, 13% of the coca fields existing in 2009 originated from the felling of forests that existed in 2008. In the period 2001-2009, 529,562 hectares have been under coca cultivation at some point; out of these, 200,730 hectares used to be covered with forests.

In the period 2000-2001, 55,000 hectares of forests were felled to plant coca, whereas in the period 2008-2009 the deforestation was of 16,500 hectares, from which more than 50% were primary forests of high complexity, biodiversity and richness. This reduction represents the return to the continued trend to the reduction of forest felling to plant coca, interrupted in the 2006-2007 period. In 2008, coca fields were at an average of 22 km from urban areas while in 2009 this distance increased to 27 km; nevertheless, 80% of the coca fields are at less than 1.3 Km from fields that had been already detected in 2001. This means that although the fields go further from urban areas, they remain in areas that had been already intervenes.

Figure 4: Deforestation rate due to coca cultivation, 2001-2009



Changes in coca cultivation in Colombia, 2001 - 2009



Source: Government of Colombia - National monitoring system supported by UNODC

Areas of possible new coca fields

The monitoring of coca cultivation done by SIMCI covered and interpreted 100% of the national territory, including areas that had not been identified as zones of coca cultivation before. In this way, an early alert system was implemented to detect and prevent the expansion of coca cultivation in new areas.

In 2009, small fields that may potentially be coca fields were detected in remote areas, different from the agricultural areas established in the departments located in the basins of the Orinoco and Amazonas rivers. The field verification has not been carried out in these areas due to the high costs in time and money of verifying the coca cultivation in small and isolated fields. As a consequence, the estimate of coca cultivation in these areas is just an indicator and was not included in the final result.

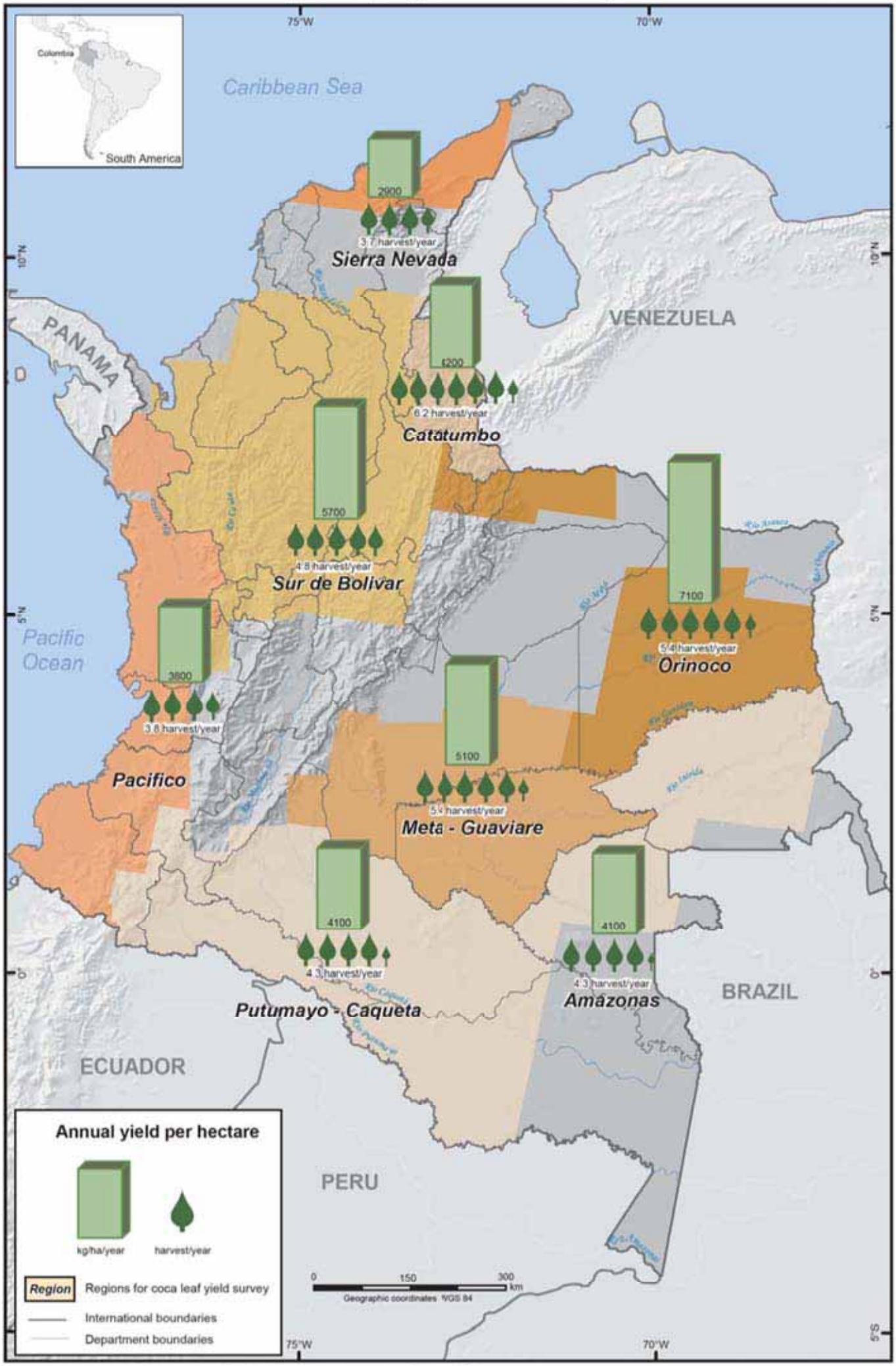
In the 2009 survey, 21 LANDSAT images were examined to identify areas of possible illicit cultivation. A total of 319 hectares was estimated in these non-traditional areas.

Table 15. Possible coca cultivation in new areas in 2009

Department	Area (ha)
Amazonas	155
Vaupes	109
Guainia	53
Vichada	2
Total	**319**

New coca field in the department of Vaupes

Coca yield by region in Colombia, 2009



Source: Government of Colombia - National monitoring system supported by UNODC

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

2.2 PRODUCTION OF COCA LEAF, PASTE AND COCAINE BASE

The yield studies enable the characterization of productive systems in terms of the agricultural practices of growers, varieties and sowing densities; in addition, they help in finding the scope and impact of these systems in terms of capacity to produce coca leaf and efficiency in the processes of extraction in the primary production phase. The main obstacles to get this data are the extreme complexity of coca cultivation in Colombia, the difficulty to get to the areas and the variability and mobility of the coca fields (as a strategy to avoid the action of the authorities), manifested in fields under shade, fields within undergrowth and stubble[6], among others.

In 2005, a productivity study was carried out covering the entire national territory. Since then, one or two regions are updated every year, given the high cost and the security conditions of the areas affected by coca cultivation. The Government of Colombia and UNODC have agreed on keeping the productivity studies up-to-date by establishing an expiry period of three years (the study of the entire country takes three years).

In 2009, the study "Evaluation of the persistence of coca cultivation in the Pacific region and compilation of local proposals for its reduction"[7] was carried out together with the National Narcotics Office –DNE. One of the objectives of this study was to evaluate the productivity of coca leaf and the primary production (coca paste and cocaine base). The Pacific region comprises the departments of Cauca, Nariño, Valle del Cauca and Choco.

The studies to determine the yield of coca leaf in Colombia are done by a multistage sampling of area frames[8]. The frame of the sampling is build based on the coca surveys; the methodology to measure productivity has two components: running crop tests and applying direct surveys to the coca growers. For the Pacific region, 276 direct interviews were carried out with growers, and 92 crop tests were done.

The results of the study in the Pacific region show an increase in the production and yield of the coca leaf in relation to the data collected in 2005. According to the crop tests, the yield of coca leaf in this region went from 2,600 kg/ha/year in 2005 to 3,800 kg/ha/year in 2009.

It is worth to note that this region of the country is one of the most affected by the issue of coca cultivation and drug production, which became even more important in the last years given the expansion of coca cultivation there (from 14,245 hectares cultivated in 2000, it went to 25,167 hectares in 2009). 37% of the cocaine laboratories (*cristalizaderos*) that were detected and destroyed in 2009 were in the Pacific region, mainly in Nariño.

Table 16.Changes in the coca leaf yield in the Pacific region 2005 vs. 2009

Region	Area (Hectares)		Number of crops	Number of crops	Annual yield of coca leaf (m.t./ha/year)	Annual yield of coca leaf (m.t. /ha/year)
	2005	2009	2005	2009	2005	2009
Pacific	17,434	25,167	2.5	3.8	2.6	3.8

Coca cultivation, as any other type of permanent cultivation is not free from diverse factors that may affect the yield: climate, plagues and illnesses. Although it is difficult to accurately estimate this impact, factors such as aerial spraying and manual eradication could have as well affected the yield in the Pacific region, which is one of the lowest in relation to other regions of the country. In 2009, 51,128 hectares were

[6] *Stubble is bushes that do not grow more than two meters.*

[7] *The results of this study will be presented in the second semester of 2010.*

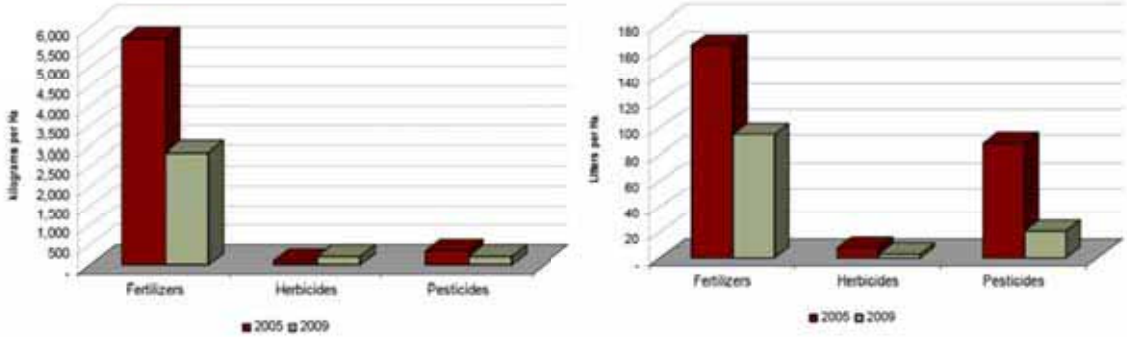
[8] *Multistage sampling: these are sample designs associated with various stages of selection. This sampling permits the selection of target units, minimizing costs and improving field operations. The sampling framework serves to identify and locate elements of a universe. It is used as a tool for random selection sample. In Particular the areas framework make reference to units or elements associated to a geographic component.*

sprayed and 22,557 hectares were manually eradicated in the Pacific region; this is respectively 49% and 37% of the national total. These activities were strongly concentrated in Nariño.

Coca growers informed about the use of different agricultural supplies to fertilize, control plagues and weed and increase productivity. Like in the other regions of the country, in the Pacific there was a reduction in the amount of agricultural supplies in relation to 2005.

Coca field mixed with stubble

Figure 5: Comparative of the use of fertilizers, pesticides and herbicides in liquid and solid forms in the Pacific region 2005 – 2009



As for the age of the cultivation, 28% of the cultivations were between 2 and 4 years old, which is the period of greatest yield. As from the fourth year, a downwards curve starts and it stabilizes as time passes. The percentage of cultivations older than 5 years went from 35% in 2005 to 52% in 2009.

Table 17.Age of coca cultivations in the Pacific region, 2005-2009

Age	2005		2009	
	% fields	Yield 05 m.t./ha/year	% fields	Yield 09 m.t./ha/year
Less than one year	1.2	0.2	-	-
Between 1 and 2 years	7.7	1.2	1.6	0.1
Between 2 and 3 years	10.6	1.8	12.0	5.2
Between 3 and 4 years	18.5	1.5	16.3	5.3
Between 4 and 5 years	27.2	1.7	18.0	2.9
Older than 5 years	34.8	1.9	52.1	2.7

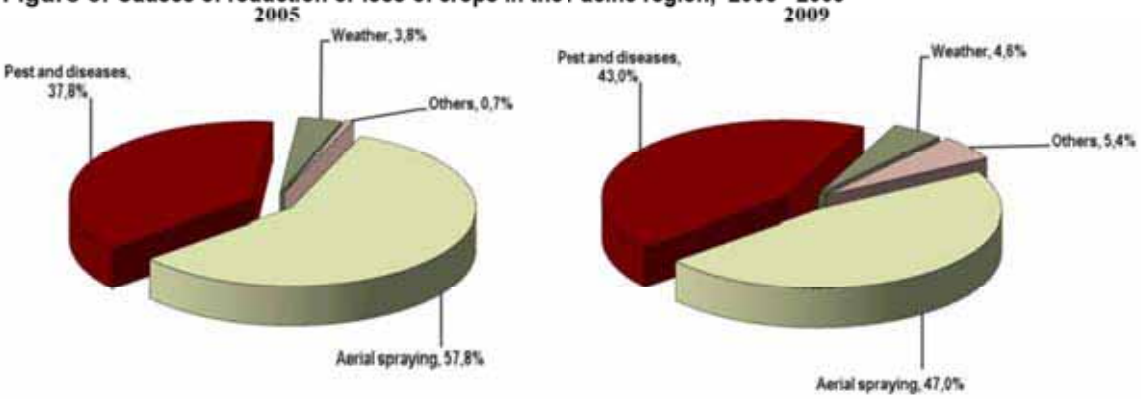
With regard to with the varieties planted, in 2005 and 2009 it was found that *Tingomaria* (that could correspond to *Erytroxilum coca* Var *coca*) is the most frequent, either as a single crop or mixed with a licit crop; there was a lower proportion of *Pajarito* and *Peruana*. It is worth noting that in 2009 a variety called "*Pinguana*" was found in the department of Cauca; this variety has high yield as compared to other varieties planted (9 m.t./ha/year).

The growers in the Pacific region were asked if their fields had been completely lost or if there had been reduction in their crops. In 2005, 94.5% of the coca growers reported loss or reduction and the most important causes were aerial spraying (58%), plagues and diseases (37%) and climate (12%). In 2009, the results showed that 65% of the coca fields either were lost or their productivity was reduced, and the main reasons reported were aerial spraying (47%) and plagues and diseases (43%).

Table 18. Fields with crop loss and/or reduction for different causes, according to interviews with growers in the Pacific region, 2005 – 2009

Aspects	2005		2009	
	# Fields	Percentage	# Fields	Percentage
Fields with loss or reduction	24,083	94.5%	14,369	65%
Fields with no loss	2,127	5.5%	7,322	35%

Figure 6: Causes of reduction or loss of crops in the Pacific region, 2005 - 2009



With respect to productive cycles, coca may be cropped several times a year. The frequency of the crops may depend on various factors such as climate, agricultural issues (change of use/ amount of herbicides, pesticides and fertilizers), aerial spraying, manual eradication and varieties planted, among others. In some cases, the frequency of the crops is also determined by the coca market instead of the maturity of the crop.

In the Pacific region, the average number of days between one crop and the other in 2005 was the lowest in the country, with 2.5 crops per year (or every 146 days); in 2009 it increased to 3.8 crops per year (or every 96 days).

Table 19. Number of annual crops regional average, 2005-2009

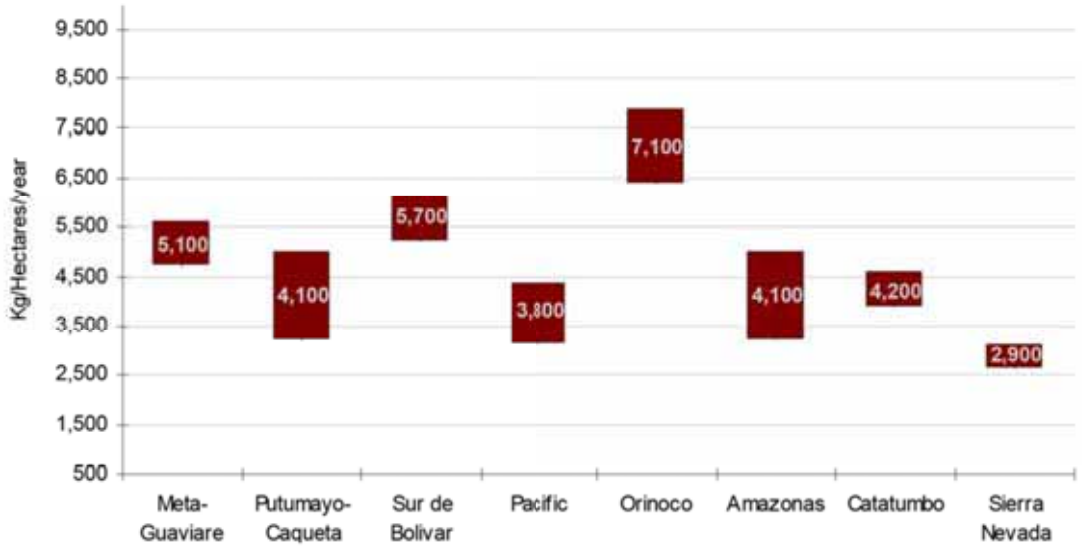
Region	2005	2009
Meta-Guaviare	6.6	5.4
Sur de Bolivar	3.3	4.8
Putumayo-Caqueta	3.9	4.3
Orinoco	5.4	5.4
Pacific	2.5	3.8
Catatumbo	4.5	6.2
Amazon	3.9	4.3
Sierra Nevada	3.4	3.7

Table 20. Yearly average yield of coca leaf by regions in Colombia, 2009

Region	Annual yield of coca leaf Kg./ha/year	Lower limit of the reliability interval 95% (Kg./ha/year)	Upper limit of the reliability interval 95% (Kg./ha/year)
Meta-Guaviare[1]	5,100	4,700	5,600
Putumayo-Caqueta[1]	4,100	3,200	5,000
Sur de Bolivar[2]	5,700	5,200	6,100
Pacific[3]	3,800	3,100	4,400
Orinoco	7,100	6,400	7,900
Amazon[1]	4,100	3,200	5,000
Catatumbo[2]	4,200	3,900	4,600
Sierra Nevada[2]	2,900	2,600	3,100
Average yield of coca leaf	4,600	4,000	5,200

1. *The coca leaf yield is the average of the data collected in the direct survey with farmers in 2008-2009.*
2. *The coca leaf yield is the average of the data collected in the direct survey with farmers in 2007.*
3. *The coca leaf yield is the average of the data collected in the crop test in 2009.*

Figure 7: Regional annual average of fresh coca leaf yield (reliability interval) in 2009



In previous years, the process of extracting coca paste or cocaine base from coca leafs was done by the growers themselves; but in the last year, there is evidence of an increase in the sales of coca leaf to be processed by an intermediary in some other place within the same region. The value added to the coca leaf to transform it into coca paste is only 15%. The transformation of cocaine base in cocaine chlorhydrate is not done by the farmers but in clandestine laboratories with the participation of other actors. The production process has different phases that include the production of coca paste, oxidation and re-oxidation of cocaine base and the production of cocaine chlorhydrate.

The coca paste is the first product resulting from the extraction process of coca leafs, using sulphuric acid and combustibles. This acid turns into cocaine sulphate with a high content of organic traces, pigments, tannins and other chemical substances. The cocaine base results from dissolving the cocaine sulphate in an acid, adding an oxidizing agent -as potassium permanganate which is the most commonly used- and a base; this is precipitated and filtered.

Manual labors in a coca field

In the Pacific region, it was found that part of the coca growers sell the coca leafs (78%), which explains the increase in the coca leaf prices given the growth of its market.

At the national level, the distribution of labours between coca growers is as follows: 41% sell the coca leafs directly, with no process involved; 22% of the growers process the coca leafs to get coca paste; the remaining 37% process the coca leafs to get cocaine base.

Table 21. Distribution of tasks in the coca leaf sales and transformation process by region, 2009

Region	% of growers that sell coca leafs directly	% of growers that process coca paste	% of growers that process cocaine base
Sierra Nevada	91%	4%	5%
Catatumbo	86%	13%	1%
Pacific	78%	21%	1%
Putumayo-Caqueta	33%	1%	66%
Sur de Bolivar	31%	5%	64%
Orinoco	15%	-	85%
Meta-Guaviare	22%	78%	-
Amazon	33%	1%	66%
All regions	41%	22%	37%

The survey explored with the coca producers the amount of coca leaf, the supplies used and the amount of final produce. The distinction between coca paste and cocaine base is not very clear because the producers use both terms indistinctly. To make the difference between the two products, it was decided to refer to cocaine base when the producers informed about the use of potassium permanganate for in the process.

Figure 8: Proportion of growers that sell and process coca leaf, 2009

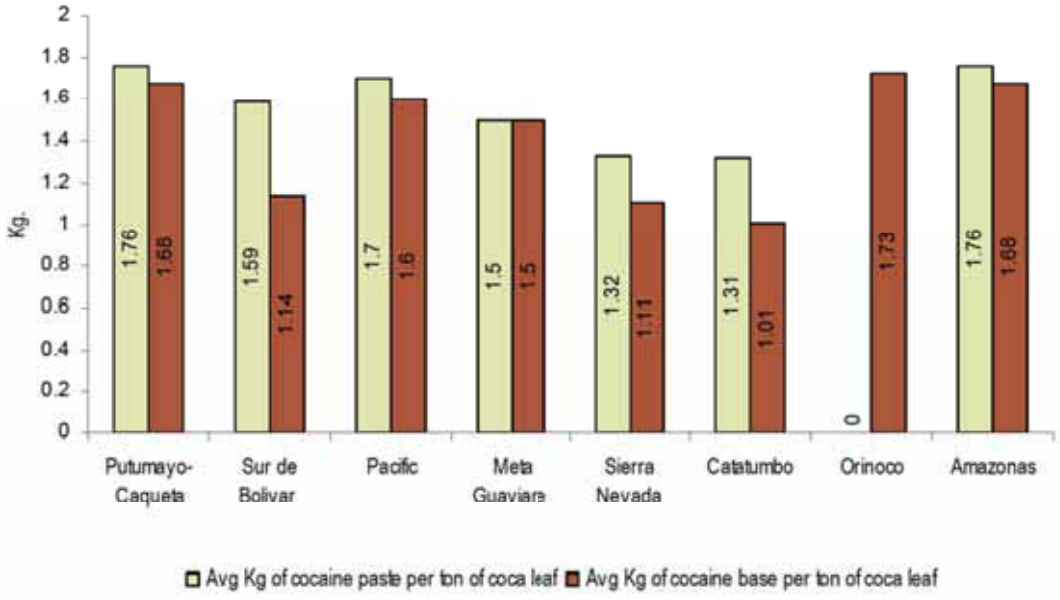


Table 22. Regional average of kilograms of coca paste and cocaine base resulting from a metric ton of coca leafs, 2009

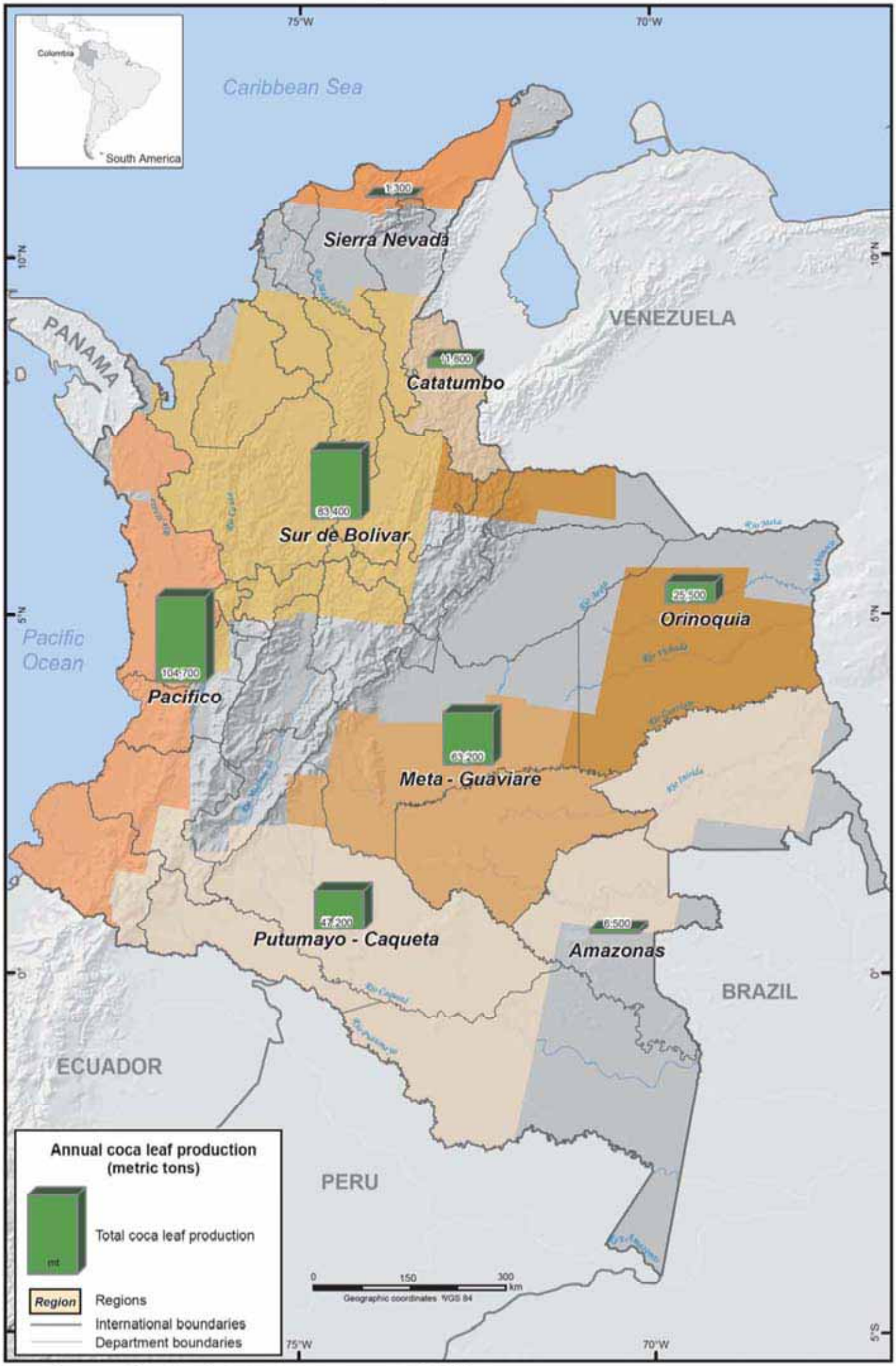
Region	Average of coca paste in Kg. by coca leaf ton	Average of cocaine base in Kg. by coca leaf ton
Putumayo-Caqueta	1.76	1.68
Sur de Bolivar	1.59	1.14
Pacific	1.70	1.60
Meta -Guaviare	1.50	1.50
Sierra Nevada	1.32	1.11
Amazon	1.70	1.60
Catatumbo	1.31	1.01
Orinoco[9]	-	1.73

According to the producers' report, the transformation process of the coca leaf is relatively similar in all regions; there are no major restrictions in the availability of chemical substances and when there is a restriction, there are always substitute substances for the process. Gasoline is reported as the product most used in the process of producing coca paste and/or cocaine base. Based on the data of the survey, it is estimated that the amount of fuel used in 2009 is approximately 44 million gallons, considering the recycling process.

Coca field and processing of the coca leaf into coca paste

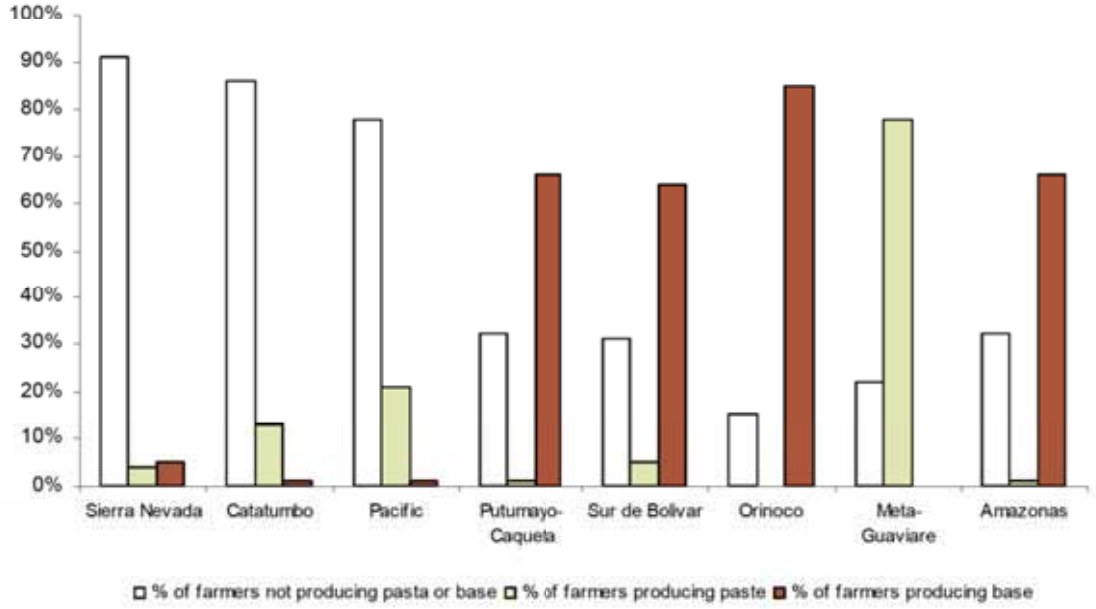
[9] *The growers in Orinoco only process cocaine base.*

Annual coca leaf production in Colombia, 2009



Source: Government of Colombia - National monitoring system supported by UNODC.

Figure 9: Regional average of coca paste and cocaine base resulting from one metric ton of coca leaf, 2009



According to the information provided by the producers in the Pacific region, it is estimated that one *arroba*[10] of fresh coca leaf may produce an average of 21 grams of coca paste. Thus, one metric ton of fresh coca leaf is equivalent to an average of 1.7 Kg. of coca paste and 1.6 Kg. of cocaine base.

Potential production of coca leaf, base and cocaine

The productivity studies enable to get information not only on the yield of the fresh leaf, but also on the transformation process of the coca leaf into coca paste or cocaine base. In 2009, the production potential of fresh coca leafs in Colombia was calculated by multiplying the average area under coca cultivation in each region by the annual yield of fresh coca leaf. The fresh coca leaf yield for the Pacific Region was calculated in 2009; the one for Meta-Guaviare and Putumayo-Caqueta was calculated in 2008; for Sur de Bolivar, Catatumbo and Sierra Nevada in 2007[11]; and the Orinoco[12] results are those calculated in 2005.

The trend analisys shows an overall reduction in the productivity of coca fields when compared with 2005 data, except for the Pacific region where an increase is reported; although it continues to be one of the regions with lower productivity.

The potential production of fresh coca leaf was estimated in 343,600 metric tons. Assuming a humidity of 57%, this is equivalent to a total production of 147,758 metric tons of sun-dried coca leaf.

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[10] *The word 'arroba' is of Arabic origin, meaning 'the fourth part' (one quintal). Arroba is widely used in Colombia, Peru and other countries as a weight unit. It is a weight, mass or volume unit. In Colombia, the weight of an arroba is around 25 pounds, or 12.5 kilograms.*

[11] *In Sierra Nevada it was 46% lower than the yield estimate in 2005 and in Catatumbo it had a decrease of 9% as compared to the estimate in 2005.*

[12] *It has been foreseen to do an updating study for the Orinoco region in 2010.*

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Table 23. Yield and production of coca leaf by region, 2009

Region	Annual yield of coca leaf in Kg./ha/year	Coca leaf production in m.t.
Meta-Guaviare	5,100	63,200
Putumayo-Caqueta	4,100	47,200
Sur de Bolivar	5,700	83,400
Pacific	3,800	104,700
Orinoco	7,100	25,500
Amazon	4,100	6,500
Catatumbo	4,200	11,800
Sierra Nevada	2,900	1,300
Coca leaf production	4,600	343,600

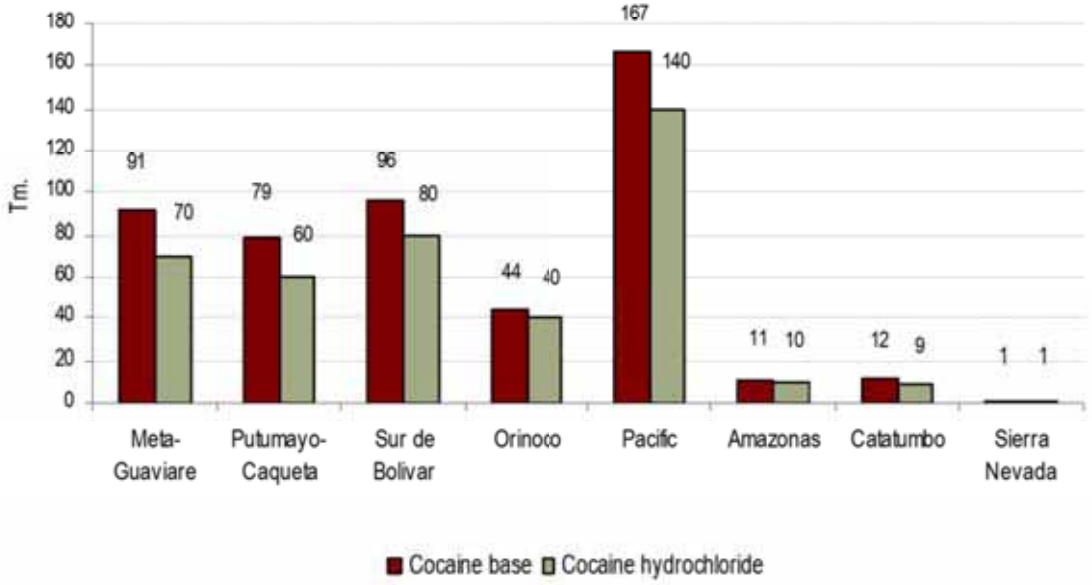
Out of the total production of 343,600 tons of coca leaf in 2009, around 77,652 metric tons are transformed into coca paste. If the conversion from leaf to paste is used for every region, the total estimate of coca paste production by the farmers is 114 m.t. The other growers produce 265,989 m.t. of fresh leafs, which they process directly into cocaine base or sell to an intermediary. Under the assumption that the production of coca leaf sold by the farmers was processed in a place different from their field to get cocaine base, the total estimate of cocaine base is 387 m.t. Hence, the production of cocaine base in 2009 from coca paste and directly from coca leafs in Colombia is approximately 501 metric tons.

To determine the rates to convert cocaine base into cocaine chlorhydrate, UNODC used external sources. UNODC and Goverment of Colombia are working together to estimate lab efficiency and conversion rates from cocaine base to cocaine hydrochloride.

The estimation of the cocaine production is based on data gathered by UNODC on coca leaf production and efficiency of the primary transformation (coca leaf into cocaine base); there is also data provided by the United States Government on efficiency of the secondary transformation (cocaine base into cocaine chlorhydrate) and purity of the cocaine base.

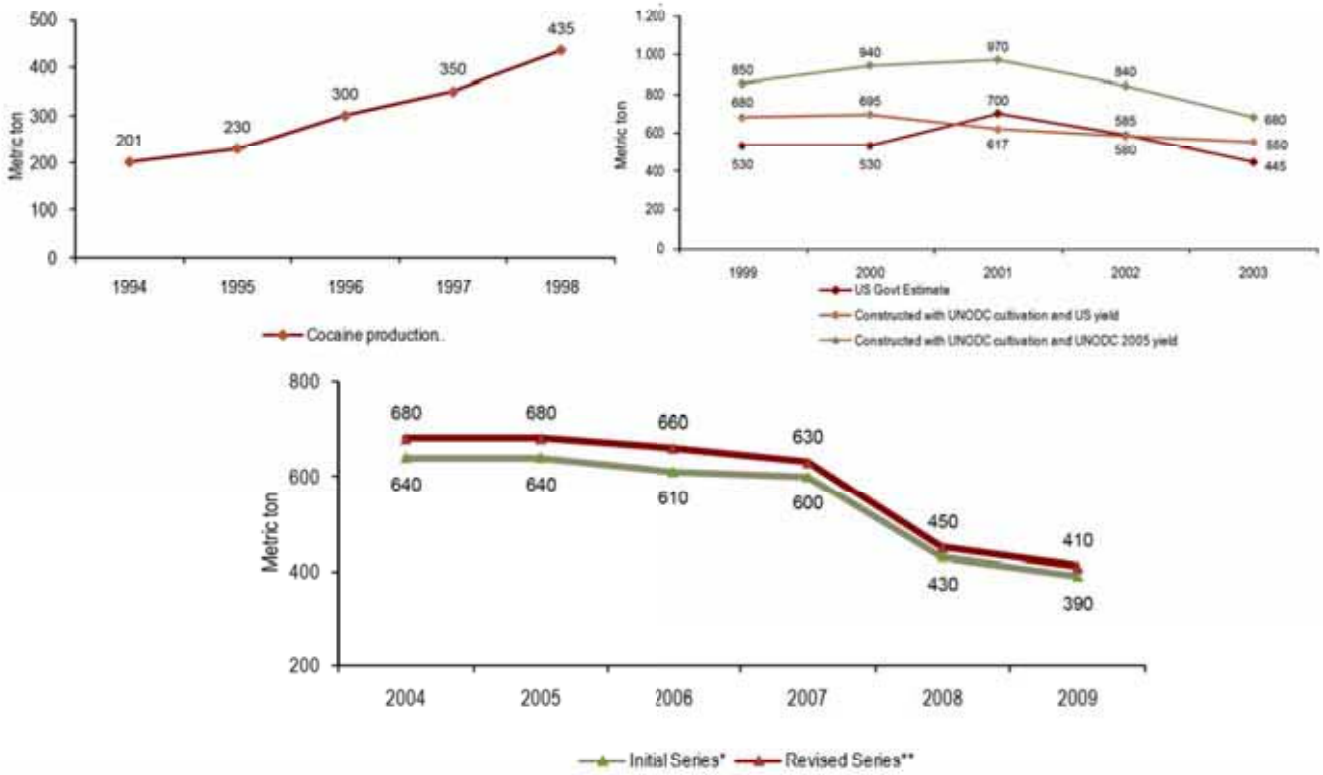
UNODC had been using a conversion rate of 1:09 from cocaine base to cocaine chlorhydrate, and a cocaine chlorhydrate purity of 85%. The conversion rates were revised according to more detailed information on the average purity of cocaine base (81%) and the conversion rate from cocaine base to cocaine chlorhydrate (1:1). The historical series as from 2004 was amended, and the production of cocaine base in 2009 (501 m.t.) is equivalent to 410 metric tons of pure cocaine.

Figure 10: Production of cocaine base and pure cocaine, 2009



Data on cocaine production in Colombia before 2004 was not obtained by SIMCI, further information can be found in Annex 3.

Figure 11: Cocaine production in Colombia, 2004 - 2009 (metric tons)



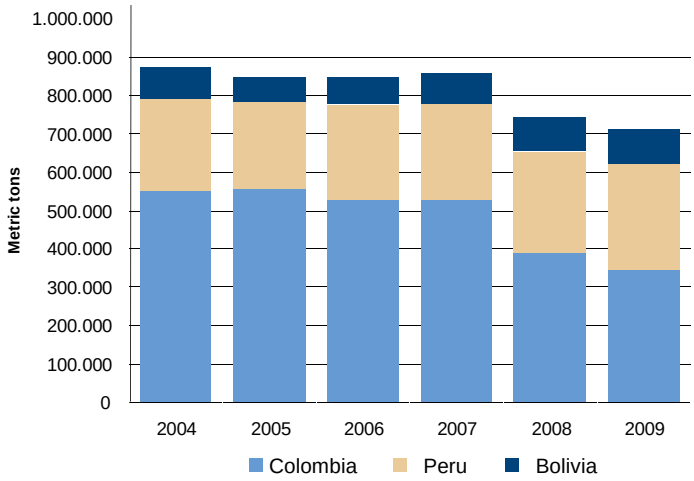
a	b
c	

(a) The 1994-1998 series is based on data from the US Government, since UNODC did not have at the time a monitoring system implemented in Colombia. (b) For the period 1999-2003 the series "US Government" was created by using US data and other two series were prepared with UNODC calculations. (c) The 2004-2009 series is based on UNODC data from primary production phase and data obtained by the US Government on efficiency of secondary transformation.

** For the initial series a conversión factor of 1 to 0.9 and purity level of 0.81 were used.*

*** For the revised series a conversión factor of 1 to 1 and purity level of 0.86 were used.*

Figure 12: Global potencial production of fresh coca leaf available for cocaine production (mt) 2004-2009



Source World Drug Report 2010.

Table 24.Potential world production of cocaine in metric tons, 1998-2009

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Bolivia	70	43	60	60	79	98	80	94	104	113	*
Peru	175	141	150	160	230	270	260	280	290	302	*
Colombia	680	695	617	580	550	680	680	660	630	450	410
Total	925	879	827	800	859	1048	1020	1034	1024	865	

*Note: At a global level, the figure was estimated as a range between 842 m.t. and 1,111 m.t.

Source: World Drug Report 2009. For a detail analisys for 1999-2003 series refer to Anex 3.
National Monitoring System –SIMCI- assisted by UNODC

Source for Peru and Bolivia World Drug Report 2010.

A revision of the conversion factors in Peru and Bolivia did not allow to present accurate data on world production in 2009. For this reason, the estimates of the potential production of cocaine in the world are presented in a range (842 m.t. – 1,111 m.t.); this reflects a tendency towards stability in the production of cocaine between 2008 and 2009.

Coca field in Tumaco

2.3 COCA PRICES

Coca leaf, cocaine base and cocaine prices

As from 2005, UNODC has an information system on the prices of drug and its derivatives. This system is fed from the collection and systematization of the prices reported in direct interviews with the growers in the production phase and from information of the intelligence services in different cities of the country in final production phases. This task is assisted by Social Action – PCI and the DIRAN.

The changes in prices are important indicators for a better understanding of the market dynamics and availability, and the consequences of the government policies for the drug control.

In 2009, after a relative stability in the coca leaf prices during the four past years (in nominal terms), the price increased 31% in relation to the previous year; this is evidence of a reactivation of the coca leaf market.

On the other hand, the price of cocaine did not change and remained around an average of $4.583.500 per kilogram, and US$ 2.248/kg. This drug price increases considerably when it gets outside Colombia, going from US$ 2.147/kg to US$34.700/kg in the United States retail market, and to US$ 55.300/kg in the European market.

Table 25.Average prices of coca leaf and its derivatives, 2006-2008

Product	2006		2007		2008		2009		Change % 2008 - 2009	
	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg
Cocaine	1,762	4,155	2,198	4,567	2,348	4,580	2,147	4,587	-8.5	0.1
Cocaine base	1,038	2,447	1,326	2,752	1,450	2,825	1,249	2,674	-13.8	-5.3
Coca paste	879	2,070	943	1,959	963	1,878	956	2,048	-0.7	9.0
Coca leaf	1	2.4	1.2	2.4	1.1	2.2	1.3	2.9	18.1	31.8

Source: UNODC-SIMCI, PCI, DIRAN

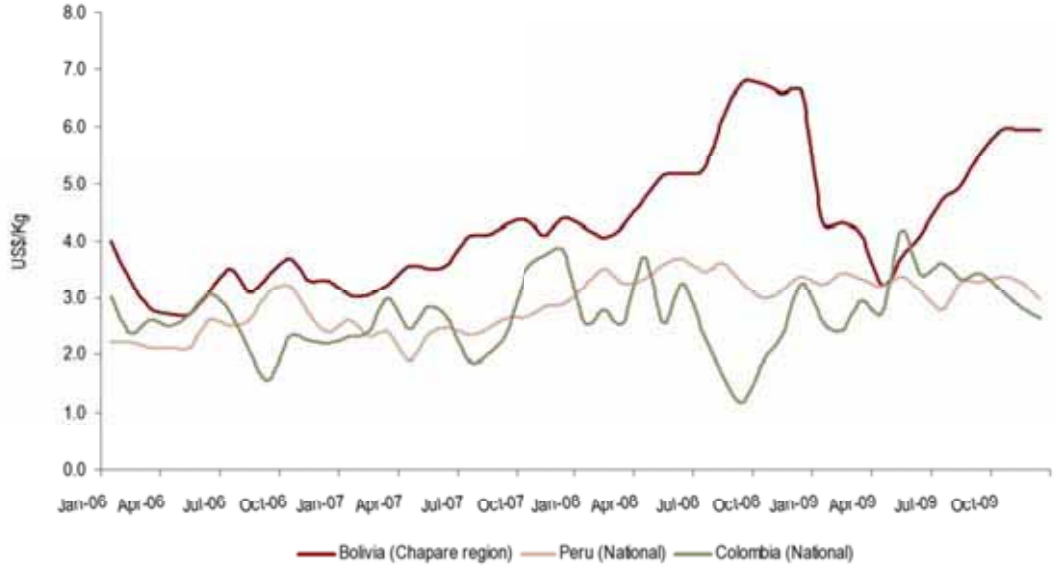
Coca leaf prices

In Colombia, coca leaf is traded fresh, whereas in Peru and Bolivia the leaf is sun-dried before it is traded. When the leaf is sun-dried (assuming a loss of 57% of humidity from the fresh leaf and the sun-dried leaf according to the coca leaf yield study UNODC-Peru), the equivalent price for the sun-dried leaf in Colombia for 2009 (US$3.1/kg), is similar to the price of the sun-dried leaf in Peru (US$ 3.2/kg), and lower than the one recorded in Bolivia (US$ 4.7/kg).

The prices of coca leaf between 2005 and 2008 were relatively stable in around the average of US$ 1.1 or $ 2,350. In 2009, the average prices of coca leaf increased 31%, going from $ 2,195/kg to 2,858/kg and from US$1.1/kg to US$1.3/kg. Different from previous years -when the grower did the transformation process to cocaine paste and/or base- in 2009 the sale of coca leaf to intermediaries was predominant; this resulted in an increase in the commercialization of coca leaf.

At the regional level, the prices are higher in the Pacific region (particularly in the department of Nariño), Sierra Nevada and Orinoco, with averages of $3,433/kg (US$1.6/kg), $3,370/kg (US$ 1.6/kg) and $2,800/kg (US$1.3/kg) respectively.

Figure 13: Prices of sun-dried coca leaf in the Andean region 2006-2009.

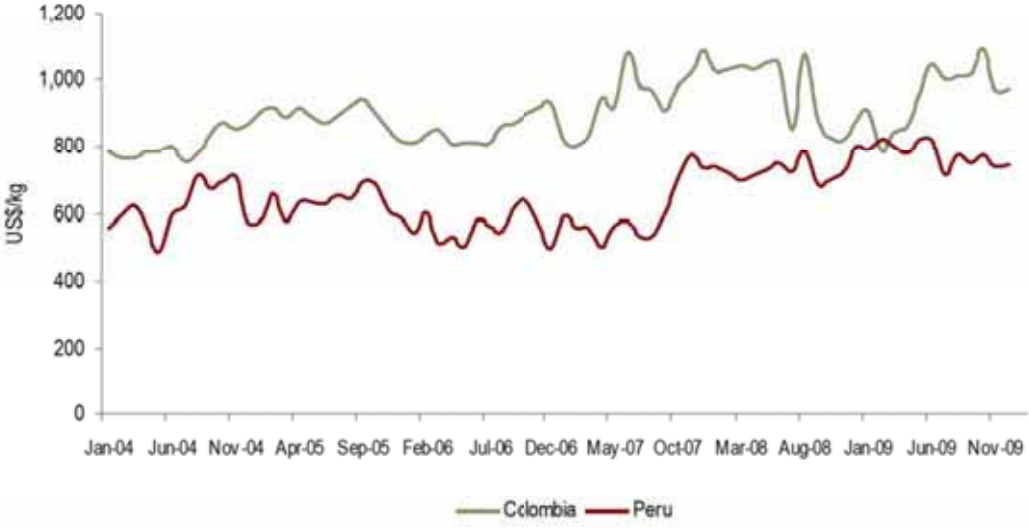


Source: SIMCI Colombia, Peru and Bolivia.

Coca paste prices

In Colombia and Peru, the prices of coca paste have been relatively stable during the last years. Nonetheless, the prices of coca paste in Colombia were always higher than in Peru between 2004 and 2008. In 2009, the average price in Colombia was US$ 956/kg, 22% higher than in Peru (US$ 779/kg.).

Figure 14: Average price of coca paste in Colombia and Peru, 2004-2009



Source: SIMCI Colombia and Peru

Coca paste is a product that is usually processed by the growers in the same places where they grow the coca plants; however, this process has lately been passed on to intermediaries that collect coca leafs from various growers. The prices of the coca paste and leaf, as well as the payment conditions are normally set by the buyer (intermediaries, illegal groups or local drug traffickers); growers have a poor negotiation power.

The prices of coca paste between 2005 and 2008 were around an average of $2 million per kilogram (equivalent to approximately US$ 900/kg). In 2009, the prices increased 8%, going from $1,878,000/kg in 2008 to $ 2,047.970/kg in 2009. Nevertheless, the comparison in dollars shows a decrease of 1%, dropping from US$ 963/kg in 2008 to US$ 956 in 2009.

Figure 15: Average monthly coca paste prices in Colombia, August 1999 – December 2010 (´000 $)

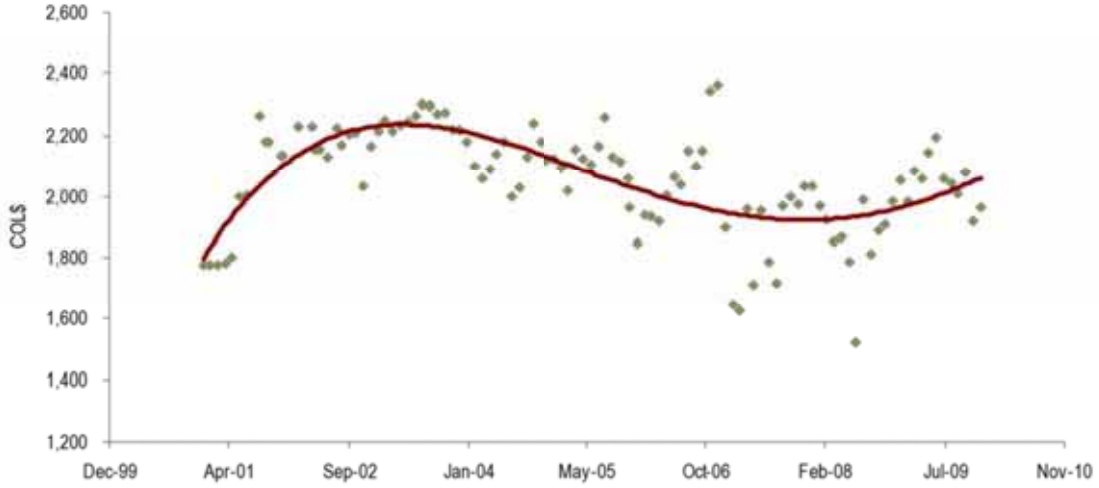


Table 26.Monthly coca paste prices in Colombia 2009 (in '000 COL$/kg)

Month	National average	Central	Pacific	Putumayo-Caqueta	Meta-Guaviare	Sierra Nevada
January	2,051	2,182	1,739	1,986	1,938	2,412
February	1,983	2,388	1,775	1,979	1,775	2,000
March	2,083	2,429	1,944	2,075	1,967	2,000
April	2,057	2,025	1,983	2,173	2,047	
May	2,141	2,077	2,077	2,206	2,177	2,167
June	2,193	2,164	2,050	2,450	1,800	2,500
July	2,058	2,163	1,993	2,133	2,000	2,000
August	2,044	1,900	2,167	2,108	2,000	
September	2,009	1,900	2,170	2,067	1,900	
October	2,077	1,900	1,960	2,075	1,950	2,500
November	1,917		1,850	2,000	1,900	
December	1,963		1,830	2,160	1,900	
Annual average in COL$	**2,048**	**2,113**	**1,962**	**2,118**	**1,946**	**2,226**
Annual average in US$	**956**	**967**	**918**	**990**	**909**	**1,018**

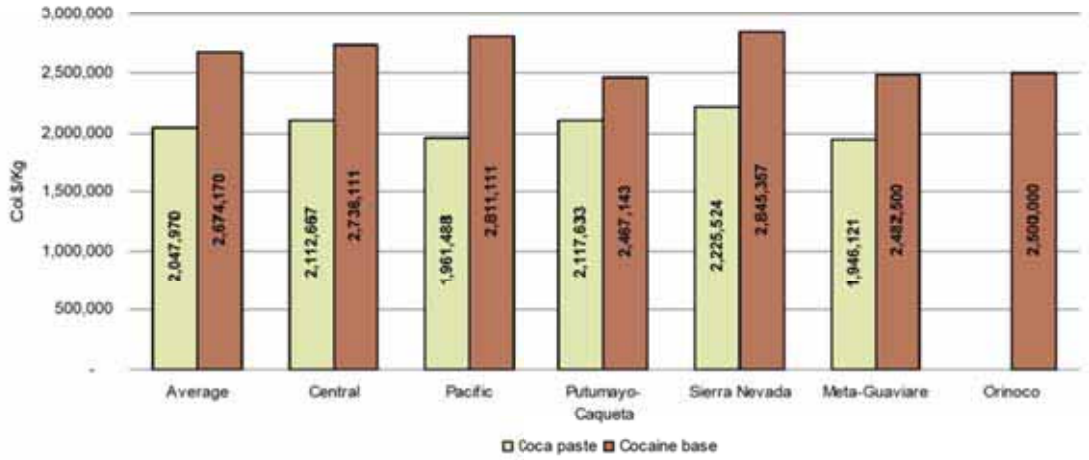
Source: UNODC/SIMCI

Cocaine base prices

The collection of data related to cocaine base prices was affected because neither the producers nor the buyers differentiate the base from the coca paste. However, there is a difference between the price of the cocaine paste and the cocaine base, attributed to the level of difficulty of the process and the greatest amount of chemical products used in the production of base, including the potassium permanganate used to remove impurities. This distintion is made by SIMCI in order to improve the systematisation and analysis of data prices.

The average price of cocaine base in 2009 was $ 2,674,000/kg while in 2008 it was $2,825,000; in dollars, it was US$ 1,450 in 2008 and US$ 1,249 in 2009.

Figure 16: Comparison of the coca paste and cocaine base prices (COP/kg) by region, 2009



*The Orinoco region has no information on coca paste because the leaf is directly processed into cocaine base

Cocaine prices

Given the illegal nature of its trade, it is more difficult to collect data on the cocaine prices than it is on coca paste and cocaine base. The prices are collected by the DIRAN and in general they are retail prices in the main cities of the country. The prices may be affected by factors such as the drug supply and demand, the drug control policies and changes in the purity levels.

As regards to the supply, the production of cocaine decreased 11% in comparison to the last year. The estimate of the potential production of cocaine for 2008 decreased to 450 metric tons after four years of a relatively stable production, in 2009 was the reduction trend and reached a production of 410 metric tons, however, this change is not yet reflected with great impact on the prices of 2009. Alternatively, cocaine seizures were similar in the last two years, with 203 tons.

In Colombia, cocaine is added with cutting substances; the most common ones are caffeine, lactose, creatinine and mannitol[14]. A study carried out by UNODC and the DNE shows that some processors use substances called "rindex", as the Diltiazem, Levamisol hydrochloride, Hidroxyzine hydrochloride and Aminopyrine; and according to information obtained, to recover the loss that occurs in the process when the coca base becomes chlorhydrate cocaine.

Throughout the distribution chain in the consumption markets, cocaine has various degrees of dilution or "adulteration". As for the levels of purity of the cocaine produced in Colombia, the only information available comes from the United States government, which estimates that the Colombian cocaine is 85% pure[15].

The table below shows the annual averages of cocaine prices since 1991. The prices are presented both in Colombian pesos (COL$) and US$ dollars.

[14] *Information provided by the General Attorney's Office and the DEA.*
[15] *DEA, 2007.*

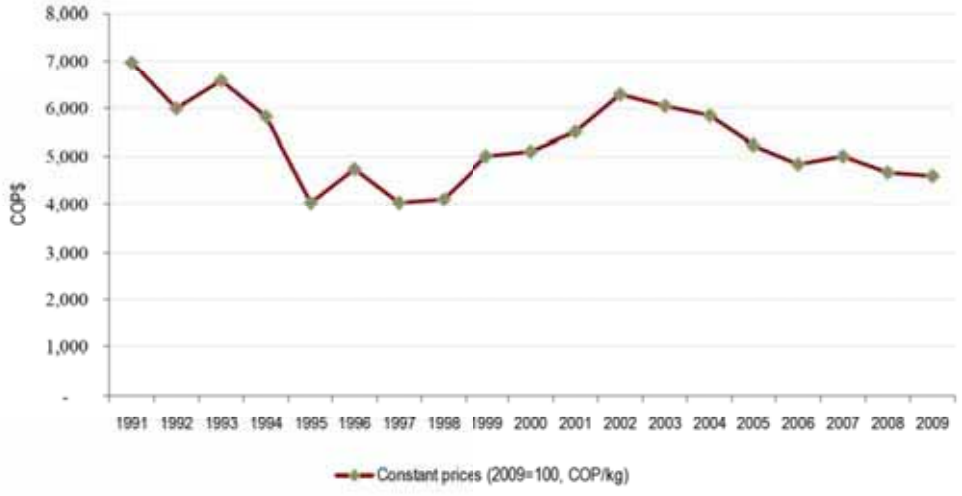
Table 27. Cocaine HCl price in Colombia 1991-2009

Year	'000 COL$/kg	US$/kg	Potential production of cocaine m.t.	Seizures of cocaine m.t.
1991	950	1,500	88	70
1992	1,020	1,500	91	31
1993	1,377	1,750	119	22
1994	1,488	1,800	201	28
1995	1,232	1,350	230	28
1996	1,762	1,700	300	27
1997	1,769	1,550	350	46
1998	2,101	1,472	435	78
1999	2,800	1,592	680	44
2000	3,100	1,485	695	87
2001	3,599	1,571	617	57
2002	4,389	1,532	580	95
2003	4,500	1,565	550	113
2004	4,600	1,713	640	149
2005	4,315	1,860	640	173
2006	4,155	1,762	610	127
2007	4,567	2,201	600	127
2008	4,580	2,348	430	198
2009	4,587	2,147	410	203

Source: DIRAN for prices, SIMCI for production and DNE for seizures.

The figure below illustrates the behaviour of the prices in Colombian peso and in US$ dollars as constant prices to make up for the inflation. In US$ dollars, they are at their highest level in the current decade (since 2000).

Figure 17: Value of cocaine in constant prices (2009=100) in Colombia, 1991-2009



Annual income per hectare under coca cultivation

The monthly price study data combined with the coca leaf yield studies data enabled the calculation of the theoretical income from the sale of coca leaf, paste and cocaine base. The differences between these incomes show the value that the growers have to add to the leaf to turn it into coca paste and cocaine base. The table below shows the determined increase in the value for every step of the processing. The value added to the leaf by primary growers or by intermediaries to produce the cocaine base as the final product is 40%. This may explain why the field studies in the last years found that the trend in the growers is to sell the coca leaf.

Table 28.Potential annual income by hectare under coca cultivation for the different derivatives of the coca leaf in 2009

Product	Annual yield by hectare kg/hectare	Annual average price US$/kg	Annual income per hectare US$/hectare	Value added to the coca leaf %
Coca leaf	4,600	1.3	5,980	
Coca paste	7.2	956	6,880	15%
Cocaine base	6.7	1,249	8,370	40%

Based on the total production of coca leaf and its derivatives sold by the farmers in their respective farm-gate prices in 2009, the resulting incomes were estimated in around US$ 496 million. This amount does not include the production costs such as herbicides, pesticides, fertilizers and day's pays.

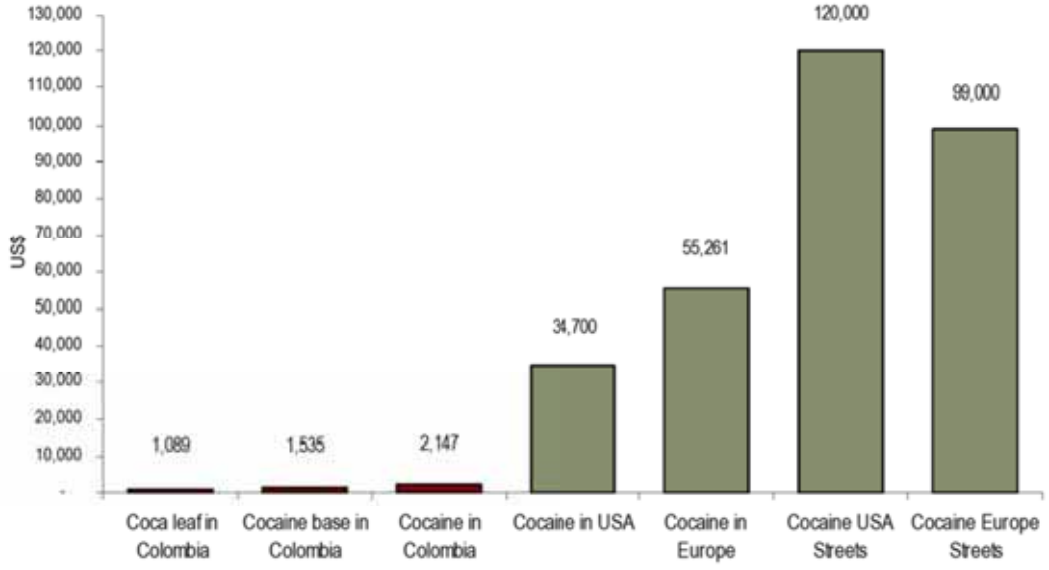
Table 29.Value of the production of coca leaf and its derivatives at farm-gate level,2009

Product	Kg.	US$/Kg.	Value in US$
Coca leaf	154,105,000	1.3	200,336,500
Coca paste	160,000	956	152,960,000
Cocaine base	114,000	1,249	142,386,000
Total value			495,682,500

The total farm-gate value of the production of coca leaf and its derivatives is 0.2% of the GDP, which was US$ 221 trillion in Colombia according to the DANE[17]. The total farm-gate value of the production of coca leaf is 3% of the agricultural GDP of the country.

The study of the coca leaf yield also allowed collecting information on the average area under cultivation per family. It was found that one household cultivates an average of 1.2 hectares of coca, for a total of 68.000 hectares in 2009. The estimated number of families involved was 56,910 and 233,688 people (these do not include floating population).

Figure 18: Costs of the coca leaf derivatives for one kilogram of cocaine in 2009



Source: Colombia Prices 2009; US and Europe prices, 2008; based on the WDR.

[17] *www.dane.gov.co, May 2010.*

Table 30.Estimate of number of families involved in the coca cultivation in Colombia, 2009 (does not include floating population).

Region	Coca fields (hectares)	Average number of people per household	Average number of hectares per household	# households	# people
Meta-Guaviare	12,619	4.2	1.3	10,021	42,088
Sur de Bolivar	13,412	5.2	1.0	12,937	31,177
Putumayo-Caqueta	9,075	3.8	1.2	7,348	27,555
Orinoco	3,557	4.4	1.4	2,500	11,000
Pacific	25,167	5.6	1.4	18,077	101,231
Amazon	1,166	3.8	1.0	2,100	7,875
Catatumbo	2,714	4.8	1.4	1,968	7,472
Sierra Nevada	314	4.8	0.4	854	1,020
All regions	68,024		1.2	56,910	233,688

* Includes households and people that live outside the UPAC

Thus, US$ 496 million distributed between 56,910 families represents a gross household annual income of US$ 8,710 with a total of 233,688 people in these families; the per capita annual gross income is US$ 2,120 (the national per capita income is approximately US$ 4,900). The annual gross income does not consider the production costs such as herbicides, pesticides, fertilizers and day's pays.

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2.4 OPIUM POPPY CULTIVATION

In Colombia, opium poppy cultivation has been decreasing according to data of the National Police, who do monitoring overflights to detect this kind of cultivation (UNODC does not monitor opium poppy cultivation). Out of 7,500 hectares cultivated in 1993, 356 hectares remained in 2009. In general, opium poppy is cultivated in small fields (smallholders) located in mountainous areas, with an altitude between 1,700 and 3,000 meters over sea level.

95% of the opium poppy fields are in the departments of Nariño and Cauca, the remaining 5% are in Huila, Tolima, Cesar, and for the first time they were also detected in Valle del Cauca (1.5 hectares).

Table 31.Opium poppy cultivation in Colombia by department, 2003 – 2009 (in hectares)

Department	2003	2004	2005	2006	2007	2008	2009	Change % 2008-2009	total % 2009
Nariño	540	460	475	316	204	24	238	892%	67
Cauca	600	450	538	448	280	126	100	-21%	28
Huila	636	1,135	320	114	45	45	11	-76%	3
Tolima	1,359	1,090	265	90	170	170	3	-98%	1
Cesar	651	675	152	3	7	18	2.5	-86%	0.7
Valle del Cauca	-	-	-	-	-	-	1.5	-	0.3
La Guajira	240	35	68	-	2	4	-	-	-
Caquetá	-	105	132	52	7	7	-	-	-
Total	4,026	3,950	1,950	1,023	715	394	356	-10%	100%

Source: DIRAN (by means of monitoring overflights)

Figure 19: Opium poppy cultivation by department, 2003 – 2009

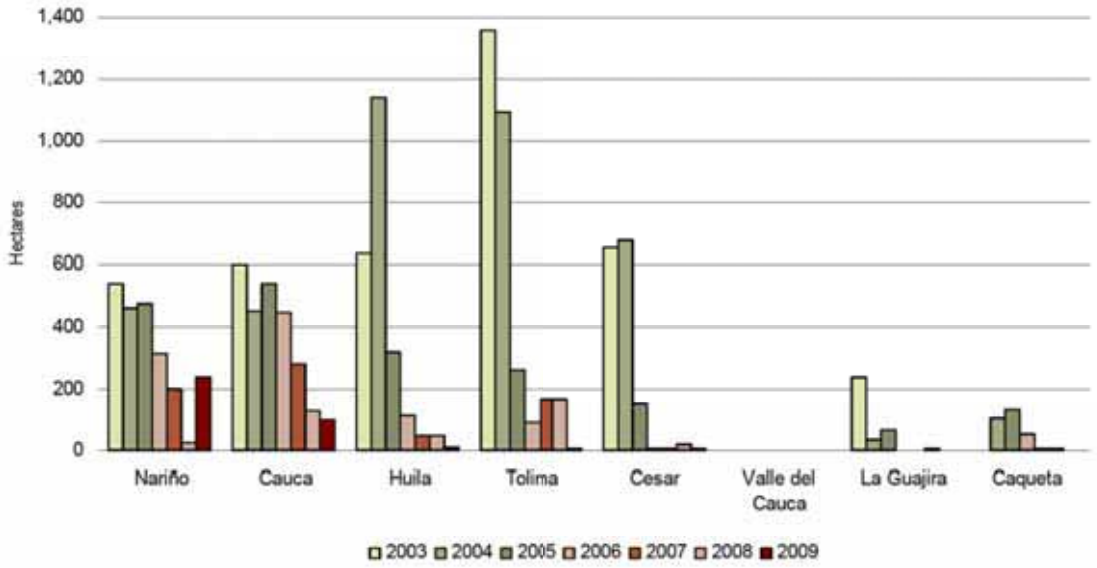
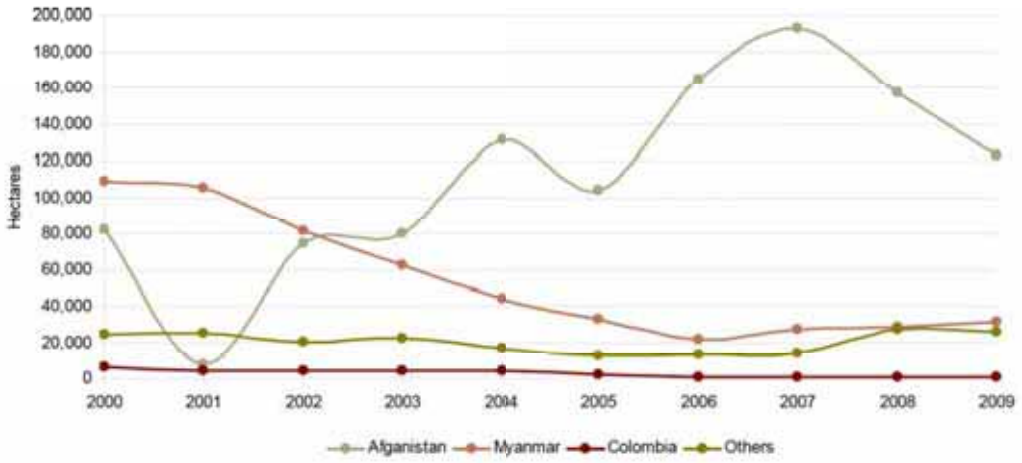


Table 32.Global cultivation of opium poppy, 2000 – 2009 (hectares)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Afghanistan	82,171	7,606	74,100	80,000	131,000	104,000	165,000	193,000	157,000	123,000
Myanmar	108,700	105,000	81,400	62,200	44,200	32,800	21,500	27,700	28,500	31,700
Laos	19,052	17,255	14,000	12,000	6,600	1,800	2,500	1,500	1,600	1,900
Pakistan	260	213	622	2,500	1,500	2,438	1,545	1,702	1,909	1,779
Colombia	6,500	4,300	4,153	4,026	3,950	1,950	1,023	714	394	356
Mexico	1,900	4,400	2,700	4,800	3,500	3,300	5,000	6,900	15,000	15,038
Other	3369	3320	3250	3074	5190	5212	4432	4,184	8,600	7,600
Total	221,952	142,094	180,225	168,600	195,940	151,500	201,000	235,700	213,003	181,373

Source: UNODC, WDR, 2009.

Figure 20: Global cultivation of opium poppy, 2000-2009 (hectares)



The extension of opium poppy cultivation in 2009 represents a reduction of 10% as compared to 2008. The opium poppy cultivation in Colombia was only 0.2% of the global cultivation in 2009, and 0.1% of the latex production. Afghanistan is still the country with the greatest area cultivated with opium poppy (123,000 hectares), which represents 90% of the world opium production.

Latex and heroin production

Opium poppy in Colombia is cropped as latex, differently from Asia, where it is cropped as gum. In Colombia, the cultivation of opium poppy is limited to the mountainous areas, since it requires low temperatures in some of the growing stages. As a result, opium poppy is not associates to coca cultivation, which is done in low lands.

According to productivity studies of the United States Government, 24 kilograms of opium latex (equivalent to 8 kilograms of oven-dried opium) are needed to produce 1 kg of pure heroin. In Colombia, opium poppy gives two crops per year, except for Nariño, where it gives only one crop. The following are the yields by hectare of the main opium poppy growing areas (dried opium):

Table 33. Yield by hectare of dried opium, 2009.

Poppy Growing Area	Yield (kg/ha/harvest)
Nariño	24.6
Serranía de Perijá	18.4
Cauca Oriental	12.3
Huila Occidental	13.1

Source: DEA, 2008.

The estimate production potential in Colombia for 2009 was 8.8 m.t. of dried opium, which produces 1.1 m.t. of heroin; this represents around 0.1% of the global production of heroin.

Latex and heroin prices

Table 34. Monthly prices of latex morphine and heroin, 2009 (in '000 COL$/kg)

Period	Latex		Morphine		Heroin	
	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg
January	576	358	12,980	5,761	21,270	9,441
February	400	256	12,736	5,066	22,271	8,859
March	577	159	15,422	6,226	22,839	9,220
April	550	233	14,666	6,165	20,465	8,602
May	887	231	16,270	7,296	21,963	9,849
June	925	398	15,950	7,632	22,878	10,946
July	825	443	14,222	6,928	19,751	9,621
August	900	402	15,528	7,691	22,367	11,078
September	900	446	14,750	7,446	19,917	10,054
October	850	454	15,310	8,036	19,786	10,386
November	850	446	19,000	9,625	25,000	12,665
December	813	431	15,111	7,492	18,555	9,200
Annual average	**754**	**355**	**15,162**	**7,114**	**21,422**	**9,993**

Source: SIMCI and PCI for latex, DIRAN for morphine and heroin.

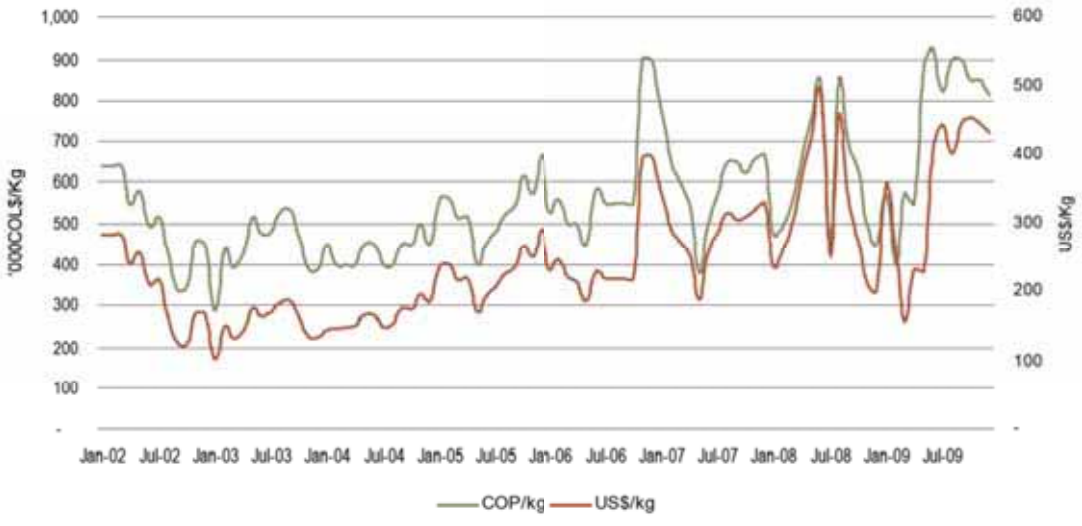
The prices of opium latex increased 23%, going from an average of $ 612,000 to $754,500 (+23% in relation to the previous year). The prices of heroin increased in a lower percentage, going from 19.5 to 21.4 million pesos (+ 9.5% in relation to the previous year).

Table 35. Average prices of latex, morphine and heroin, 2005-2009

Product	2005		2006		2007		2008		2009	
	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg	US$/kg	´000 COL$/kg
Latex	230	534	251	593	286	591	318	612	358	754
Morphine	6,204	14,401	8,045	18,969	8,022	16,630	7,369	14,400	7,114	15,162
Heroin	9,070	21,051	9,992	23,562	10,780	22,294	9,950	19,550	9,963	21,421

Source: DIRAN, SIMCI and PCI for latex

Figure 21: Prices of latex in Colombia, 2002 – 2009 ('000 COL$/Kg, and US$/Kg.)



2.5 RELATED RESEARCH AND STUDIES

Regional approach for the integral monitoring of coca cultivation

The great geographic and cultural diversity is a substantial feature of the Colombian territory recent conformation. This reality requires an understanding of Colombia as a country with different regions to deal with the problem of illicit crops. In fact, in every region, the production and transformation chain of the coca leaf assume different socio-spatial changes to maintain the dynamics of the productive process. These changes imply territorial division, annual displacement of cultivations, dispersion and reduction of the size of the fields; mixed crops; planting under the forest, etc.

SIMCI has been working on an alternative methodology of a regional approach to go deeper in a comprehensive knowledge of illicit crops; this with the aim of supporting in a timely and operative manner the tasks of social and institutional recovery of the regions affected by these crops. With the cooperation of Social Action – PCI and the Anti-narcotics Police –DIRAN this methodology was applied in a pilot study in the central region Antioquia-Cordoba by the end of 2009. Such methodology proposes the following activities:

i) Study of the spatial dynamics of the "coca leaf" cultivation cycle
Mapping and monitoring the "coca leaf" cultivation cycle is the process that guides the construction of an information baseline and the analysis of the risk of the territory to have this kind of cycle. In the study of the cycle it is possible to recognize five different moments, as may be seen in the Figure 21.

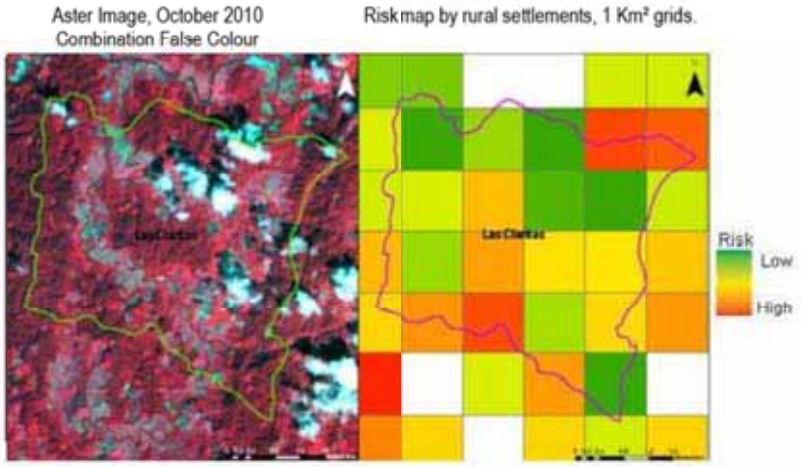
Figure 22: "Coca leaf" cultivation cycle

ii) Baseline of the integral information on the coca leaf cultivation cycle
The Baseline is the *integrated and georeferenced group* of the inter-institutional information about coca cultivation; *aimed at* the timely provision of the information necessary for the tasks of social and institutional recovery of the areas affected by illicit crops in a regional context, and *regulated* by principles of opportunity, periodicity, focusing and institutional concurrence.

iii) Estimation of the risk of the territory to the presence of the coca cultivation cycle
It is an evaluation model that proposes the quantitative estimation of the risk of the territory to the presence of the coca cultivation cycle; this is done by means of the combination of possible threats and their consequences on the vulnerability of the territory to the current and future presence of illicit crops. On one hand, the threat has to do with geographic variables of spatial self-correlations to infer the presence of illicit crops; on the other hand, the vulnerability evaluates institutional and cultural variables that may preserve the territory from the presence of illicit crops.

This methodology was applied through the interpretation of 15 satellite images ALOS, ASTER, LANDSAT and an exhaustive aerial recognition. The results present the current and future risks of coca cultivation cycle, which Social Action – PCI is applying in the management of the different institutional actins during 2010 for the integral recovery and consolidation of the territories affected by illicit crops in the Antioquia-Cordoba region (Eradication, Productive Projects, Forest Warden Families, regional development projects).

Figure 23: Mapping of risks by means of the Baseline methodology (Detail).



Characterization of the transformation process of coca leaf into cocaine chlorhydrate

Within the framework of the Project "Prevention of the diversion of drugs precursors in the Latin American and Caribbean Region"- PRELAC of the European Commission and United Nations, a regional study (Colombia, Peru and Bolivia) was carried out together with the National Narcotics Office. This study was intended to update the information on types, volume and trends in the processing and dynamics of the traffic of the chemical precursors used to produce coca paste, cocaine base and cocaine chlorhydrate.

For this purpose, workshops were held in different cities with the participation of the National Police, the Technical Investigations Body –CTI, DAS, National Army, the Navy, and the INPEC, among others. Applying the methodology of talking maps, it was possible to establish and outline the routes of access and trade of the chemical precursors that are deviated to the illicit business, traffic in borders, regions affected by the presence of clandestine laboratories, as well as the amounts and types of seized substances.

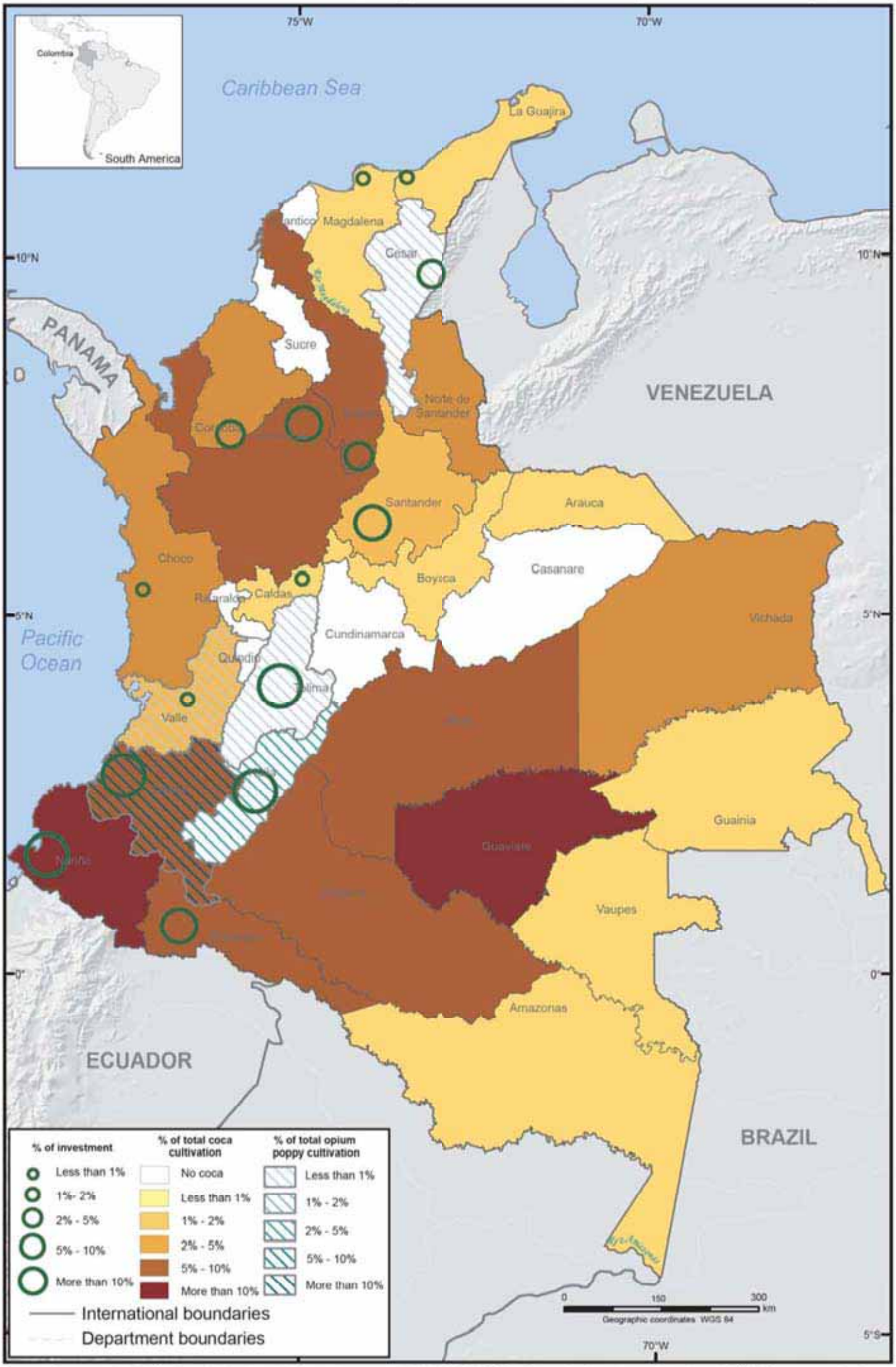
Alternatively, direct interviews were done with coca growers and people who process coca paste, cocaine base and cocaine chlorhydrate, so as to establish the current procedures to transform coca leafs, the origin, type and amount of substances used.

The study showed that drug traffickers have a great ability to adapt to changes in the norms, using innovations in the processes and substances. Evidence was found of rural processing of substances such as potassium permanganate, ammonia, hydrochloric acid and natural gasoline. Besides, there was information on a process to manufacture cocaine chlorhydrate with variations in some of the stages, such as using substances to accelerate crystallization. Likewise, it was found that substances such as Levamisole, Diltiazem and Hydroxyzine are used to increase the amount and aminopyrine and caffeine among others are still being used.

Laboratories of great infrastructure are no longer common; currently, there is predominance of small laboratories that may be easily set up and dismounted. These laboratories generally produce cocaine chlorhydrate for the owner of the laboratory but at the same time they provide the service for others (*maquila*). For this purpose, they use labels that identify the laboratory.

Despite the great efforts of the law enforcement agencies, it was found that the drug producers have the chemical substances they need to extract and refine. This proves the need to further know and analyze this issue, so that the national and international law enforcement agencies may establish mechanisms to prevent traffic and illicit use of these chemical substances. The people interviewed manifested that many of the substances used enter the country through the borders of neighbour countries, in the same way the cocaine chlorhydrate goes out. For more information on this study, refer to www.biesimci.org.

Investment in Alternative Development and illicit crops in Colombia, 2009



Source: Government of Colombia - National monitoring system supported by UNODC. PCI for Alternative Development investment. DIRAN for poppy cultivation.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

2.6 ILLICIT CROPS AND ALTERNATIVE DEVELOPMENT PROGRAMMES

Alternative development programmes

In 1985 the alternative development projects were established in Colombia, with the aim of substituting illicit cultivations and complementing the aerial spraying and manual eradication actions. The programmes started in Cauca and continued in 1990 in Guaviare, Caqueta and Putumayo. The Productive Projects Programme is led by Social Action – Presidential Management against Illicit Crops – PCI, to encourage and support the agricultural and forestry activities so that the farmers will quit coca cultivation. The investment comes from the Colombian Government and International Cooperation.

The information reported for 2009 corresponds to productive projects that were ongoing in 2009 (some of these projects started since 2007). According to the information provided by the Presidential Programme against Illicit Crops -PCI and USAID (ADAM, MIDAS and ACDI-VOCA) about the total amount invested in alternative development programmes, more than a half (55%) are local resources coming from farmer's savings, private and public sector and in-kind contributions.

Most of the international investment comes from the United States Agency for International Development - USAID, by means of the Programmes ADAM, MIDAS and ACDI-VOCA; these entities work in coordination with Social Action to assist the national government in their alternative development policy. The current projects are in their final phases (some of them will end in 2010) so as to be in line with the Consolidation Plan of the Colombian Government for future investments.

20 % of the projects under execution are in the department of Cauca and 15% in Nariño. These departments together have 33% of the area under coca cultivation in 2009. Two departments that were object of important investments as well are Huila with 19% and Tolima with 11%, given that they have opium poppy fields (11 ha and 3.3 ha respectively). The departments of Putumayo, Antioquia, Santander, Bolivar and Cordoba, where the coca cultivations decreased in relation to the previous year, received around 30% of the total investment in alternative development.

Figure 24: Projects under execution, 2009

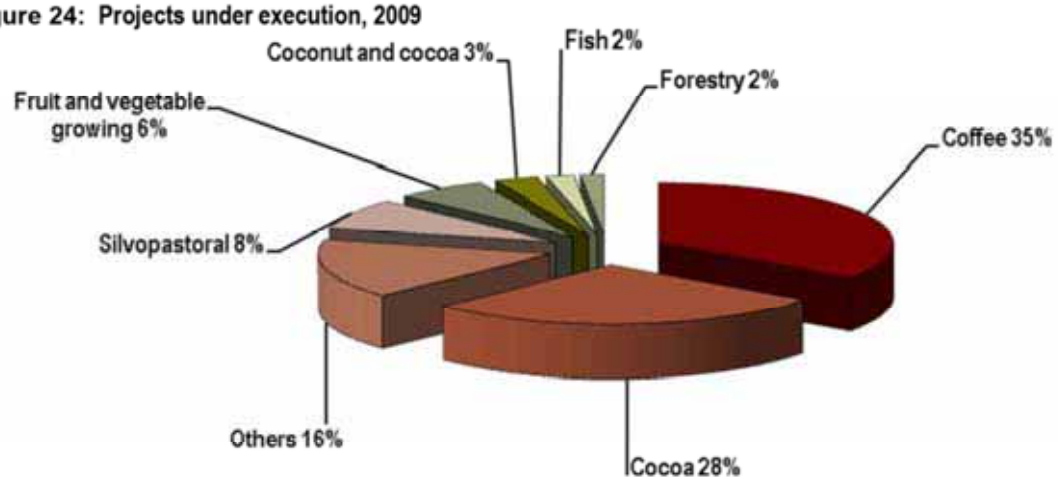


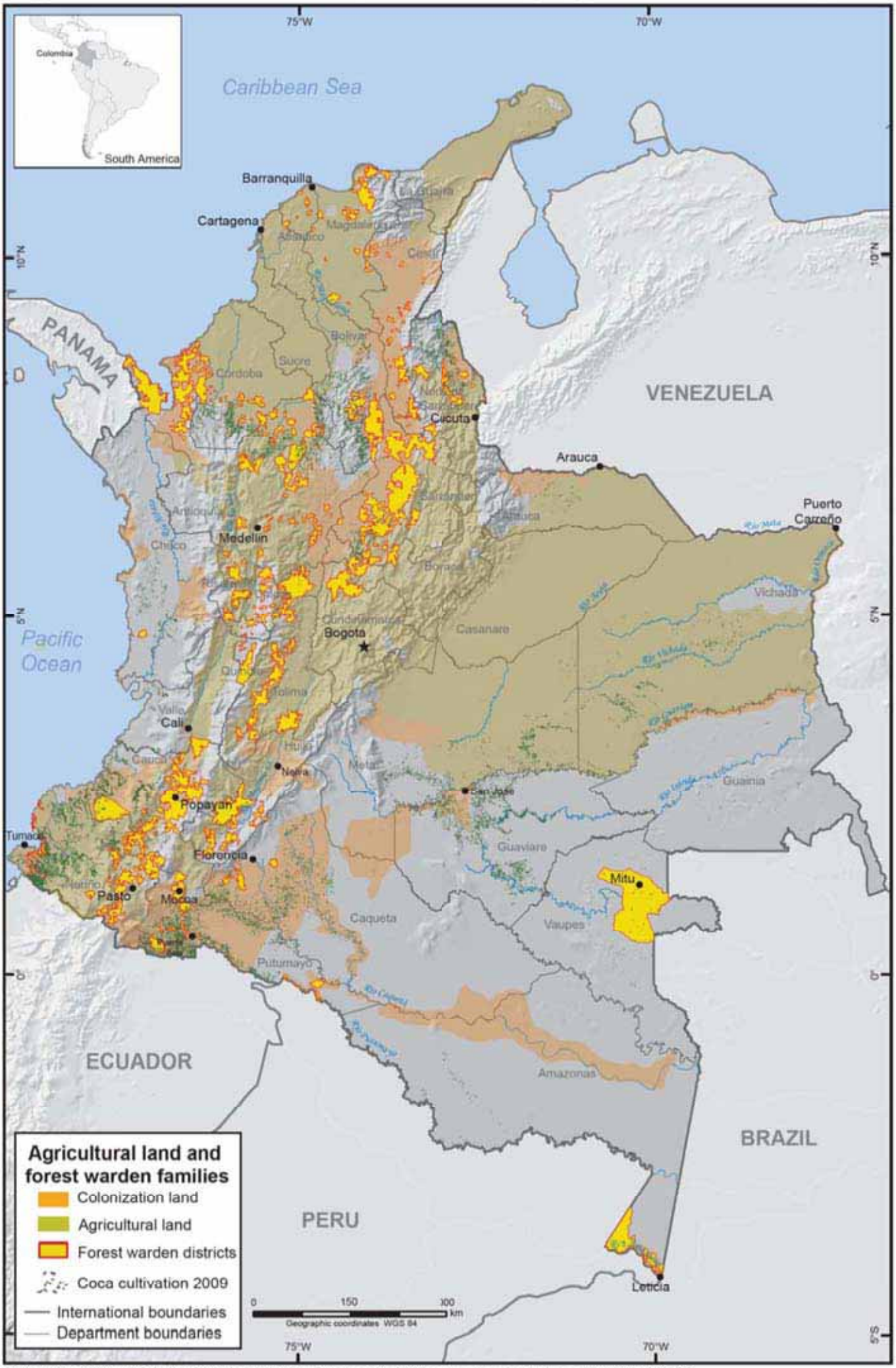
Table 36. Coca and opium poppy cultivations and investment in alternative development: Social Action -PCI and USAID, 2009

Department	Coca cultivation 2009 (Ha.)	Opium poppy cultivation 2009 (Has.)	Total Investment
Cauca	6,144	100	101,362,045,506
Huila		11	97,769,960,680
Nariño	16,428	238	77,471,382,352
Tolima		3	56,537,946,896
Putumayo	5,316		43,106,318,315
Antioquia	4,554		36,145,809,209
Santander	953		36,075,358,632
Bolivar	4,777		21,679,253,268
Córdoba	2,782		12,815,103,300
Cesar		2,5	10,786,976,033
Magdalena	151		4,437,716,330
Guajira	163		1,872,729,717
Valle del Cauca	929	1,5	1,833,720,914
Caldas	166		1,604,625,000
Choco	1,666		576,460,640
Guaviare	8,323		152,528,000
Norte de Santander	2,713		118,889,600
Caqueta	3,760		112,554,700
Boyaca	182		51,008,403
Meta	4,295		
Vichada	3,139		
Guainia	536		
Arauca	418		
Vaupes	351		
Amazonas	277		
Other			208,225,000
Total	68,025	356	504,718,612,495

Sources: PCI-Social Action, SIMCI and USAID for the coca cultivation area and DIRAN for opium poppy cultivation.

Source: UNODC

Agricultural land and forest warden families programme in Colombia, 2009



Source: Government of Colombia for Agricultural land - Forest warden families programme for districcts supported by UNODC.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

Coca cultivation and Forest Warden Families Programme

The alternative development programmes that have been developed in Colombia for the last years are aimed at the abandonment of illicit crops, the preservation of natural resources and the improvement of the competitiveness of the families that –in one way or another- have been ever involved in illicit cultivation. On these grounds, the national government has implemented, the Forest Warden Families Programme - PFGB[18] as a strategy to insert part of the population into a culture of lawfulness.

The PFGB benefits farmers, indigenous and afro-Colombian communities who live in eco-systems that are environmentally strategic and affected by the presence of illicit cultivation. These communities acquire the obligation of eradicating these cultivations, not sowing or re-sowing illicit cultivations, and not carrying out any task related to illegal cultivation whatsoever. The government and the families sign an agreement of bimonthly payments; the current amount is COL$408.000 per family (US$ 190) during a one year and half period.

During 2009, the PFGB was present in 96 municipalities from 21 departments of the country, and has paid around COL$ 86 thousand million pesos. Approximately 68,282 families are currently enrolled in the Programme.

SIMCI assists the Programme of UNODC with thematic cartography, updated satellite images and detection of coca cultivation by means of the coca survey and other coverage as forests, high stubble, grasses and low stubble, other cultivations, etc. According to the multi-temporal vegetable coverage analysis done by the PFGB 122,228 hectares of forest has been recovered between 2004-2008 and a total of 143 hectares have been voluntary eradicated.

Table 37. Summary report of the Forest Warden Families Programme, 2009

Department	Municipality	N° Districs	N° Families	Payment COL$
Amazonas	Leticia, Puerto Nariño	2	17	9,384,000
Antioquia	Amalfi, arboletes, Argelia, Cáceres, Ituango, Narño, Nechí, San Carlos, San Juan de Urabá, San Luis, San Pedro de Urabá, Tarazá, turbo, valdivia, Vegachí, Yalí, Yondó	17	11,366	11,958,288,000
Archipiélago de San Andrés y Providencia	Providencia, San Andrés	2	515	210,120,000
Bolívar	Santa rosa del sur, Simití	2	1,704	4,149,000,000
Boyacá	Pauna, Puerto Boyacá, San Pablo de Borbur	3	1,526	636,480,000
Caldas	Marquetalia, Pensilvania, Samaná	3	6,462	10,491,720,000
Caquetá	Albania, Belén de los Andaquíes, Currillo, El Paujil, la montañita, Morelia, San José de la Fragua	7	2,331	3,407,088,000
Cauca	La Sierra, Rosas, San Sebastián, Sotará	4	4,058	1,920,000,000
Cesar	Aguachica, San Alberto	2	11	6,120,000
Chocó	Acandí, Belén de Bajira, Carmen del Darien, Riosucio, Tadó, Unguía, Unión Panamericana	7	4,357	4,985,256,000
Córdoba	Montelíbano, Puerto Libertador, tierralta	3	1,703	2,267,088,000
Cundinamarca	Caparrapí, Paime, Topaipí, Yacopí	4	4,428	8,818,104,000
Huila	La Argentina, Paicol, Pitalito	3	3,938	1,606,704,000
La guajira	Dibulla, El Molino	2	717	493,680,000
Meta	Puerto Concordia, Puerto Lleras, Puerto Rico, Vista Hermosa	4	1,966	4,662,624,000
Nariño	Belén, Colón, Consacá, La Cruz, La Florida, La Unión, Puerres, San Bernardosan Pablo, San Pedro de Cartago, Sandoná, Taminango	12	9,784	8,441,784,000
Norte de Santander	Convención, San Calixto, Sardinata, Teorama, Tibú	5	1,181	1,880,112,000
Putumayo	Mocoa, Puerto Guzmán, Puerto Leguízamo, Valle del Guamuez, Villagarzón	5	2,902	4,851,432,000
Santander	Bolívar, El Florián, El Peñón, La Belleza, Landázuri, Sucre	6	4,614	11,055,264,000
Tolima	Ataco, Natagaima	2	3,555	2,898,840,000
Vaupés	Mitú	1	1,147	1,031,832,000
	TOTALES	**96**	**68,282**	**85,780,920,000**

Source: PCI – Social Action.

[18] PFGB includes: Forest Warden Families Programme (PFGB); Productive Forest Warden Families Programme (PFGBP) and Emergency Plan in the municipalities of La Argentina, Paicol and Pitalito (Huila), Sotara and Rosas (Cauca).

Coca cultivation in coffee plantation areas in Colombia, 2009

Source: Government of Colombia - National monitoring system supported by UNODC. Colombian National Coffee Growers Federation for coffee plantation areas.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

Coca cultivation in coffee growing area

Coffee growing in Colombia is the most important and representative agricultural activity; hence, the national concern has always been to prevent the penetration of coca cultivation in the areas suitable for coffee growing (*ecotopos*) given the serious impact that this situation would have on the agricultural economy of the country.

Coca fields in coffee growing areas are 1.7% of the country total. Still, in the last years these areas have grown considerably (71% with respect to 2006); this is an early alert to intensify the prevention activities and forced or voluntary manual eradication of this cultivation.

In 2009, 1,229 hectares were recorded being cultivated with coca in the coffee growing *ecotopos*; this is 223 hectares (+25%) more than 2008. The departments with the greatest increase were Guajira and Norte de Santander. This trend coincides with a constant reduction in the coffee production at the national level.

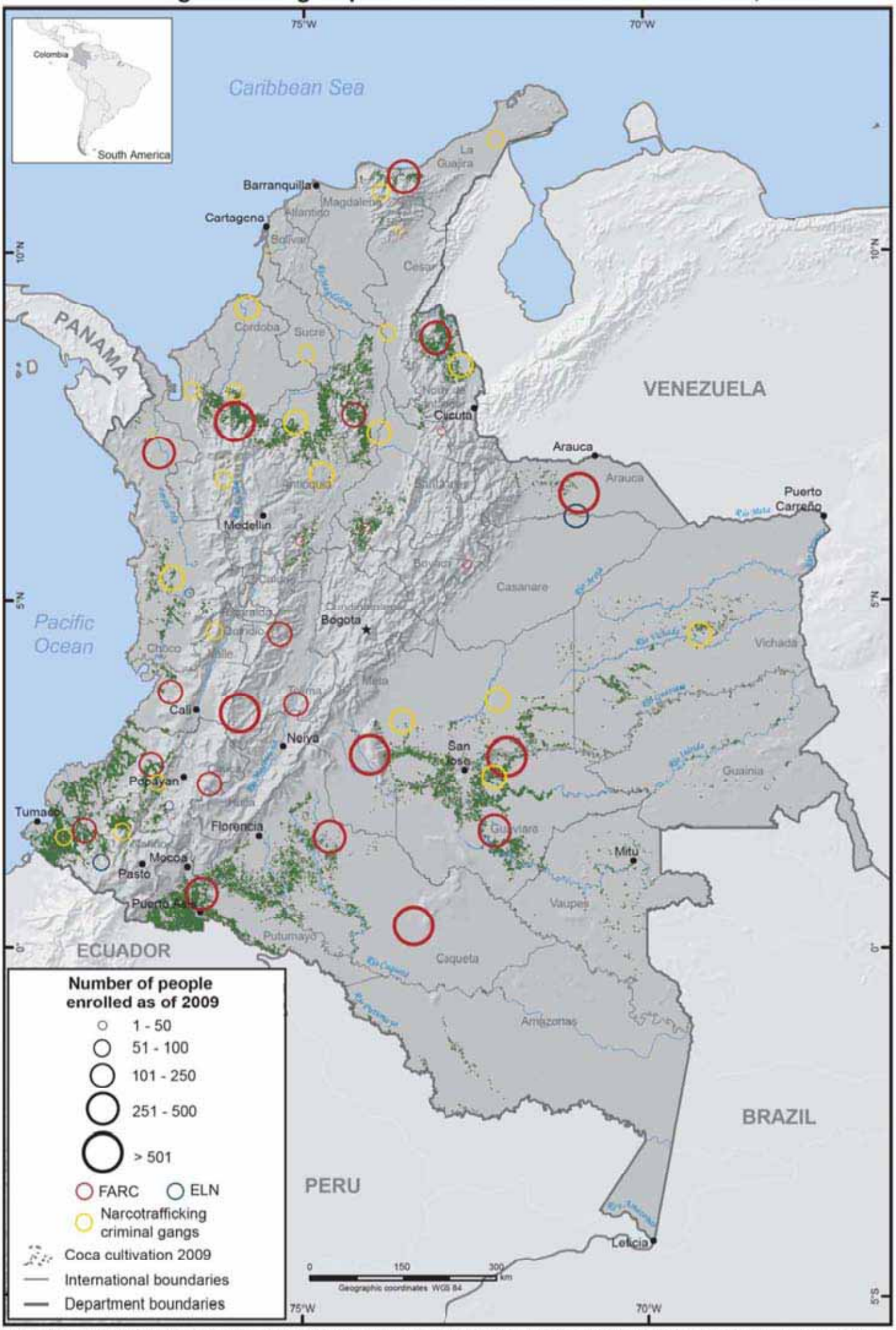
Table 38.Coca cultivation in coffee ecotopos, 2006-2009

Department	Area of coffee *ecotopos* (hectares)	2006 Coca cultivation (hectares)	2007 Coca cultivation (hectares)	2008 Coca cultivation (hectares)	2009 Coca cultivation (hectares)
Antioquia	1,205,099	165	163	190	252
Boyaca	324,190	29	4	-	4
Caldas	257,571	49	4	44	20
Caqueta	196,509	26	34	83	113
Cauca	668,825	155	335	308	193
La Guajira	118,228	38	10	19	73
Magdalena	157,621	18	13	55	45
Nariño	154,046	116	257	60	55
Norte de Santander	475,130	25	36	122	320
Santander	624,649	38	17	24	54
Valle del Cauca	594,793	-	-	1	-
Total	4,776,661	659	873	906	1,129

Source: National Coffee Growers' Federation for coffee *ecotopos*.

Coca cultivation mixed with coffee cultivation

Illegal armed groups and coca cultivation in Colombia, 2009



Sources: for coca cultivation Government of Colombia - National monitoring system supported by UNODC; Ministry of Defence and National Police for number of persons enrolled in armed groups.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

Coca cultivation and illegal armed groups

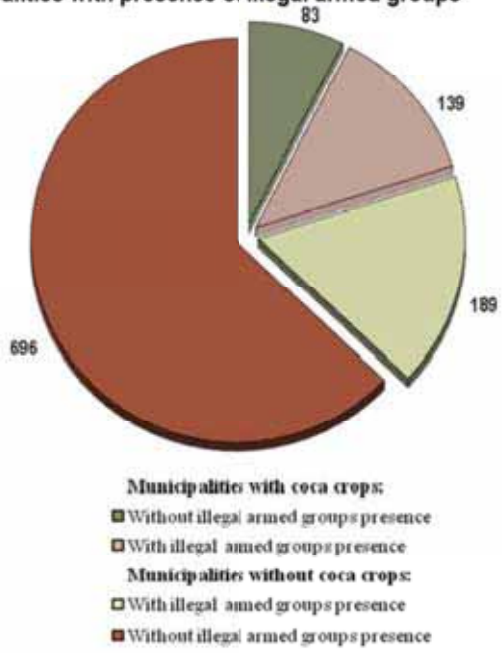
The problem of illicit cultivation in Colombia is very complex due to its relation with the illegal armed groups that in one way or another use it for their own financing. Coca cultivation and zones of drug production highly coincide with the presence of illegal armed groups and the so-called criminal bands at the service of drug trafficking -BACRIM[18]. These bands have made alliances with drug trafficking and created a perverse cycle of –illicit cultivation-violence-terrorism-drug trafficking.

Law enforcement agencies report the presence of illegal armed groups in 328 municipalities (in 139 of them there is also coca cultivation). In some municipalities there is presence of one single group and in others there are alliances between the groups. It is difficult to know what the links of the economic chain managed by the different actors are. According to data of the law enforcement agencies, in some areas the guerrilla groups control the coca cultivation and the production of coca paste while the BACRIM control the strategic corridors for the drug trafficking and the protection for the operation of the cocaine chlorhydrate laboratories.

According to the figures of the national government, the approximate number of people enrolled in the illegal armed groups in Colombia in 2009 was 10.000 (FARC and ELN). The National Police says there is around 3,750 people involved in BACRIM, with presence in 159 municipalities (72 of these also have the presence of illicit cultivation), mainly in the departments of Antioquia, Cordoba, Nariño, Choco, Meta, Guaviare Casanare and Vichada.

The OAS highlights the geographic correlation between the areas under coca cultivation, the strategic corridors for drug trafficking and the presence of emergent criminal groups. The MAPP/OAS[19] have identified 28 affected zones comprised by 153 municipalities with illegal armed groups involved in drug trafficking[20]. The strategic corridors that are affected are mainly the Uraba Gulf towards the east, going through south Cordoba, Low Cauca, south Bolivar, Barrancabermeja, south Cesar and Norte de Santander. There is also presence in the Pacific Region, Magdalena Medio and in the departments of Meta, Vichada, Antioquia and high Guajira (see map).

Figure 25: Number of municipalities with presence of illegal armed groups

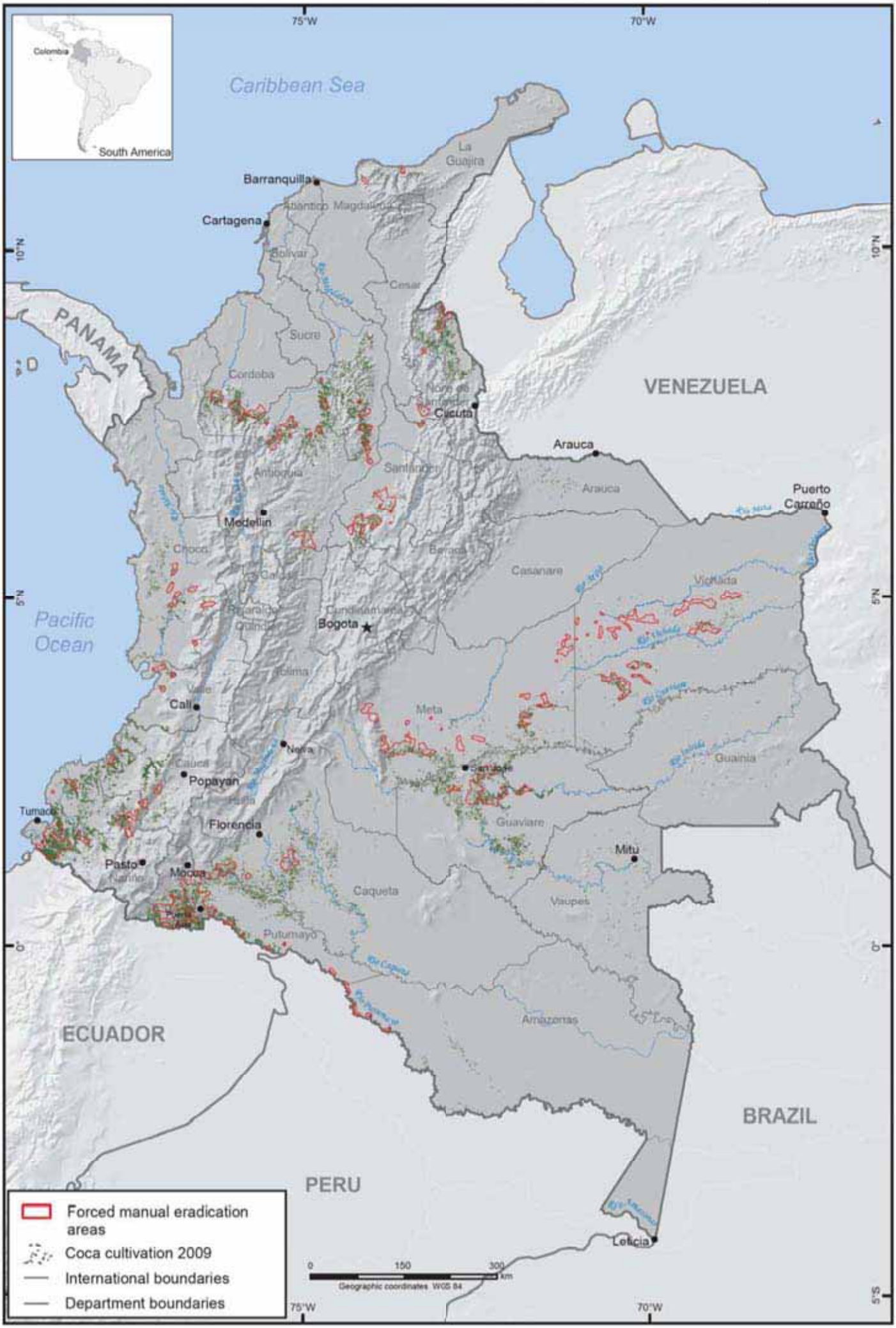


[18] *Criminal bands (BACRIM) remain as a product of the demobilization of the Autodenfesas Unidas.*

[19] *Mission to Support the Peace Process in Colombia of the OAS.*

[20] *Twelfth quarterly report from the Secretary General to the Permanent Council on the Peace Process Support Mission in Colombia. February, 2009.*

Forced manual eradication and coca cultivation in Colombia, 2009



Sources: Government of Colombia, for coca cultivation National monitoring system supported by UNODC; GME monitoring system for manual eradication areas.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

2.7 SUPPLY REDUCTION

Forced manual eradication

In 2009, 60,544 hectares of coca cultivation were eradicated; for the first time since 2001 when the forced manual eradication programme was implemented, the eradicated area decreased with respect to the previous year (-37%), to levels similar to those in 2007 (66,805 hectares). These activities were carried out in 25 departments, but mainly in Nariño (16,543 hectares) and Antioquia (7,198 hectares). An extension of 593 hectares of opium poppy was eradicated in four departments; nevertheless, 99% of the eradicated area of opium poppy is in the departments of Nariño and Cauca.

The strategy of manual eradication is under the responsibility of the Presidential Agency for Social Action. It is carried out by the Mobile Eradication Groups –GME Presidential Managment of ilicit crops-, with the support of the Anti-narcotics Police and the Military Forces, which have been certified by UNODC since 2007. In addition, the National Police and the Army carry out other manual eradication activities throughout the country.

Table 39. Manual eradication of coca cultivation by department, 2009

DEPARTMENT	Coca cultivation		Opium poppy cultivation	
	Eradicated area (has)	% from total	Eradicated area (has)	% from total
Nariño	16,543	27.3	280	47.2
Antioquia	7,198	11.9	-	-
Meta	4,917	8.1	-	-
Vichada	4,758	7.9	-	-
Putumayo	4,654	7.7	-	-
Caqueta	3,922	6.5	-	-
Norte de Santander	2,820	4.7	-	-
Cauca	2,615	4.3	309	52.1
Guaviare	2,467	4.1	-	-
Santander	2,084	3.4	-	-
Cordoba	2,043	3.4	-	-
Choco	1,707	2.8	-	-
Bolivar	1,454	2.4	-	-
Valle	1,042	1.7	-	-
Magdalena	693	1.1	-	-
Amazonas	550	0.9	-	-
Boyaca	461	0.8	-	-
Cundinamarca	173	0.3	-	-
Caldas	146	0.2	-	-
Guajira	88	0.1	-	-
Guainia	85	0.1	-	-
Arauca	66	0.1	-	-
Cesar	55	0.1	-	-
Risaralda	4	0.0	-	-
Casanare	1	0.0	-	-
Huila	0	0.0	1	0.2
Tolima	0	0.0	3	0.5
Total	60,544	100	593	100

Source: UNODC. PCI-Social Action. National Police and National Army.

Manual eradication has a greatest impact on the production of coca leaf, since the plants are pulled out completely. The replanting implies costs for the farmers, since they need approximately eight months between the sowing and the first crop with a low productivity in the first stage. However, replanting has been found in some eradicated areas; on these grounds, UNODC recommends in their eradication report to complement it with alternative development projects.

UNODC evaluated the behaviour of the replanting activities in the areas that were forcedly eradicated, by overlapping the coordinates reported by the GME, considering the image and the eradication dates. The table below shows the area of fields that were manually eradicated throughout the year and which were replanted with coca at the moment of the survey. The analysis only includes forced manual eradication certified by UNODC.

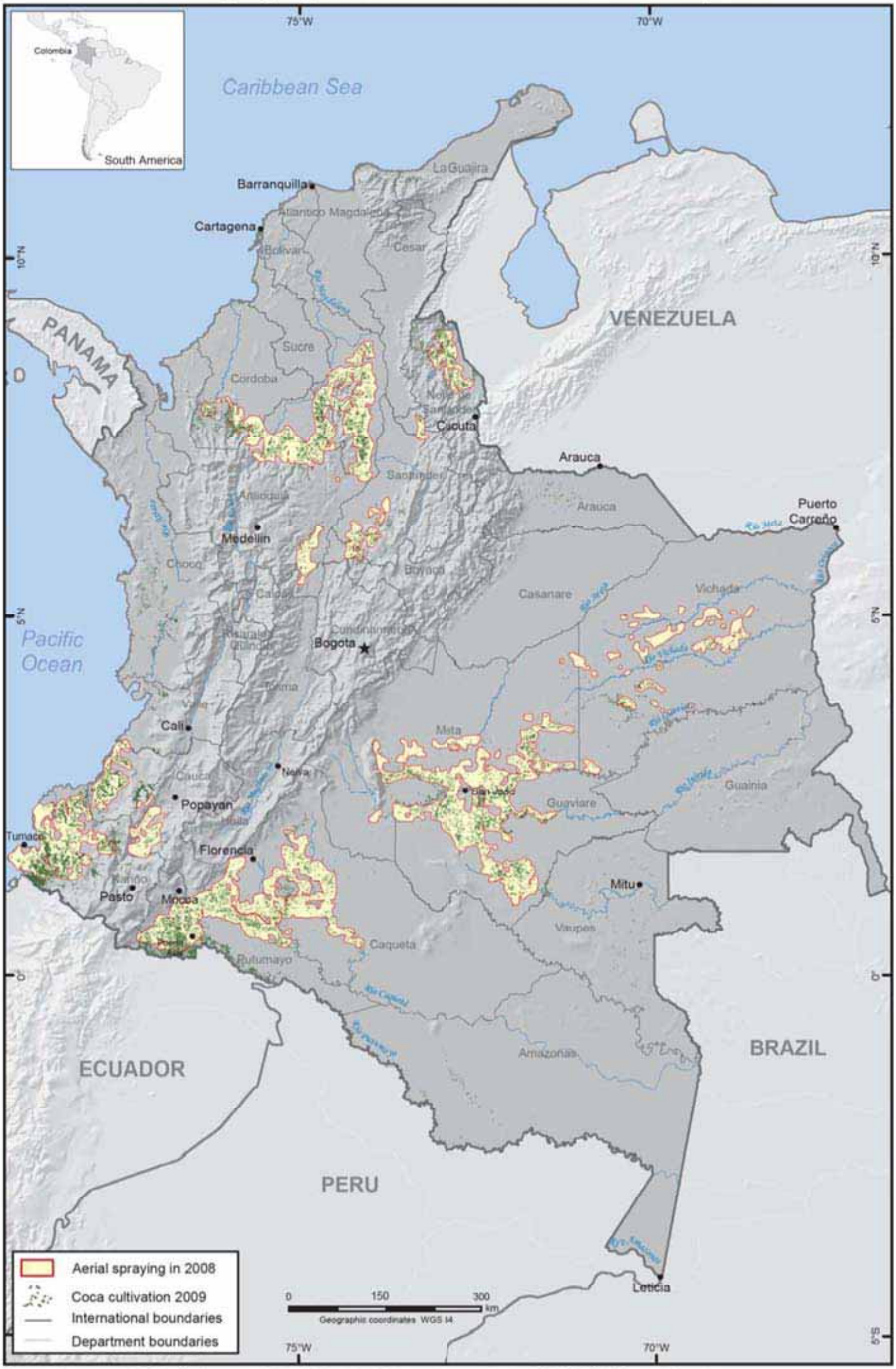
Table 40.Analysis of replanting in areas that were subject of forced manual eradication by GME,2009

Region	Reported eradication Hectares	Replanting with coca		No replanting		No data	
	Hectares	Hectares	%	Hectares	%	Hectares	%
Amazon	147	37	25	93	63	17	12
Central	11,551	2,532	22	8,239	71	780	7
Guaviare - Meta	6,492	1,805	28	4,554	70	133	2
Orinoco	4,328	1,738	40	2,555	59	35	1
Pacific	18,417	5,421	29	7,568	42	5,428	29
Putumayo - Caqueta	7,190	1,319	18	5,804	81	67	1
Sierra Nevada	77	1	1	76	99	0	0
TOTAL	**48,202**	**12,853**	**27**	**28,889**	**60**	**6,460**	**13**

Sources: PCI. UNODC

This comparison showed that 87% (41,742 hectares) of the total eradicated area have enough information to evaluate replanting and 13% (6,460 hectares) is covered by gaps or clouds. The analysis showed that 12,853 hectares (27%) were replanted in the same place, while there is no evidence of replanting in 28,889 hectares (60%). Although there is a reduction of the eradicated area, the replanting remained constant with respect to the same evaluation carried out in 2008 (31%). In the general balance, the regions that have the highest area of coca replanted are Pacific and Central, which add up for 62% of the 12,853 hectares replanted in the whole regions.

Aerial spraying and coca cultivation in Colombia, 2009



Sources: Government of Colombia, for coca cultivation National monitoring system supported by UNODC; DIRAN for aerial spraying.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

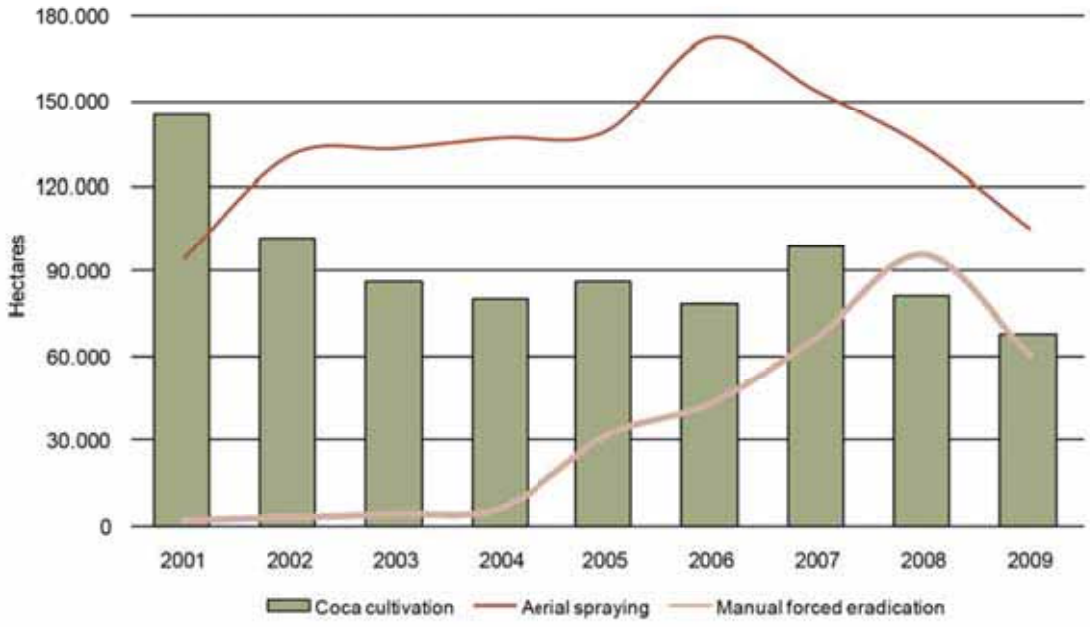
Aerial spraying

The strategy of Colombia against drugs includes a series of measures that include aerial spraying, forced or voluntary manual eradication, alternative development and substitution programmes. UNODC neither participates in nor supervises the aerial spraying; all data presented here was provided directly by the Anti-narcotics Police – DIRAN.

The aerial spraying programme according with the National Narcotics Council is carried out by DIRAN with a mixture of the commercial formulations of glyphosate herbicide, a surfactant and water. This chemical mixture has a systemic effect and is absorbed throught the leafs and conducted toward the roots; hence, according with coca growers interviews, the bush may go back to its production cycle in approximately six months, if it is subject of a prune operation at about 30 cm over the ground. In 2009, the effectiveness of the aerial spraying was estimated in 90% by the National verification comission.

In 2009, the DIRAN sprayed a total of 104,771 hectares, which represents a reduction of 27% with respect to the previous year; this was the lowest rate of aerial spraying since 2002. 61% of the aerial spraying activities were done in the departments of Nariño, Guaviare and Cauca which together have 45% of the area under coca cultivation in the country according to the reports.

Figure 26: Comparison of coca cultivation and the cumulative sprayed and manually eradicated areas,1998-2009



Source: PCI for eradication, DIRAN for aerial spraying and SIMCI for coca cultivation.

The cumulative sprayed area is the sum of the areas sprayed during one calendar year (calculated by multiplying the length of the flight lines by their width); it is different from the effective sprayed area, which does not consider the overlap between adjacent sprayed areas and the areas sprayed several times during the same year.

In the last 3 years, the aerial spraying activities have focused mainly in the department of Nariño, where there was a reduction of 10% in the cultivated area in that same period.

Figure 27: Comparison of the variations in the area sprayed and the area under coca cultivation, 2007-2009.

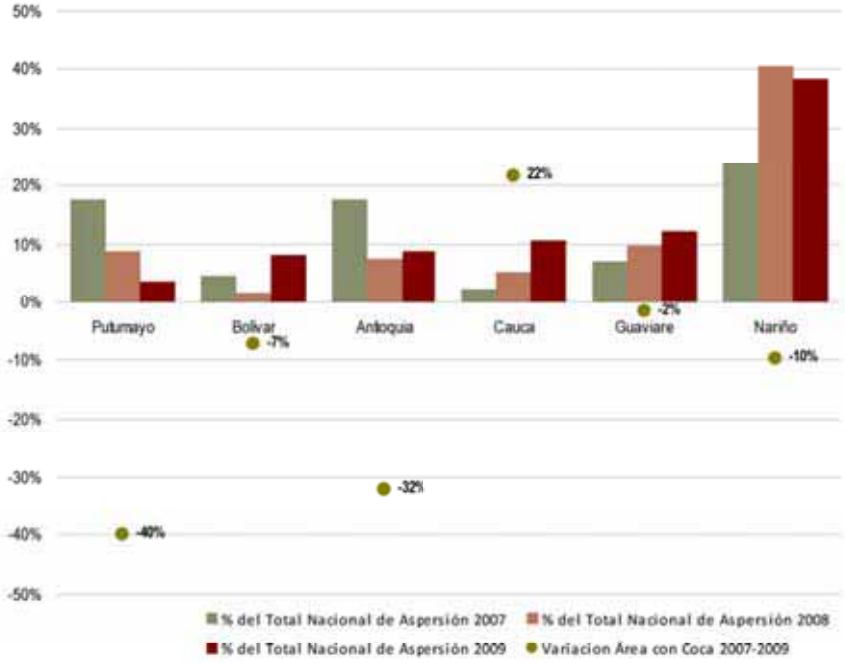


Table 41. Aerial spraying of areas under coca cultivation by department and year (in hectares) 2000-2009

Sources	National Police – Anti-narcotics									
Department	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Nariño	6,442	8,216	17,962	36,910	31,307	57,630	59,865	36,275	54,050	39,992
Guaviare	8,241	7,477	7,207	37,493	30,892	11,865	14,714	10,950	13,061	12,584
Cauca	2,950	741	-	1,308	1,811	3,292	1,536	3,557	6,891	11,136
Antioquia	6,259	-	3,321	9,835	11,048	16,833	18,022	27,058	10,028	9,281
Bolivar	-	11,581	-	4,783	6,456	6,409	2,662	7,050	2,214	8,715
Meta	1,345	3,251	1,496	6,973	3,888	14,453	25,915	15,527	9,057	6,755
Caqueta	9,172	17,252	18,567	1,059	16,276	5,452	4,575	5,084	11,085	6,652
Putumayo	13,508	32,506	71,891	8,342	17,524	11,763	26,491	26,766	11,898	3,777
Norte de Santander	9,584	10,308	9,186	13,822	5,686	899	1,687	2,683	2,864	1,883
Vichada	-	2,820	-	-	1,446	-	5,485	7,193	5,901	1,699
Santander	470	-	-	5	1,855	2,042	2,146	1,754	422	1,269
Cordoba	-	-	734	550	-	1,767	5,588	6,259	3,561	742
Caldas	-	-	-	-	190	1,090	1,068	284	-	169
Boyaca	102	-	-	-	-	925	831	-	166	117
Arauca	-	-	-	11,734	5,336	2,584	1,400	2,695	2,296	-
Choco	-	-	-	-	-	425	-	-	-	-
Valle	-	-	-	-	-	5	-	-	-	-
La Guajira	-	-	-	-	449	572	-	-	-	-
Magdalena	-	-	-	-	1,632	383	-	-	-	-
Vaupes	-	-	-	-	756	340	-	-	-	-
Cundinamarca	-	-	-	-	-	43	41	-	-	-
Total aerial spraying	**58,073**	**94,152**	**130,364**	**132,814**	**136,552**	**138,772**	**172,026**	**153,135**	**133,496**	**104,771**
Cultivated area (hectares)	163,000	145,000	102,000	86,000	80,000	86,000	78,000	99,000	81,000	68,000

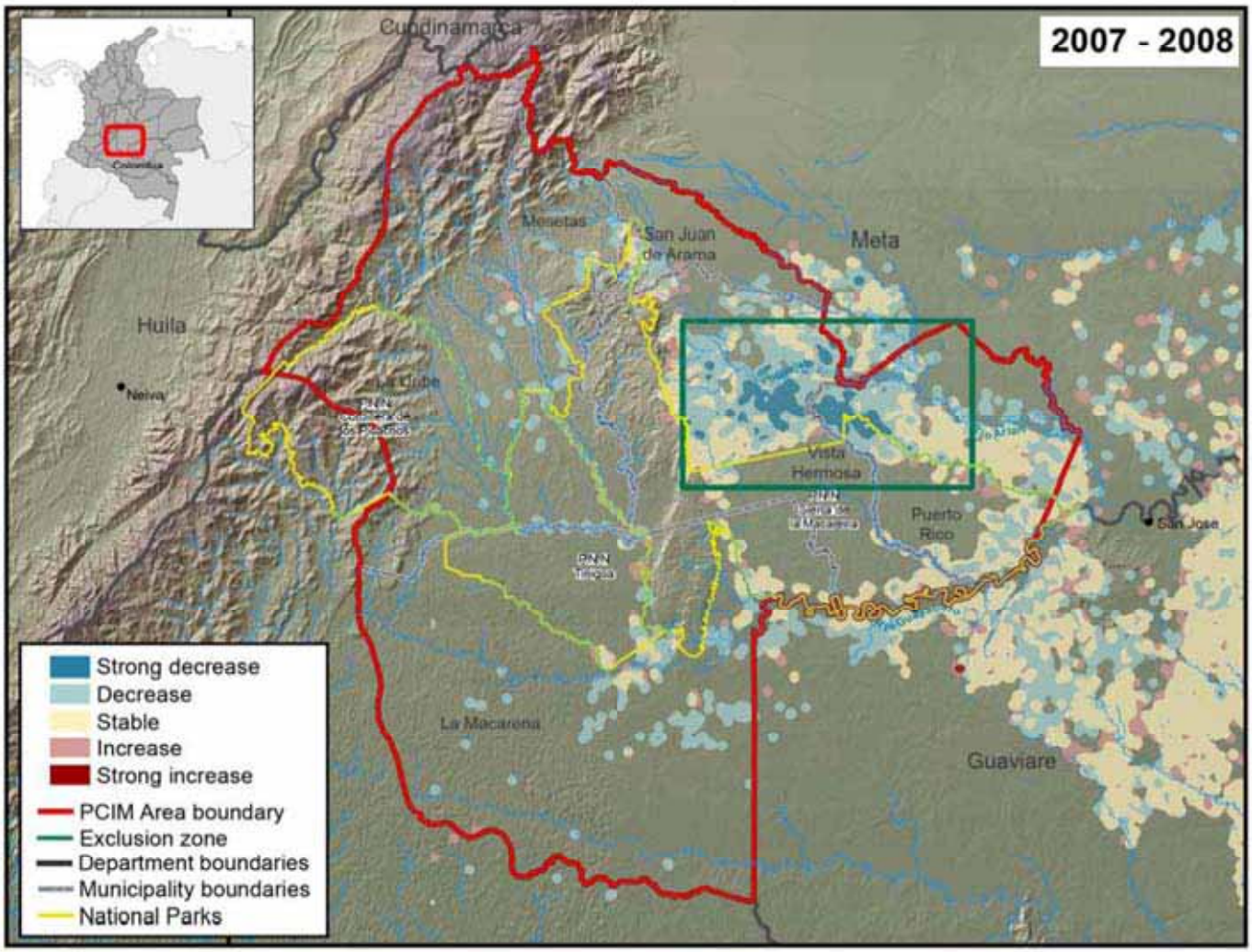
Source: DIRAN

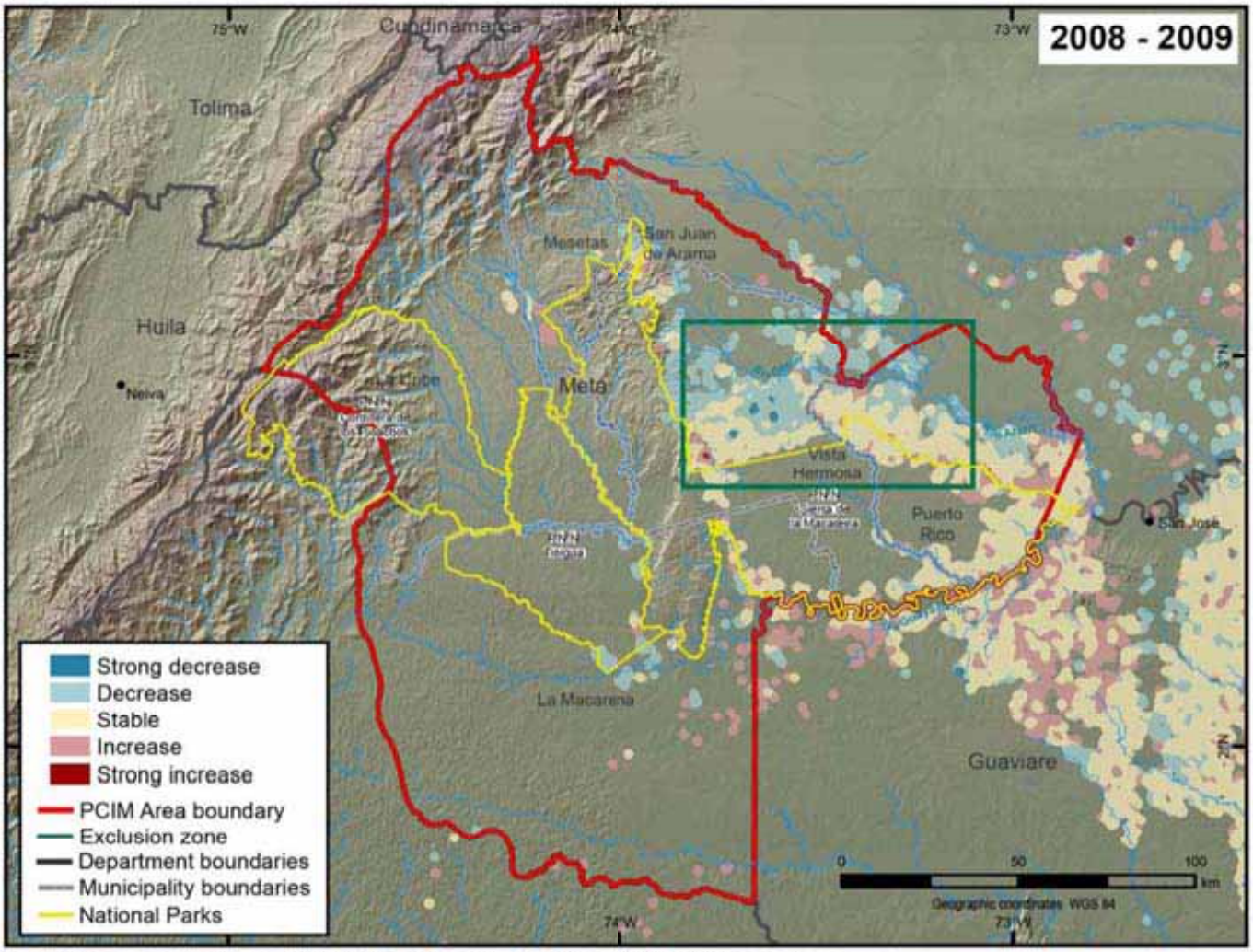
Once the coca fields are sprayed, they need between six and eight months to recover their productivity when pruned or replanted. However, when it rains or when the farmers wash the bushes or crop immediately after the aerial spraying, the loss of the coca leaf decreases and the cultivation recovers rapidly.

To reduce the impact of spraying, the growers develop strategic behaviours such as: sowing mixed crops; applying substances to isolate the leaf surfaces from the effect of glyphosate; wash the leafs; increase the number of fields so that some of them will not be affected; rotate the fields in a productive unit and reduce the size of the field, among others. Aerial spraying, depending on its level of affectation, may cause the loss of one or more crops, reduction of the production or total loss. These affectations vary significantly from one region to the other and it is clear that aerial spraying is not the only cause of crop reduction of loss.

The previous reasons, in addition to reduction or loss of crops due to climate, plagues or diseases, explain why the area under coca cultivation in Colombia is not constant throughout the year; in other words, this shows that there are actions or factors that cause the increase (re-planting and protection against aerial spraying) or the decrease (aerial spraying, manual eradication, market or violence issues).

Coca cultivation density change in PCIM area





Source: Government of Colombia - National monitoring system supported by UNODC. DIRAN for Exclusion zone.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

Integral Consolidation Plan

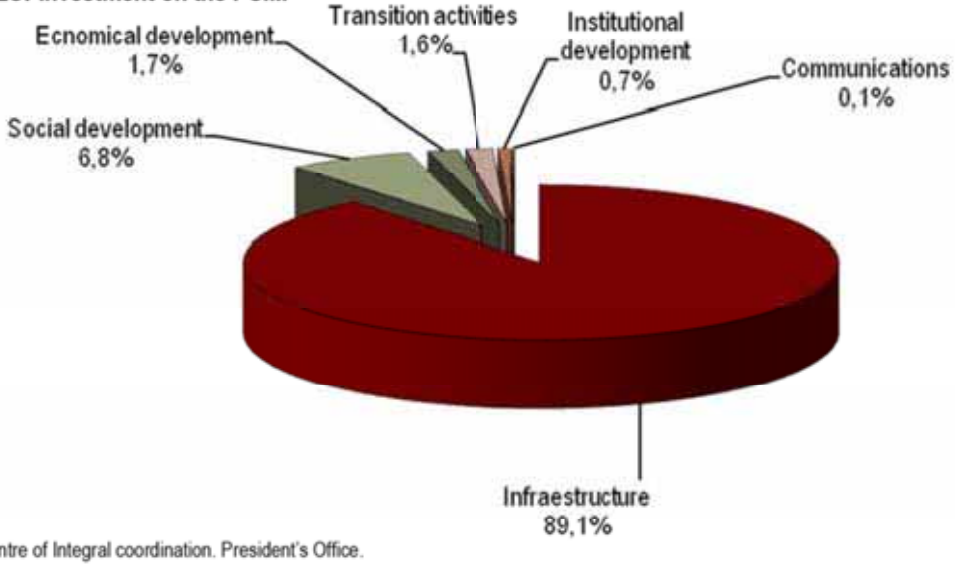
In Colombia, National Integral Consolidation Plans are being developed to guarantee the security in the areas and maintain a legal economy in a sustainable manner. This is done through strategies that assure the institutional presence with social development. The Directive Council of the Centre for Coordination and Integral Action- CCAI[21], is responsible for strategic leadership and coordination of the national level entities in charge of the consolidation.

The Integral Consolidation Plan started in the Macarena region (2007) to consolidate it as an area free of illicit cultivation; in addition, it intended to recover the territorial security and to establish the conditions needed for the development of this zone that has been historically affected by the presence of illegal armed groups and drug trafficking. Currently, the efforts are aimed at specific geographic spots that have been established as priorities, located in the regions of Pacífico (Nariño, Cauca, Buenaventura, Sourthern lands of Choco), "Bajo Cauca Antioqueño", Córdoba, Tolima and Valle del Cauca. The transition areas are: Montes de María, Sierra Nevada de Santa Marta and eastern lands of Antioquia[22].

The Integral Consolidation Plan of Macarena (PCIM) acts mainly on six municipalities of the department of Meta, which are: La Macarena, Mesetas, Puerto Rico, San Juan de Arama, Uribe and Vistahermosa. It is worth highlighting that La Macarena is of great environmental importance because it has three areas protected by the National Parks System, these are La Macarena and Tinigua National Parks.

In 2009, the investment in the PCIM reached the amount of COL$ 231 thousand million (around US$ 107 million). The strategic areas that the investment is allotted to are: infrastructure, social development, economic development, strengthening, transition actions (alimentary security), institutional development and communications. The infrastructure strategic area received 89% of the investment and comprises the actions of connectivity of road and electric networks, among others.

Figure 28: Investment on the PCIM



Source: Centre of Integral coordination. President's Office.

[21] The Directive Council is composed by National Police, Colombia Army, Presidential Agency for Social Action and International Cooperation, National Planning Department and the Office of the Atorney General.
[22] Presidencia de la República.

In 2009, in the area of the PCIM, 1,421 hectares were sprayed and 2,839 hectares were manually eradicated; out of these, 84% were eradicated within the so called "Exclusion Zone". The eradication strategy in this area is developed through the control of a sequence between territorial security, eradication and assistance for the transition. The manual eradication agreements are both voluntary and forced.

The department of Meta was in the first place in area under coca cultivation in 2004 and 2005, given its tendency to increase this kind of cultivation since 2001. In 2008, there was a significant change in this tendency, since there was a reduction of 47% as compared to 2007; it went down to the sixth place in extension under coca cultivation at the national level. In 2009, Meta was in the seventh place with 4,295 hectares under coca cultivation, with a reduction of 22% with respect to the 5,525 hectares reported in 2008.

There was a reduction of 31% in the extension of coca cultivation in the PCIM area; it dropped from 2,697 hectares in 2008 to 1,848 hectares in 2009. In the "exclusion zone", the reduction in the area under coca cultivation with respect to 2008 was of 39% in 2009.

Table 42.Coca cultivation in the department of Meta and in the PCIM area in hectares, 2002-2009

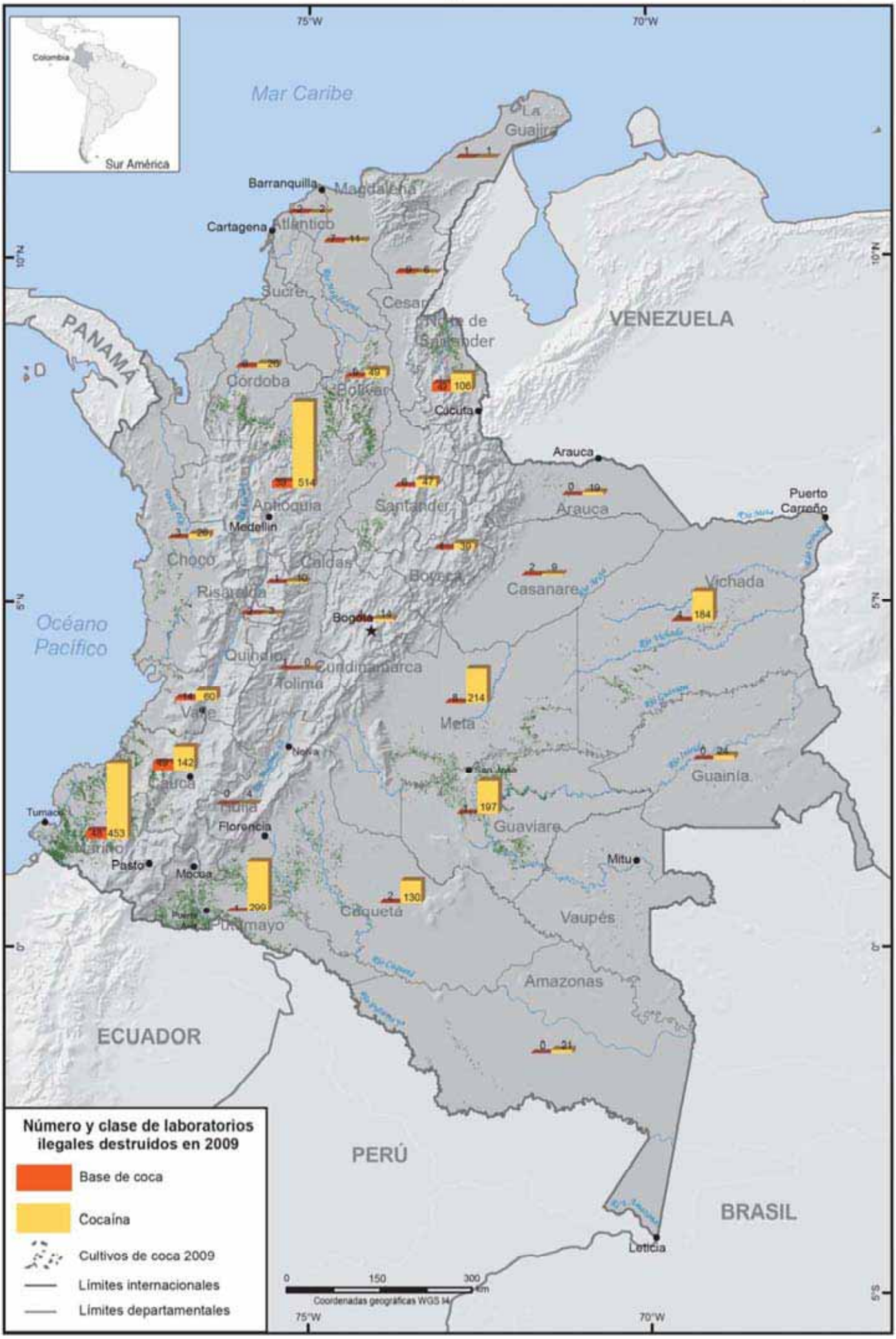
Area	2002	2003	2004	2005	2006	2007	2008	2009	Change % 2008 -2009
Exclusion zone	2,546	2,718	8,705	9,530	3,574	5,333	1,524	934	-39%
PCIM	6,527	5,858	12,200	12,597	6,498	7,248	2,697	1,848	-31%
Department of Meta	9,222	12,814	18,740	17,305	11,063	10,386	5,525	4,295	-22%

Source: UNODC

The productivity of the coca fields in the PCIM area was reduced from 6.6 annual crops per year with an annual yield of 9.9 m.t./ha/year of coca leaf in 2005 to 5.4 crops per year with a yield of 5.1 m.t./ha/year of coca leaf in 2008.

The cocaine production potential in the PCIM area was reduced 46%, going from 26 m.t. of pure cocaine (6% of the country total) in 2008, to 14 m.t. in 2009 (3% of the country total).

Laboratorios clandestinos destruídos y cultivos de coca en Colombia, 2009



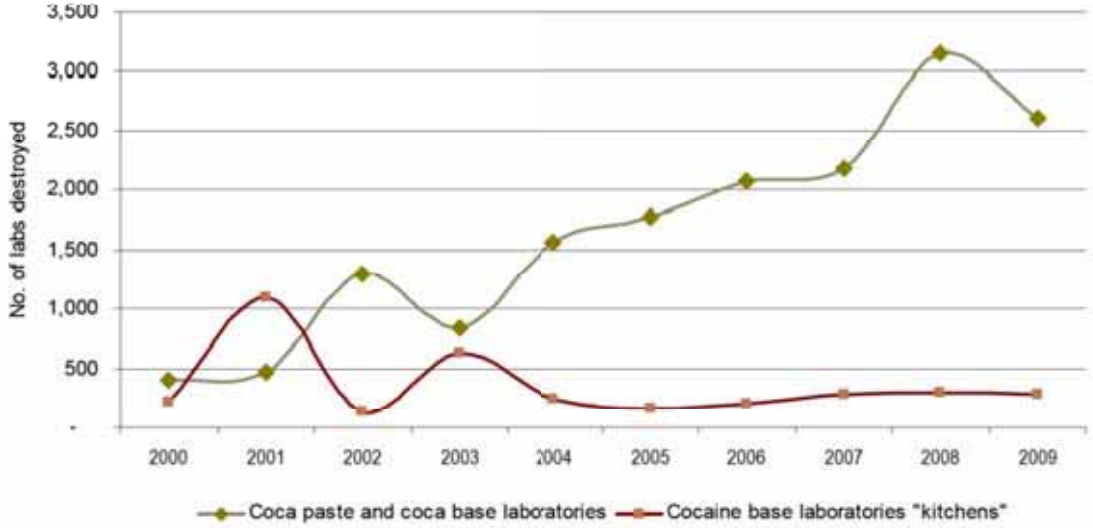
Fuentes: para cultivos de coca Gobierno de Colombia - Sistema de monitoreo apoyado por UNODC; para laboratorios destruídos: DNE

Seizures

UNODC did not participate in the collection of data on seizures and destruction of laboratories. Nonetheless, this information is taken into consideration because it provides interesting signs of the possible trafficking corridors and it enables a better understanding of the dynamics around the drugs business.

According to the National Narcotics Office - DNE, a total of 2,888 illegal laboratories were destroyed in 2009, out of which 2,610 were laboratories to process coca paste or cocaine base and 278 were laboratories to process cocaine chlorhydrate. There was an increase of 4% in the identification and destruction of cocaine chlorhydrate laboratories (*cristalizaderos*). These are located in rural areas and according to intelligence information from law enforcement agencies, their current characteristic is that they are getting smaller each time and that they may be easily set up and dismantled to avoid the action of the authorities.

Figure 29: Laboratories destroyed in Colombia, 2000-2009



37% of the cocaine chlorhydrate laboratories were detected and destroyed in the Pacific region, mainly in Cauca and Nariño; 18% of them in Norte de Santander and 14% in Antioquia. In general, the cocaine chlorhydrate laboratories are not always located in the areas under coca cultivation, but they get their supply in close areas (see table 1)

The data provided by the DNE show that the cocaine seizures in 2009 were of around 207 tons. 53% of the cocaine seizures were carried out in the departments of Nariño, Valle del Cauca and Choco, and 14% in Antioquia.

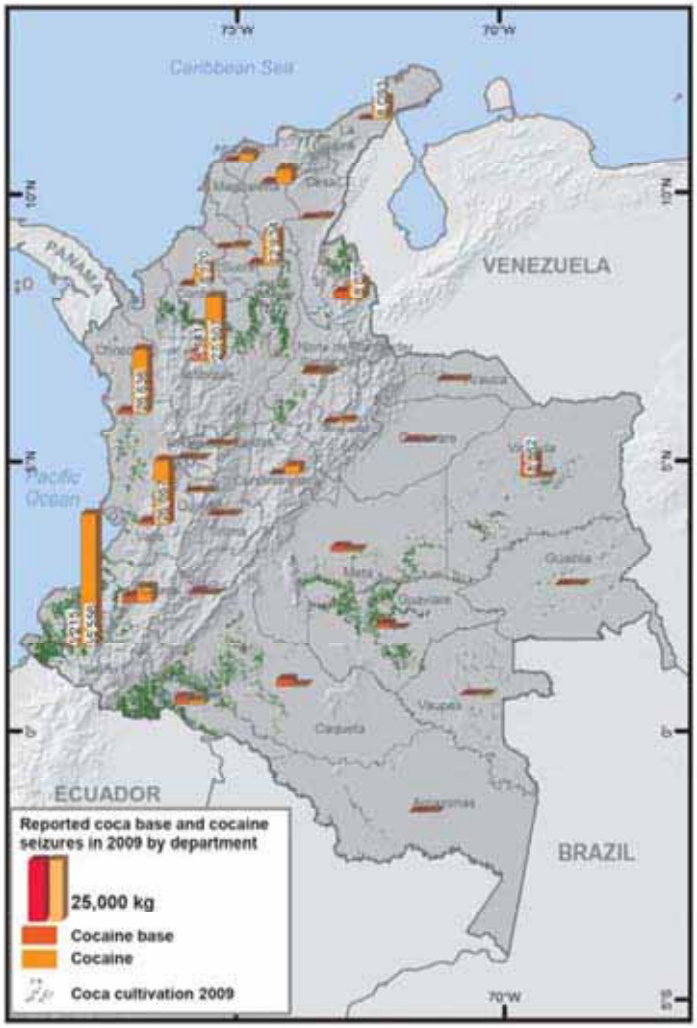
As regards to the heroin seizures, these increased 13% in relation to the previous year, going from 646 kilograms to 732 kilograms (the heroin production potential is estimated in 1,100 kg). 48% of the heroin seizures were done in Nariño, 18% in Atlantico and 9% in Valle del Cauca. There was a reduction of 18% in the seizures of cannabis as compared to the previous year.

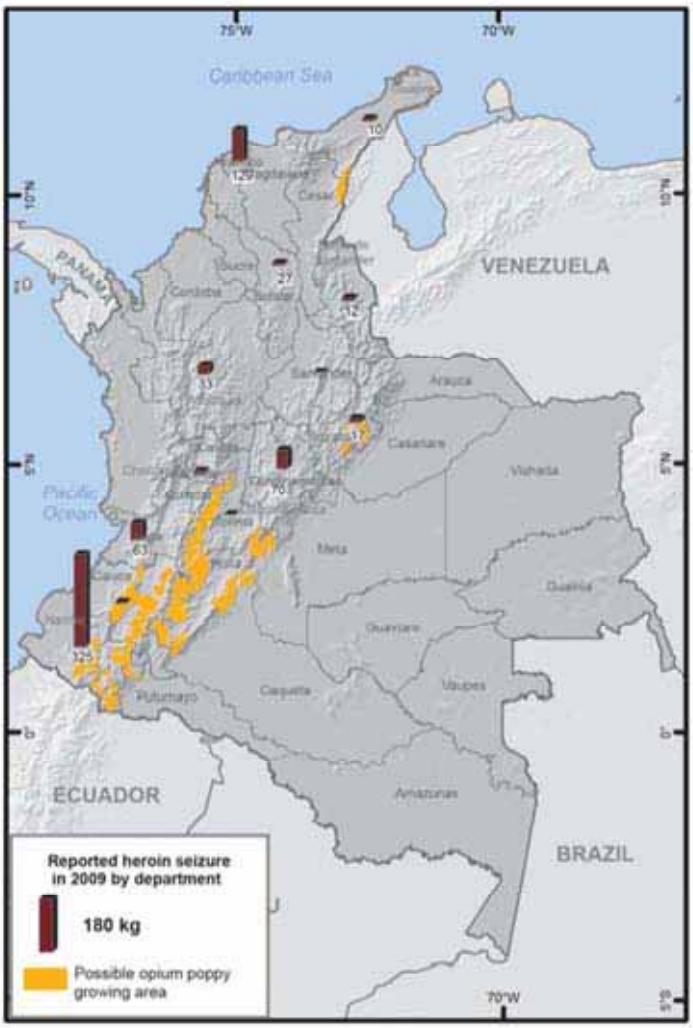
Table 43.Illegal laboratories destroyed by department and by drug type, 2009

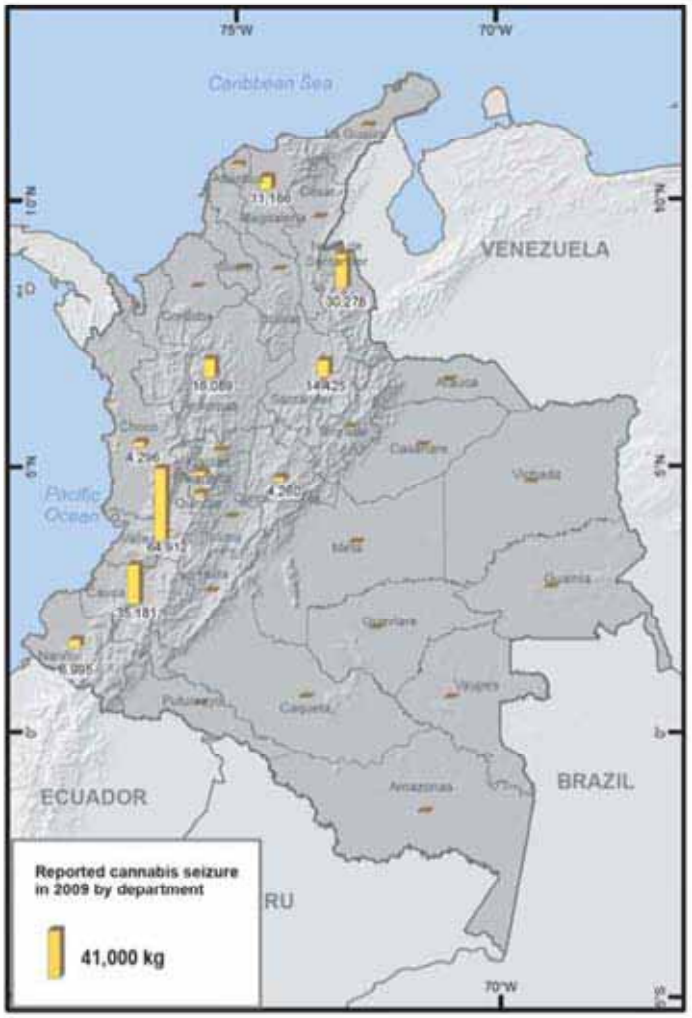
Department	Pasta/base laboratories destroyed	Cocaine laboratories destroyed "*cristalizaderos*"	TOTAL
Amazonas	21		21
Antioquia	514	39	553
Arauca	19		19
Atlantico	2	2	4
Bogota	0	1	1
Bolivar	49	9	58
Boyaca	39	8	47
Caldas	10	1	11
Caqueta	130	2	132
Casanare	9	2	11
Cauca	142	49	191
Cesar	6	9	15
Choco	26	3	29
Cordoba	26	8	34
Cundinamarca	14	3	17
Guainia	24		24
Guaviare	197	1	198
Huila	4		4
La guajira	1	1	2
Magdalena	11	7	18
Meta	214	8	222
Nariño	453	48	501
Norte de Santander	106	49	155
Putumayo	299	1	300
Risaralda	3	2	5
Santander	47	6	53
Tolima	0	1	1
Valle del cauca	60	14	74
Vichada	134	4	188
Total	**2,610**	**278**	**2,888**

Source: DNE

Drug seizures by department and by drug type, Colombia 2009







Source: Government of Colombia, for coca cultivation National monitoring system supported by UNODC, for drug seizures: Colombia Drug Observatory DNE.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

Table 44.Seizures of illicit drugs, 2002-2009

Drug	Unit	2002	2003	2004	2005	2006	2007	2008	2009
Coca leafs	Kg	638,000	688,691	567,638	682,010	818,544	1,064,503	644,353	826,793
Coca paste	Kg	974	2,368	1,218	2,651	5,451	922	5,001	11,400
Coca base	Kg	22,615	27,103	37,046	106,491	42,708	33,882	49,663	41,634
Cocaine	Kg	95,278	113,142	149,297	168,465	127,326	126,641	198,366	203,166
Opium latex	Kg	110	27	57	1,632	118	125	172	49
Morphine	Kg	21	78	39	93	27	8	-	1
Heroin	Kg	775	629	763	745	442	537	646	728
Marihuana	Kg	76,998	108,942	151,163	150,795	93,745	142,684	254,685	206,811
Synthetic drugs	Unit	175,382	5,042	19,494	148,724	7,888	1'968,857	5,597	132,987

Source: DNE

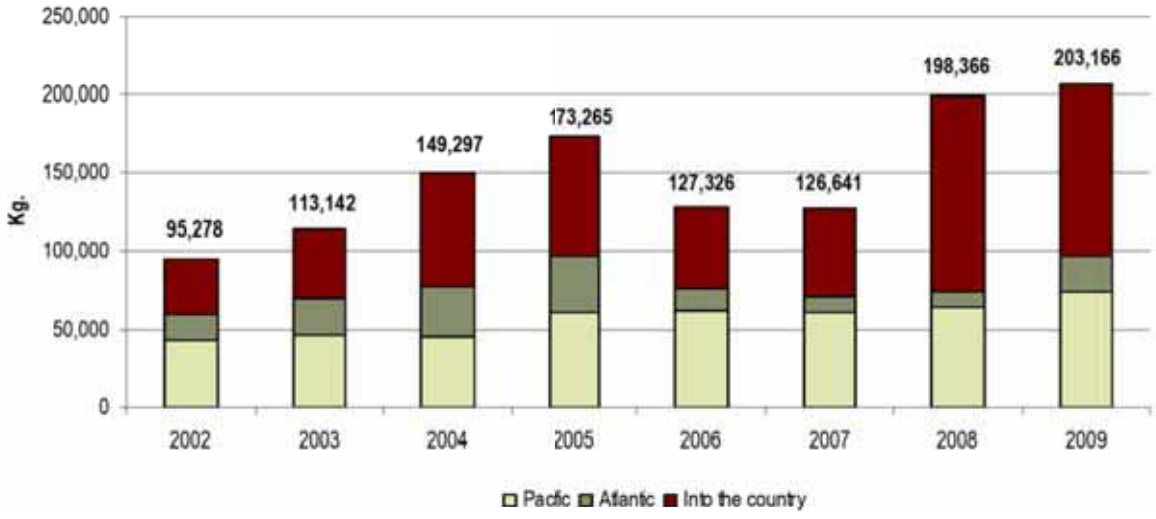
Table 45.Seizures of cocaine in the Pacific and Atlantic routes (Kg), 2002-2009

	2002	2003	2004	2005	2006	2007	2008	2009	Seized %
Pacific	43,435	47,137	46,128	61,042	61,758	61,423	64,467	74,617	77%
Atlantic	16,065	23,157	30,928	35,856	14,150	9,235	10,157	22,783	23%
Total seizures at sea	59,500	70,294	77,056	96,898	75,908	70,658	74,644	97,400	100%
Total seizures (land and sea)	95,278	113,142	149,297	173,265	127,326	126,641	198,366	203,166	
% seizures at sea	62%	62%	52%	56%	60%	56%	38%	48%	

Note: 20 semi-submersibles were neutralized in 2009. Source: Colombian Navy, Intelligence Division.

Out of a total of 206.8 metric tons of cocaine seized in 2009, 97.4 tons or 47% were seized at sea or in maritime ports; the Pacific Ocean is still where the greatest seizures have taken place.

Figure 30: Seizures of cocaine in Colombia, in maritime ports, at sea and in land, 2002 – 2009



Source: National Navy

Table 46.Seizures of illicit drugs by departments, 2009

Department	Coca leaf	Coca paste	Coca base	Cocaine	Latex	Heroin	Pressed marihuana	Amphetamines	Ecstasy	Royphnol
	Kg	Kg	Kg	Kg	Kg	Kg	Kg	Unit	Unit	Unit
Amazonas	850	1,204	21	11	-	-	18	-	-	-
Antioquia	78,512	47	4,141	27,507	-	33	16,089	-	92	3,791
Arauca	7,551	-	48	39	-	-	8	-	-	-
Atlantico	-	-	62	3,265	-	129	2,501	-	263	-
Bogota D.C	-	-	25	2,126	-	51	3,982	103,051	513	22
Bolivar	35,694	80	799	12,934	-	10	751	-	98	-
Boyaca	1,626	-	226	1,063	-	17	227	-	117	-
Caldas	1,325	-	132	5	-	-	1,740	-	307	-
Caqueta	24,763	398	2,796	482	-	-	314	-	-	-
Casanare	-	-	317	60	-	-	11	-	-	-
Cauca	120,349	1,898	2,663	6,449	-	7	35,181	-	-	24
Cesar	735	-	166	653	-	-	520	-	6	-
Choco	2,126	5,976	1,299	26,636	-	-	4,296	-	-	-
Cordoba	6,235	-	355	8,120	-	-	111	-	13	-
Cundinamarca	2,627	-	83	1,449	-	19	278	-	49	-
Guainia	300	1	2	-	-	-	5	-	-	-
Guaviare	44,000	4	1,830	10	-	-	84	-	-	-
Huila	13	-	719	21	-	-	312	-	20,000	-
La guajira	25	-	2	8,093	-	10	1,818	-	-	-
Magdalena	2,647	39	464	6,061	-	-	11,666	-	4	-
Meta	96,725	20	2,096	819	-	-	1,271	-	-	-
Nariño	190,912	1,170	5,215	55,556	48	352	6,995	-	9	-
Norte de Santander	42,335	43	3,552	8,077	1	12	30,276	-	-	-
Putumayo	70,350	183	3,134	1,732	-	-	286	-	-	-
Quindio	-	-	47	29	-	3	2,833	-	120	-
Risaralda	-	-	164	131	-	14	5,122	-	791	-
San Andres	-	40	-	3,030	-	-	176	-	-	-
Santander	25,059	52	985	513	-	4	14,425	30	965	1,440
Sucre	-	-	7	899	-	-	238	-	-	-
Tolima	1,024	244	18	303	-	4	357	-	35	-
Valle del Cauca	9,685	1	1,404	26,667	-	63	64,912	15	95	1,137
Vaupes	-	-	-	-	-	-	4	-	-	-
Vichada	61,325	-	8,862	426	-	-	4	-	-	-
Total	**826,793**	**11,400**	**41,634**	**203,166**	**49**	**728**	**206,811**	**103,096**	**23,477**	**6,414**

3. METHODOLOGY

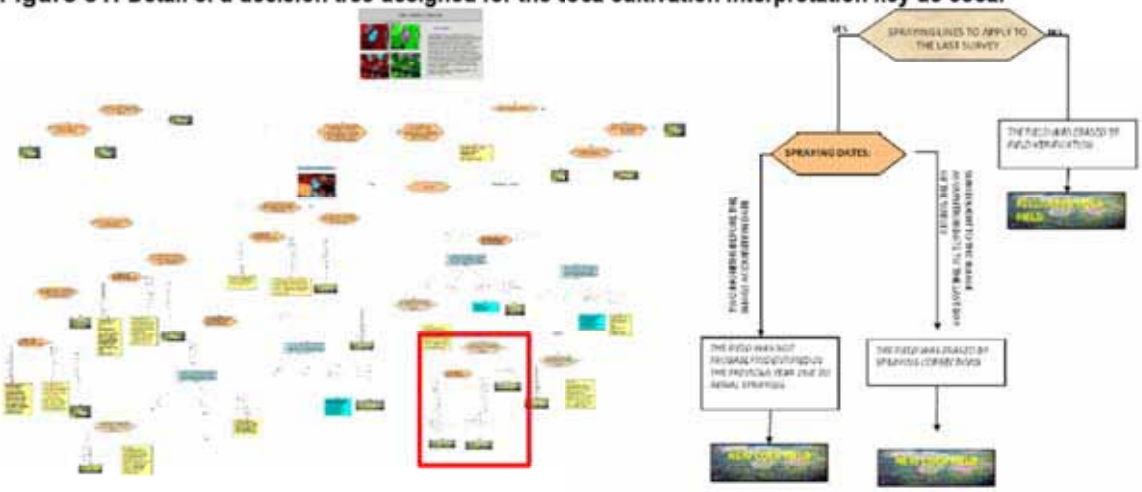
3.1 Coca Cultivation

The monitoring of coca cultivation in Colombia is based on the interpretation of several types of satellite images. For the 2009 survey, the project analyzed a total of 64 LANDSAT 7 ETM images; 12 LANDSAT 5 TM images; 7 ASTER images and 10 ALOS images; all these were taken between August 2009 and February 2010. The images cover the entire national territory (1,142.000 km^2), except the islands of San Andres and Providencia.

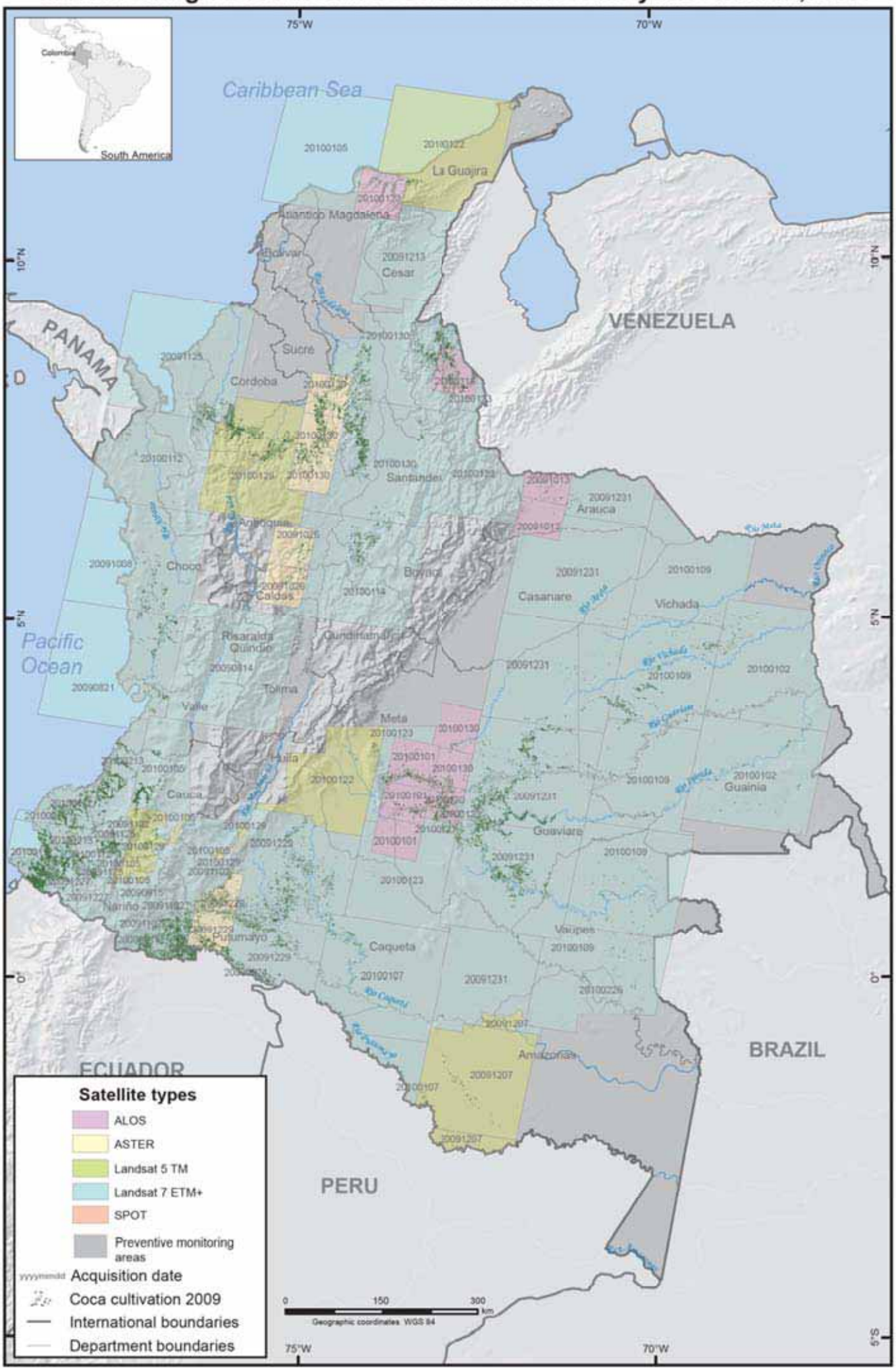
In September 2005, the Natural Resources and Applied Sciences Institute of the BOKU University of Vienna (Austria) did a technical evaluation of the methodology developed for the measurement of coca cultivation. The Institute concluded that the methoddogy is appropriate and praised the work of the team of experts in remote sensors that does the interpretation of the satellite images. In addition, the Institute gave particular recommendations about the use of aerial photography for the quality control of the interpretation that started in 2008 on two pilot areas in the departments of Meta and Antioquia.

The project developed decision trees for the interpretation of coca cultivation in satellite images with the support of the BOKU University in three regions: Meta-Guaviare, Putumayo-Caqueta and Cauca-Nariño. The object is the documentation of the process carried out to qualify a field as coca cultivation with all the possible variations within the dynamics of every region (see figure 31).

Figure 31: Detail of a decision tree designed for the coca cultivation interpretation key de coca.



Satellite images used for the coca cultivation survey in Colombia, 2009



Source: Government of Colombia - National monitoring system supported by UNODC
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

The estimate of the total area with coca cultivation in Colombia in 2009 is the result of the following processes:

1. Identification and acquisition of satellite images: One of the main difficulties in the acquisition of images is the frequent cloudiness on Colombian territory. For this reason, a permanent monitoring is kept of the passing of satellites in the search of images that provide information about cloudy areas.

The LANDSAT 7 ETM+ data are collected in 6 spectral bands with a spatial resolution of 30 meters, a thermal with a spatial resolution of 60 meters and an additional panchromatic band with a spatial resolution o 15 meters. The satellite has a repetition cycle of 16 days, which increases the possibilities to get images free from clouds. Its band width of 185 Km is appropriate for regional studies. Since May 2003 there have been flaws in the LANDSAT 7 ETM+ Scanning Lineal Corrector (SLC). These flaws produce information losses in the image calculated in 16 %, which gradually reduce towards the centre of the scene.

The LANDSAT 5 TM images have the same characteristics as those of LANDSAT 7 ETM+; the difference is that LANDSAT 5 TM does not have flaws in the scanning corrector, so the images do not have gaps.

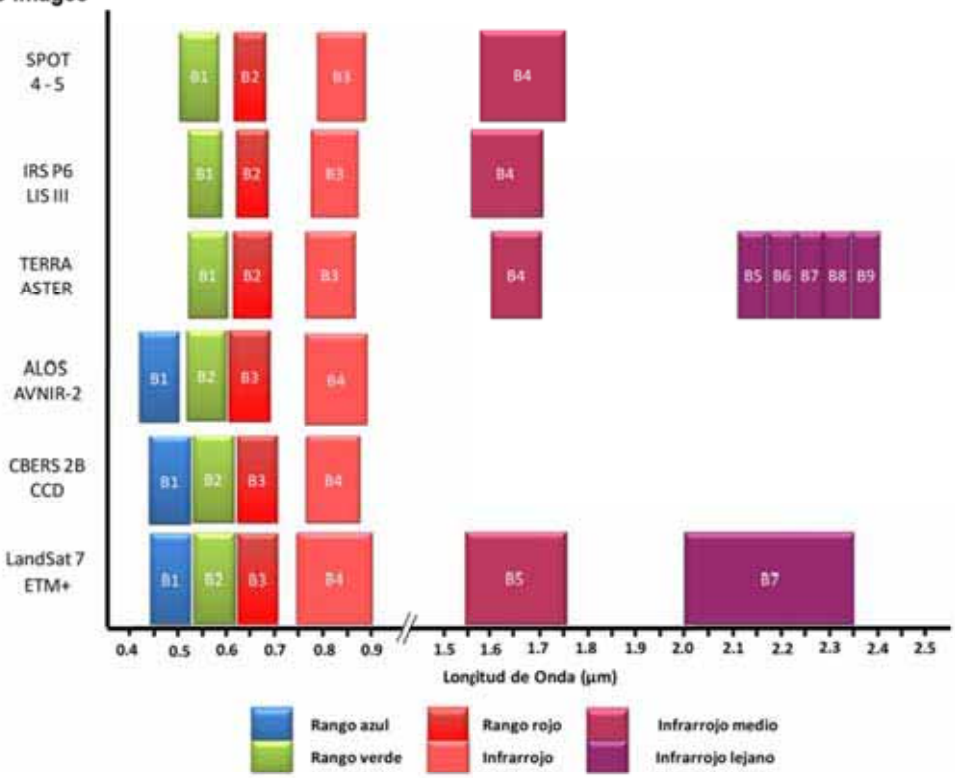
The ASTER images captured 14 spectral bands with a spatial resolution that varies between 15 and 90 meters. Since 2008, the bands 4 to 9 have not been available due to failure in the sensor; currently only the green and red bands with 15 meters of resolution and the close infrared with 30 meters of resolution are useful. This implies that the spectral information capturing range is smaller than in the original images. The image has a band width of 60Km with a repetition cycle of 16 days.

The images of the AVNIR-2 spectral sensor on the Advanced Land Observation Satellite -ALOS have 4 bands and a spatial resolution of 10 meters with a scanning width of 70 km. These are comparable in spectral resolution to CBERS and to the first four bands of LANDSAT.

Table 47.Satellite images used for the 2009 survey in Colombia

Sensors	% 2001	% 2002	% 2003	% 2004	% 2005	% 2006	% 2007	% 2008	% 2009
LandSat 7 ETM+	92	99	82	94	92	89	89	95	69
LandSat 5 TM									13
SPOT 4 and 5	8	1	2	1	5	3	3	4	
ALOS	-	-	-	-	-	-	3	1	11
ASTER			16	5	3	5	5	-	7
IRS6 – LISS III	-	-	-	-	-	3	-	-	
Total	100	100	100	100	100	100	100	100	100

Figure 32: Spectral comparison between bands of SPOT, ASTER, IRS, LISS III, LANDSAT, ALOS and CBERS images



2. Pre-processing of images

2.1. Geo-reference

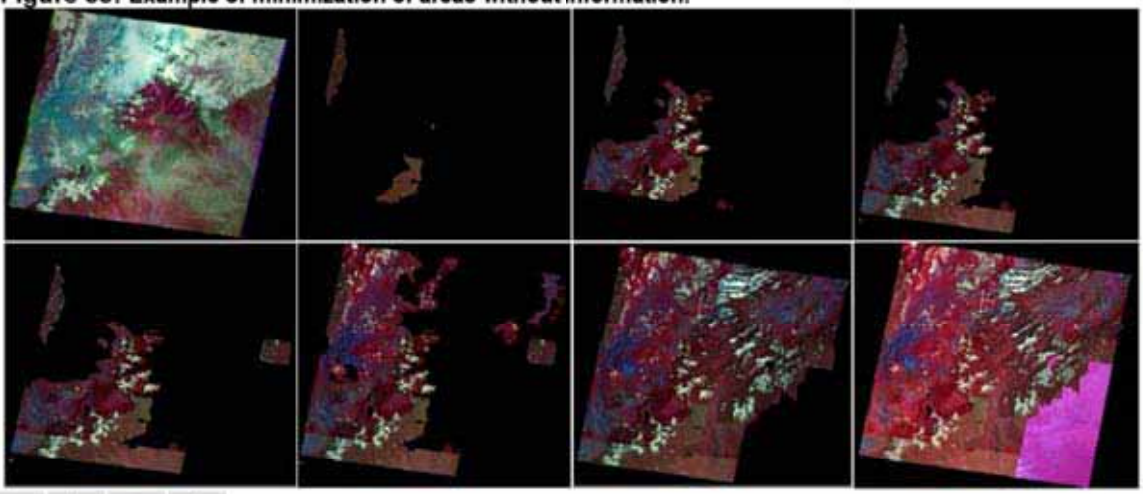
To use spectral and spatial information together with other spatial data available (i.e. digital elevation models) the data of the images need to be in the same map coordinate system. The satellite images are georeferenced by means of mosaics built with the images from previous surveys that are less cloudy, adjusted and put together.

2.2. Minimization of areas without information

The constant presence of clouds in the Colombian territory makes it difficult to get clear images; to minimize this loss of information, a permanent monitoring of the images captured by the different satellites is done, so as to replace cloudy images with clear images from other satellites; every segment of image used is analyzed as an individual image and this enables a better coverage of areas of interest.

The minimization of areas without information corresponding to the gaps in the Landsat 7 ETM+ Slc-off, are adjusted in a similar way to those with clouds; in this case, images free of gaps or Landsat images of different dates with overlapped gaps are used.

Figure 33: Example of minimization of areas without information.



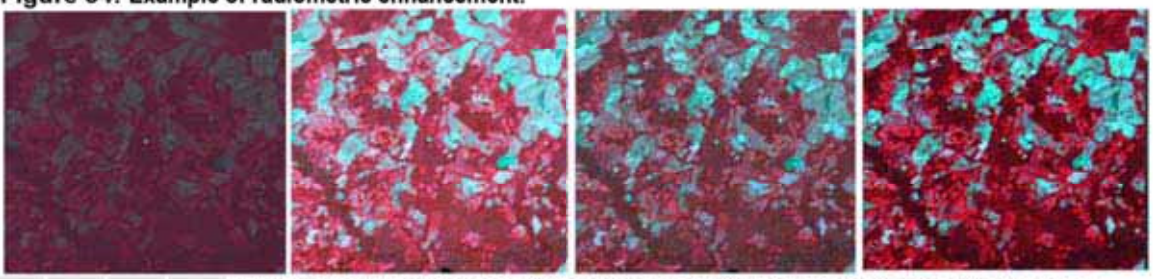
a	b	c	d
e	f	g	h

From a Landsat 7 ETM+ image (a) and by selecting and adding information available in other 5 Landsat images (c, d, e, f and g) and 2 ASTER images (h), a complete image is built (h).

2.3. Radiometric and spatial enhancements

Radiometric enhancement is aimed at improving the spectral contrast of the data to facilitate and optimize visual interpretation.

Figure 34: Example of radiometric enhancement.

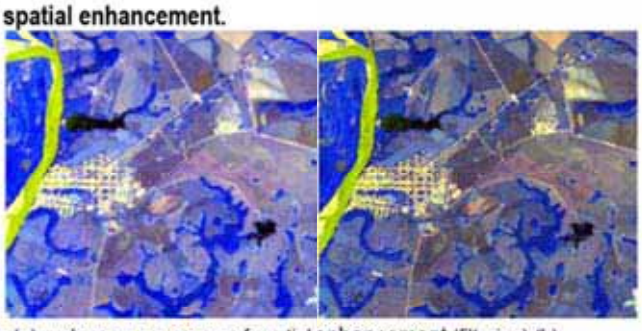


a	b	c	d

The original data (a) undergoes different processes of highlighting of brightness and contrast (b, c, and d)

To enhance the spatial characteristics of an image, several filters are used to modify the value of the pixels, using the values of the neighbour pixels; the function of this process is to highlight lineal elements as hydrographical and road nets that are present in the image.

Figure 35: Example of spatial enhancement.



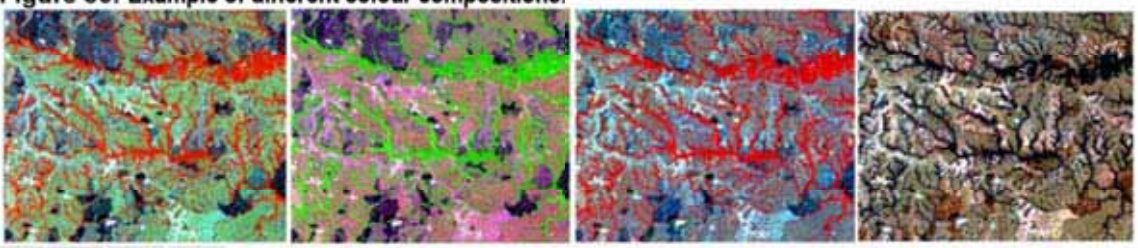
a	b

The original data (a) undergoes a process of spatial enhancement (filtering) (b)

2.4 Colour compositions

The multi-spectral images capture information in several ranges of the electromagnetic spectrum. In this way, it is easy to use them either in gray scale or in colour combinations by assigning bands. The selection of which range of the spectral information captured is charged in each channel will depend on the objective of the interpretation, since different compositions will highlight certain characteristics or data on the image.

Figure 36: Example of different colour compositions.



a b c d

From one Landsat 7 ETM+ image, some of the colour compositions used: (a) RGB(4,5,3), (b) RGB(5,4,3), (c) RGB(4,3,7) and (d) RGB(7,3,2).

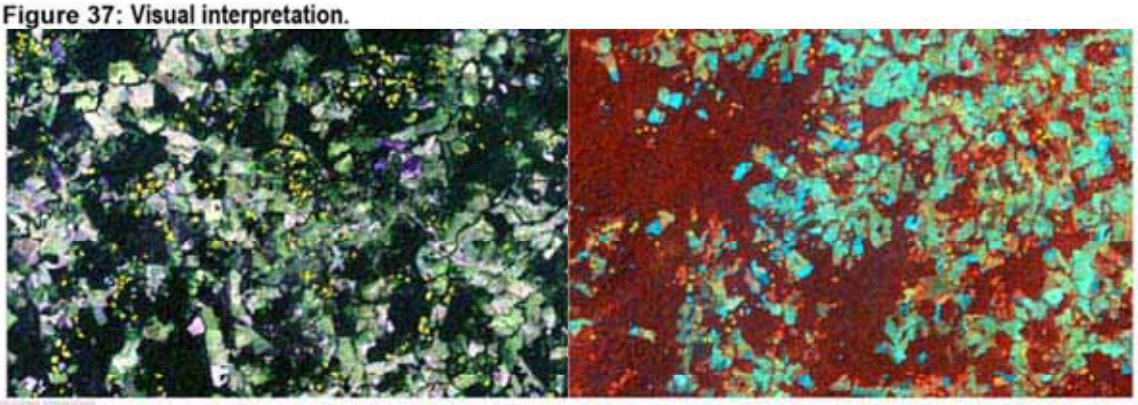
3. Visual interpretation of coca fields

The characteristics of the Colombian territory make it impossible to establish a fixed crop calendar; this, together with the spectral characteristics of coca cultivation that overlaps with other vegetable cover along its different phenological states, does not allow a supervised classification to get coca cultivation. The identification of coca fields is based on the visual interpretation of the satellite images, according to: spectral characteristics, interpretation elements (tone, shape, texture, and pattern), geographic surrounding and specific characteristics of the area. The class 'coca' in all its states can be considered to be a composition of areas where high and low leaf density are mixed, characterized by high reflectivity of the land; thus, the spectral response of coca fields is within a wide scope.

The interpretation of coca fields comprises three stages:
1- Preliminary interpretation of coca cultivation
2- Verification overflights
3- Edition.

3.1 Preliminary interpretation of coca cultivation
The process of preliminary visual interpretation is based on elements mentioned before: the analysis of the historical series of coca and of secondary information such as aerial pictures, information provided by different government agencies and United Nations, information on aerial spraying and manual eradication.

Figure 37: Visual interpretation.



a b

Coca fields visually interpreted (yellow outline) in ALOS - AVNIR 2 image; colour compositions: Natural RGB (3,2,1) (a) and False colour RGB (4,3,2) (b).

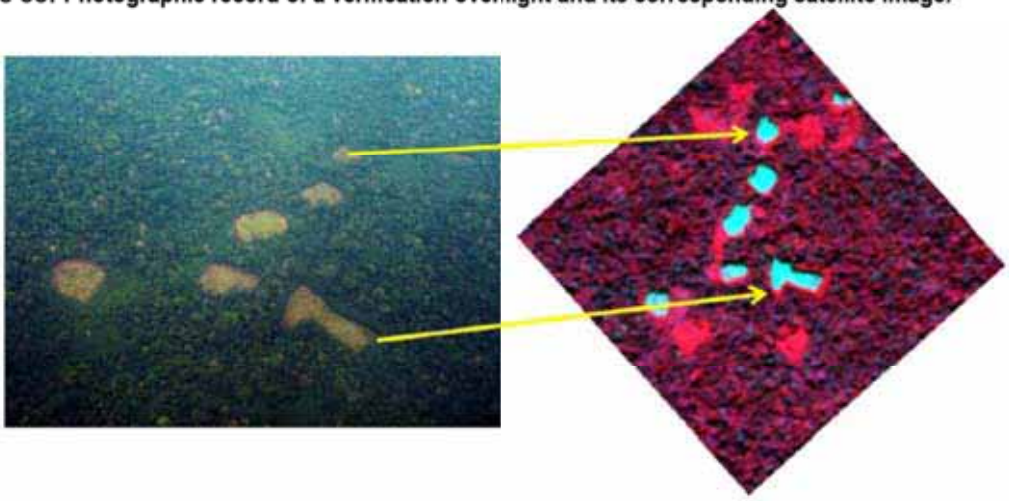
3.2 Verification overflights
Verification overflights are required to validate and adjust the interpretation. This verification is based on the direct visual inspection of the field from an aircraft. Graphic outputs of the satellite images (scale 1:70,000) are used as orientation and as a record of the verification where coca fields and cultivation nucleuses have been identified as well as other land covers.

In addition to the visual inspection from the aircraft, a digital camera, combined with GPS and a video camera is used for additional information to compare with the fields that have been detected in the preliminary analysis.

3.3 Edition

The information collected in the verification overflights is used to adjust the preliminary interpretation considering the moment in which the images were taken; once the adjustment is done, the coca cultivation interpretation file is ready. In the same way, an edition process is done on secondary information.

Figure 38: Photographic record of a verification overflight and its corresponding satellite image.



Study area distributed by region and coca cultivation in Colombia, 2009

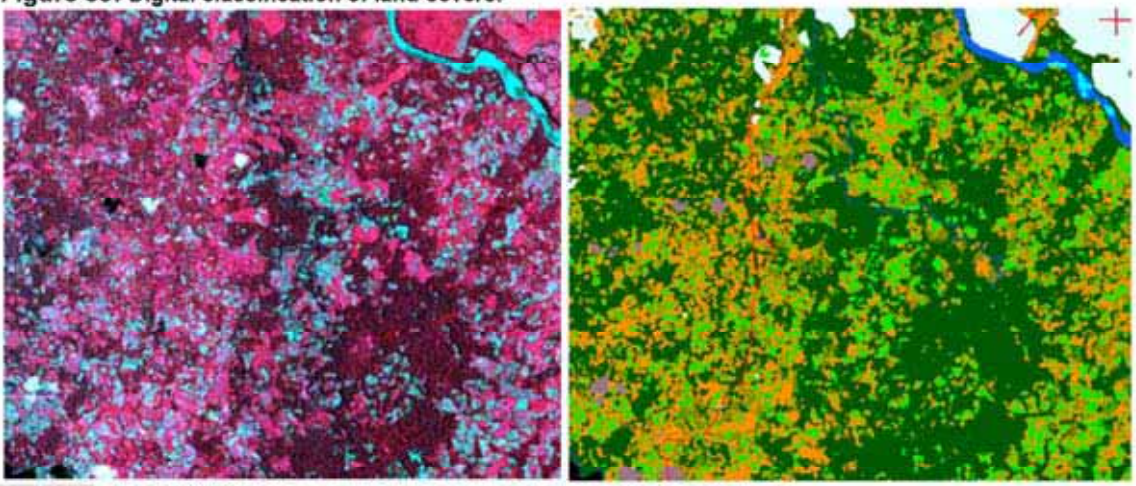
Sources: Government of Colombia, for coca cultivation National monitoring system supported by UNODC; for 1:100.000 grid IGAC.
The boundaries and names shown and the designations used in this map do not imply official endorsement or acceptance by the United Nations

4. Digital classification of the covers of land use and vegetation

Besides from coca cultivation other land covers are interpreted in the coca regions, according to the legend adopted by the project. These covers are used to do the annual multi-temporal analysis whose objective is to determine the dynamics of coca cultivation with regards to other covers.

This process is done by means of a supervised classification, in which the known land cover pixels are used in training areas to classify all the pixels of the image; the algorithm used is that of maximum plausibility used by a probabilistic model in the formulation of pixel valuation rules. In this process, 12 classes of the established legend are obtained: Primary forest and rainforest, secondary forest, grasses and low stubble, high stubble, naked lands, other cultivation, rocky outcrops, sandbanks, flooding zones, clouds and gaps; this does not include: water bodies, roads or urban areas that are lineal covers or coca cultivations that are managed differently.

Figure 39: Digital classification of land covers.



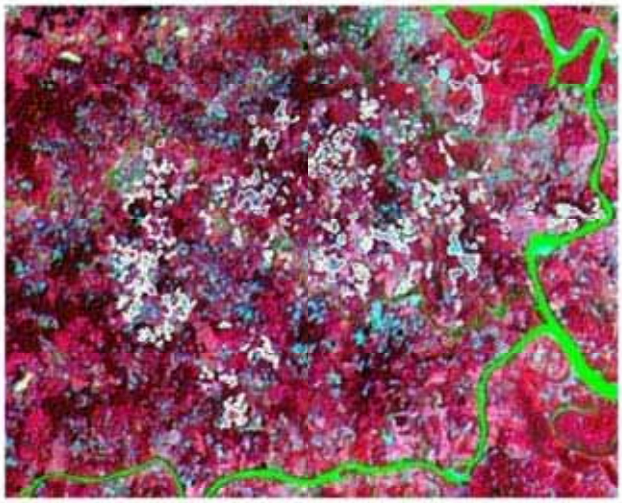
a **b** SPOT RGB (3,2,1) image (a) and its corresponding land cover classification (b).

5. Corrections

The interpretation of satellite images is complemented with the application of a series of corrections that enhance the data and reduce the error associated to lack of information and differences between the date of the image and the survey cut-off date.

5.1 Correction for forced manual eradication

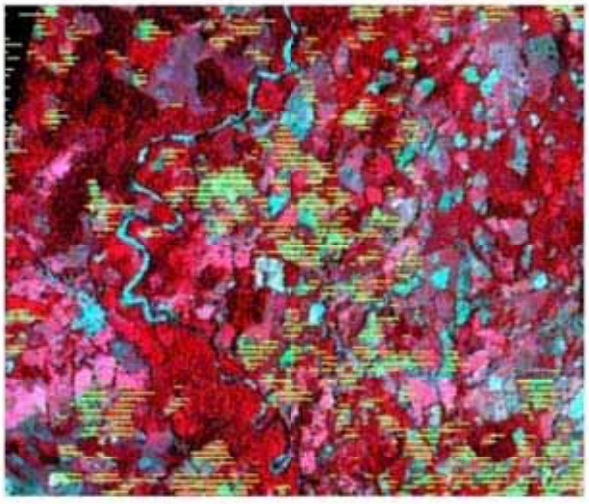
As part of the coca eradication activities, coca fields are manually eradicated and their coordinates are recorded and reported to UNODC. Then, the corresponding corrections are done, depending on the image and the eradication dates. If the eradication took place before the image was taken and before the survey cut-off date, the eradicated fields are not considered in the interpretation. When the eradication takes place after the image was taken, the coca fields that appear in the coordinates reported are deleted from the interpretation, given that these do not exist anymore on the survey cut-off date.



Manually eradicated coca fields (after the date of the image) in white.

5.2 Corrections for aerial spraying

Coca fields are sprayed from aircrafts as part of the illicit cultivation aerial spraying programme. The spraying lines are automatically recorded. After translating these coordinates into the satellite images coordinate system, a buffer is drawn around the recorded spraying line, according to the type of aircraft. The buffers are overlapped on the coca cultivation interpreted and the corrections are applied considering the image and the spraying dates. All coca fields interpreted in images taken before the spraying are deleted from the interpretations and the estimate survival percentage of the sprayed cultivation is added to the final statistics. According to the DIRAN, the survival rate in 2009 was 10%.



Coca fields with spraying lines in yellow.

5.3 Corrections for cloudiness and gaps in LANDSAT 7 images (SLC-off)

Clouds and shadows are reduced to the maximum possible using several images of the same area and building mosaics that reduce the area that is lacking information. In 2009, an effective coverage of 88% was achieved. This means that from all the area affected by the presence of coca cultivation, only 12% had restrictions due to lack of information; this percentage is strongly concentrated in the departments of Nariño, Cauca, Valle del Cauca and Choco.

To correct the effect of areas where it is definitely impossible to get satellite images, these areas are delimited during the process of land cover classification. Then, one-kilometre buffers are drawn around the clouds on the images and the coca cultivation is measured around this buffer. By comparison with the cultivation of the previous survey, the trend of coca cultivation under the buffer area is calculated. This trend is applied to the area under coca cultivation detected in the previous survey below the cloud in the current survey to estimate the area under coca cultivation below the clouds. The position and size of the

coca fields identified in the previous survey under the clouds or gaps of the current images are maintained when the trend shows an increase in the surrounding area.

In the 2009 survey, the corrections for the LANDSAT 7 gaps were treated as corrections for cloudiness. The only difference is that the buffers were 300 meters instead of 1000 meters. Both for clouds and gaps, the width of the buffer was determined by a heuristic model.

5.4 Corrections of differences in the images acquisition dates

In the satellite image, only the fields that were present on the date the image was taken can be observed. Hence, a correction factor must be applied to get the estimates for 31 December. This factor is calculated as a monthly increasing or decreasing rate, according to the coca cultivation trend in the images of the same area used in consecutive surveys. This rate is then applied to the initial interpretation for the number of months between the date when the image was taken and 31 December to calculate the area under coca cultivation that must be added or subtracted from the final statistics.

Table 48. Corrections applied to get the final result of the 2009 survey

	Area (in hectares)	% of the initial result
Initial results	58,634	86.2
Correction of cloudiness and gaps	6,177	9.1
Correction of survival after aerial spraying	2,843	4.2
Correction due to differences between image dates	371	0.5
Total	**68,025**	100

Accuracy assessment

The assessment of the accuracy of the interpretation results is part of quality control. This assessment has two aspects: geometric accuracy, which is the precision of the interpreted boundaries or size of the land cover units and the thematic accuracy that measures the reliability of the land cover classes.

Currently the images are georeferenced on the basis of the georeferenced mosaic. In the case of LANDSAT 7 ETM+ images, there may be a maximum position deviation of 1/10 of elevation difference in mountainous areas. During the revision of the methodology, the Institute of Natural Resources and Applied Sciences of Vienna (Austria) recommended to ortho-rectify the images with an Elevation Digital Model to increase the geometrical accuracy to less than 1.5 pixels; this process is under evaluation with the assistance of the Agustin Codazzi Geographic Institute for its application in the 2010 survey.

The general thematic quality is specified in terms of an error matrix, according to the frequency (probability) of wrongly classifying the different land covers. The compilation of the error matrix must be based on a random representative sample. The reference information is difficult to collect in field due to security reasons.

Although thematic quality is a good indicator of the interpretation quality, it does not provide a range of results and hence cannot be used to correct the results.

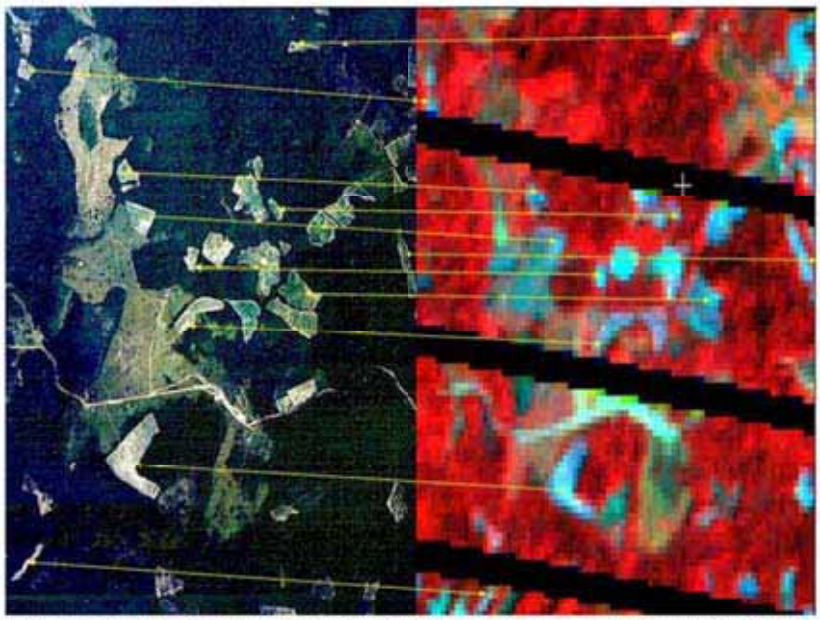
According to the recommendations of the Natural Resources and Applied Sciences Institute of Vienna, the project is developing the methodology for the accuracy assessment based on the aerial photography and field verification required to correct bias in the interpretation.

The project got medium scale true colour aerial photographs taken by a private company hired in January 2008 in the surroundings of Vistahermosa (Meta) and Caceres (Antioquia) to compare the results of the interpretation of the coca fields in the aerial photographs with the results of the interpretation of LANDSAT 7 and ALOS satellite images taken in similar dates and used in the 2007 survey.

Although the results in the Meta and Antioquia test areas are not representative of the entire survey, some conclusions have been made: field verifications notably improve the interpretation and the experience of

the interpreter in a specific region have a positive effect on the final result. Although the area measurements show a compensation effect both in geometrical and thematic quality, the data show the need to go further in the process of adaption of the interpretation methodology to the new challenges brought by the use of images different from Landsat. For this purpose, the project has implemented pilot studies with DEIMOS, RAPIDEYE and ALOS images. The difficulty to get accurate ground truth data is still the main barrier for the quality assessment of the interpretation.

The results of this study are the first approach to the intention of measuring the accuracy of the coca cultivation interpretation in satellite images by referring to the interpretation aerial photography in big scale and then continue with the adequate statistical design for its expansion to the survey.



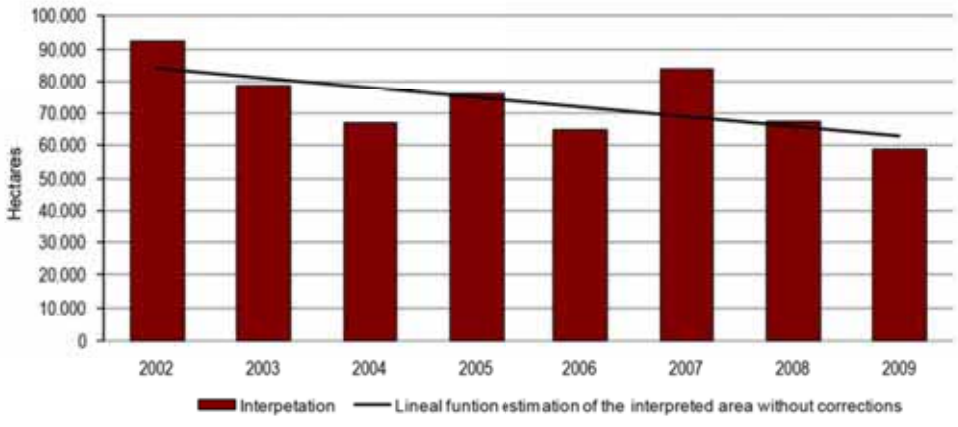
a b *Comparison of the interpretation of coca fields (outlined in yellow) in aerial photography (a) and in satellite image (b).*

Appendix 1: Correction in hectares of cloudiness, gaps, aerial spraying and image dates in 2009

Department	Interpretation (has)	Corrections (has)				Total 2009	Participation of corrections in the total area %
		Cloudiness	Gaps in satellite images	Survival after aerial spraying	Image dates		
Amazonas	265	10	0	0	2	277	4
Antioquia	3,870	473	2	180	29	4,554	15
Arauca	424	4	0	0	-10	418	1
Bolivar	4,657	0	33	69	18	4,777	3
Boyaca	155	20	0	5	2	182	15
Caldas	111	40	0	16	-1	166	33
Caqueta	3,548	21	123	55	12	3,760	6
Cauca	5,744	477	9	134	-221	6,144	7
Choco	1,463	388	0	0	-185	1,666	12
Cordoba	2,607	65	78	11	21	2,782	6
Guainia	352	0	47	126	12	538	35
Guaviare	8,330	0	40	8	-54	8,323	0
La Guajira	165	0	0	1	-3	163	1
Magdalena	131	0	0	0	20	151	13
Meta	4,217	10	15	17	36	4,295	2
Nariño	9,669	3,645	88	2,180	845	16,428	41
Norte de Santander	2,722	17	12	10	-47	2,714	0
Putumayo	5,302	18	95	18	-116	5,316	0
Santander	867	29	9	6	42	953	9
Valle del Cauca	586	336	14	0	-8	929	37
Vaupes	330	4	8	0	9	351	6
Vichada	3,122	0	45	6	-34	3,139	1
TOTAL	**58,634**	**5,557**	**620**	**2,843**	**371**	**68,025**	**14**

Figure 40 shows the area under coca cultivation interpreted in the satellite images and their trends without the corrections applied to calculate the country total.

Figure 40: Interpretation of coca cultivation without corrections, 2002 -2009



The amount of corrections applied vary between 11% in 2005 with respect to the total of 86,000 hectares reported in the survey, to 17% in 2004, 2006 and 2008 with respect to the total hectares reported in the respective surveys. In 2009, there was a decrease as compared to the previous year, since the variation was 14% with respect to 68,000 hectares reported. Thus, there is no correlation between the value of the corrections and the amount of coca interpreted since the cloudiness and the gaps (which are the greatest deal of corrections) on coca cultivations is totally random and unpredictable.

Table 49.Historical series of corrections, 2004-2009

Year	2004	2005	2006	2007	2008	2009
Correction of cloudiness	3,990	1,942	5,554	4,941	7,358	5,557
Correction of gaps	7,163	4,420	2,864	3,416	2,604	620
Correction of differences in the dates	665	1,020	1,135	-917	391	371
Correction of aerial spraying	1,483	2,315	3,349	7,625	3,266	2,843
Total	13,301	9,697	12,902	15,065	13,619	9,391
Percentage/ survey	17	11	17	15	17	14
Area interpreted in hectares	67,049	76,053	64,968	83,888	67,334	58,634
Area reported in hectares	**80,000**	**86,000**	**78,000**	**99,000**	**81,000**	**68,000**

Appendix 2: List of satellite images used in teh coca survey, 2009

LANDSAT 7 ETM+		
PATH	ROW	Acquisition date (dd/mm/yyyy)
3	58	26/12/2009
3	59	26/12/2009
4	56	02/01/2010
4	57	02/01/2010
4	58	02/01/2010
4	59	02/01/2010
4	60	02/01/2010
4	61	02/01/2010
4	62	02/01/2010
4	63	15/11/2009
5	56	09/01/2010
5	57	09/01/2010
5	58	09/01/2010
5	59	09/01/2010
5	60	09/01/2010 - 26/02/2010
5	61	03/09/2009 - 19/09/2009
5	62	03/09/2009 - 06/11/2009
6	55	31/12/2009
6	56	31/12/2009
6	57	31/12/2009
6	58	31/12/2009
6	59	31/12/2009
6	60	31/12/2009
7	52	23/01/2010
7	55	23/01/2010
7	56	06/12/2009 - 23/01/2010
7	57	23/01/2010
7	58	23/01/2010
7	59	23/01/2010
7	60	07/01/2010
7	61	07/01/2010
8	53	13/12/2009
8	54	30/01/2010
8	55	30/01/2010
8	56	14/01/2010
8	57	29/12/2009 - 14/01/2010
8	59	29/12/2009
8	60	24/09/200/ -29/12/2009
9	52	05/01/2010
9	53	04/12/2009 - 05/10/2010
9	57	14/08/2009
9	58	05/01/2010
9	59	15/09/2009 - 02/11/2009 -05/01/2010
9	60	15/09/2009 - 02/11/2009
10	54	25/11/2009
10	55	12/01/2010
10	56	08/10/2009
10	57	21/08/2009
10	58	12/01/2010 - 13/02/2010
10	59	25/11/2009 - 27/12/2009 - 12/01/2010 -
TOTAL	64	

LANDSAT 5 TM		
J	K	Acquisition date (dd/mm/yyyy)
4	56	07/11/2009
4	61	07/11/2009
4	62	07/11/2009
5	61	14/11/2009
5	62	14/11/2009
6	60	07/12/2009
6	61	07/12/2009
6	62	07/12/2009
8	52	22/01/2010
8	58	22/01/2010
9	55	29/01/2010
9	59	29/01/2010
TOTAL	12	

ALOS	
PATH - No. CENTRE	Acquisition date (dd/mm/yyyy)
449-3460	13/10/2009
449-3470	13/10/2009
450-3530	30/01/2010
450-3540	30/01/2010
450-3550	30/01/2010
451-3540	01/01/2010
451-3550	01/01/2010
451-3560	01/01/2010
452-3430	18/01/2010
455-3380	23/01/2010
TOTAL	10

ASTER		
LATITUDE	LONGITUDE	Acquisition date (dd/mm/yyyy)
0.7°	- 76.2°	29/12/2009
1.2°	- 76.1°	29/12/2009
5.5°	- 75.2°	26/10/2009
6.0°	- 75.1°	26/10/2009
7.1°	-74.8°	30/01/2010
7.6°	- 74.7°	30/01/2010
8.2°	-74.6°	30/01/2010
TOTAL		7

Appendix 3: Adjustments on the historical series of cocaine production in Colombia.

The calculation of the volume of cocaine produced in Colombia is carried out by the measurement or estimation of four (4) production factors, namely: 1. Area under coca cultivation; 2. Yield of coca cultivation in terms of tons of coca leaf per crop; 3. Number of times that a field is cropped throughout one year; and 4. Efficiency in the transformation of coca leafs into cocaine chlorhydrate.

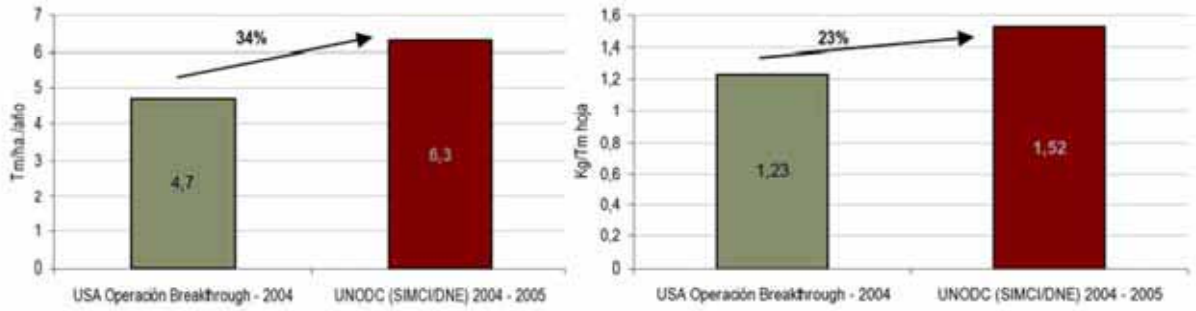
The first production factor (area under coca cultivation) is measured by SIMCI/UNODC by means of the annual coca cultivation survey carried out since 1999; the other production factors have only been measured by SIMCI/UNODC as from 2004. To calculate the cocaine production in Colombia the following sources were used:

Information sources for the calculation of the potential production of cocaine in Colombia

Period	Before 1999	Between 1999 and 2004	2004 - Currently
Area under coca cultivation	CICAD and United States State Department; report on the international strategy for narcotics prosecution	SIMCI Project - UNODC	SIMCI Project - UNODC
Yield per crop		CICAD and United States State Department; report on the international strategy for narcotics prosecution	
Number of crops per year			
Efficiency of primary transformation			
Efficiency of secondary transformation			United States State Department

One of the findings in the studies carried out by SIMCI in 2005 was an important increase in the yield and the number of crops as compared to the data that had been used up to that moment; in fact, it was determined that the capacity to produce coca leaf was 34% more than the estimate to that date. Likewise, it was found that the transformation efficiency was 23% higher than what they had been using.

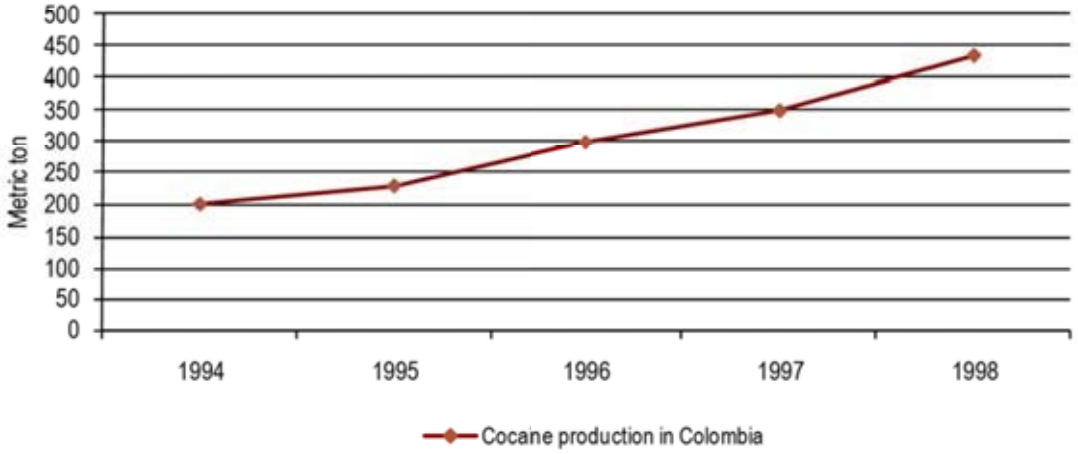
Figure 41: Variation in the production and transformation efficiency found by UNODC in 2005.



With the purpose of evaluating the new evidence available, experts from the ICMP, SIMCI – UNODC and the Colombian Government developed work boards that enabled the construction of possible data series besides the current one; wich offer more and better information to the users.

The proposed series are grouped in periods within which the data are comparable. For the joint construction of a complete series, the reader must take into account that there are methodological differences that limit the possibility to compare.

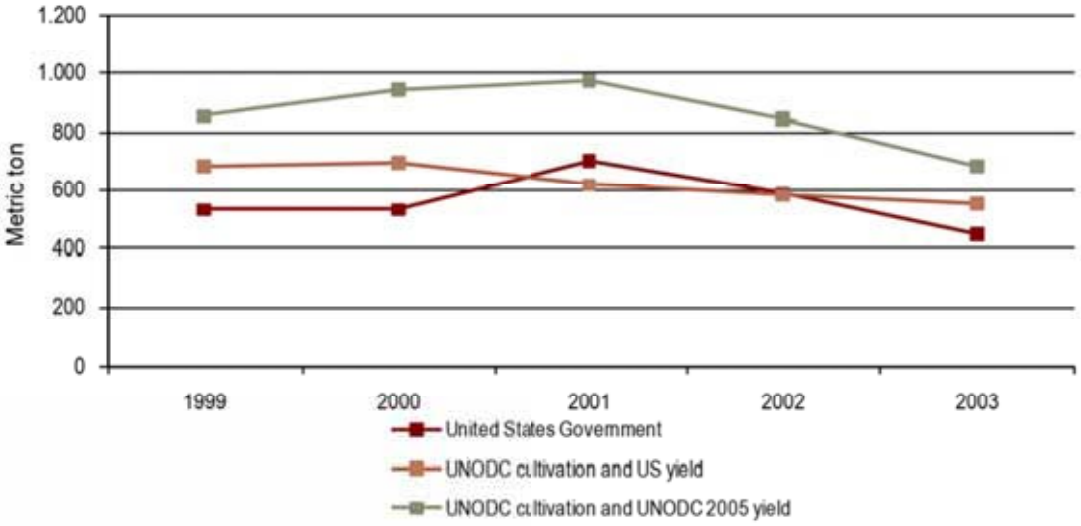
Figure 42: Cocaine production, 1994-1998



The series from 1994 – 1998 is based on data from the United States Government. UNODC did not have monitoring systems implemented in Colombia during that period.

In the period 1999 – 2003, UNODC did the monitoring of the area under coca cultivation but did not carry out studies on the capacity of those areas to produce coca leaf or on the conversion factors of coca leaf into cocaine chlorhydrate. For this reason, it is not possible to calculate a series for this period that is comparable with the data obtained after 2004. The following figure shows three different "possible" series.

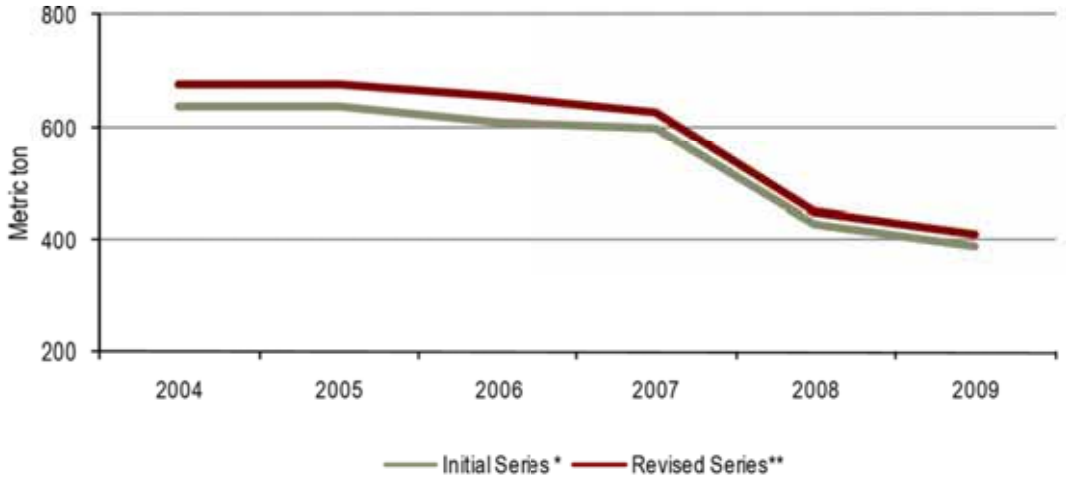
Figure 43: Estimate series of cocaine production, 1999 - 2003



The series "United States Government" reports the cocaine production published by the government of the United States using their own data, both in yield and in cultivated area. The series "UNODC cultivation – UNODC yield 2005" was calculated using area data reported by UNODC and cocaine yield estimated from a lineal overlap between the data reported by the Colombian Government in 2000 (5.8kg/ha) and the figure reported by UNODC in 2005 (8.2 kg/ha). Although these calculations are not comparable with the data subsequent to 2004, the reduction seen in the period 2001 – 2003 is additional to the one observed in the period 2004 – 2009.

As from 2004, UNODC publishes data of both the area under coca cultivation, and yield and efficiency of the coca leaf in the transformation into cocaine base.

Figure 44: Production of cocaine in Colombia, 2004 - 2009 (metric tons)



The estimate of cocaine production is based on data collected by UNODC on coca leaf production and efficiency in the primary transformation (coca leaf into cocaine base), and data collected by the United States government on efficiency in the secondary transformation (cocaine base into cocaine chlorhydrate), and purity of the cocaine base.

UNODC had been using a conversion rate of 1:09 of cocaine base into cocaine chlorhydrate, and a purity of 85% of cocaine chlorhydrate. These conversion rates were revised on the grounds of more detailed information on the average purity of the cocaine base (81%) and the conversion rate of cocaine base into cocaine chlorhydrate (1:1). The historical series as from 2004 was amended; the production of cocaine base in 2009 (501 m.t.) is equal to 410 metric tons of pure cocaine.

** For the initial series a conversión factor of 1 to 0.9 and purity level of 0.81 were used.*
*** For the revised series a conversión factor of 1 to 1 and purity level of 0.86 were used.*

Appendix 4: Coca cultivation in indigenous territories. 2009.

The cartography available on indigenous territories is from 2009, and it is issued by the Austin Codazzi Geographical Institute - IGAC; the delimitation of indigenous reservations and territories is done in Colomba by INCODER. The spatial crossing of the IGAC 2009 cartography with the coca buffers identified by SIMCI show the presence of 4,549 hectares of coca in 2009; this is 22% less than in 2008. The following table shows the area under coca cultivation in 2008 and 2009 per reservation.

INDIGENOUS TERRITORIES *	HECTARES IN 2008	HECTARES IN 2009
ADUCHE	25	11
AGUA NEGRA	15	9
AGUACLARA AND BELLA LUZ DEL RIO AMPARO	10	8
AGUANEGRA	13	20
AGUAS NEGRAS	2	1
ALBANIA	2	0
ALMORZADERO, SAN ISIDRO AND LA UNIÉN	3	4
ALTO DEL RIO MUGUINDO	0	2
ALTO LORENZO	9	5
ALTO ORITO	14	6
ALTO SINU. ESMERALDA CRUZ GRANDE E IWAGADO	72	203
ALTO UNUMA	257	330
ANGOSTURAS	3	7
ARARA, BACATÍ, CARURU AND MIRAFLORES	110	26
ARHAUCO DE LA SIERRA NEVADA	0	32
AWA DE CAÑAVERAL	19	19
BACHACO BUENAVISTA	4	9
BAJO GRANDE	5	0
BAJO RIO GUAINIA AND RIO NEGRO	0	2
BARRANCO CEIBA AND LAGUNA ARAGUATO	29	41
BARRANCO COLORADO	23	18
BARRANCON	4	1
BARRANQUILLITA	35	42
BELLA VISTA	9	8
BELLAVISTA AND UNION PITALITO RIO SIGUIRI SUA-DOCAMPADO	18	1
BLASIAKU	1	1
BUENAVISTA	26	16
CAICEDONIA	13	9
CALARCA	40	35
CALENTURAS	3	3
CALI-BARRANQUILLA	20	16
CALLE SANTA ROSA RIO SAIJA	136	117
CAMPO ALEGRE DEL AFILADOR	5	5
CAÑO JABON	0	1
CAÑO NEGRO	0	2
CAÑO OVEJAS (BETANIA- COROCITO)	1	1
CARPINTERO PALOMAS	12	12
CECILIA COCHA	1	2
CHAGPIEN	13	2
CHAGUI CHIMBUZA	12	10
CHARCO CAIMAN	7	8
CHIGUIRO	25	8
CHINGUIRITO MIRA	9	18
CHOCÓN	1	0
CHONARA BUENA	7	3
CIBARIZA	4	21
CONCORDIA	0	1
CONSARA-MECAYA	6	10
COROCORO	25	14
CUAIQUER INTEGRADO LA MILAGROSA	0	12
CUAMBI - YASLAMBI	0	8
CUASBIL - LA FALDADA	4	7
CUAYQUER DEL ALTO ALBI	81	44
CUCHILLA-PALMAR	0	4

INDIGENOUS TERRITORIES *	HECTARES IN 2008	HECTARES IN 2009
CUENCA MEDIA AND ALTA DEL RIO INIRIDA	191	111
CUMARAL-GUAMUCO	16	11
CUSUMBE-AGUA BLANCA	1	2
DAMASCO VIDES	6	5
DEARADE BIAKIRUDE	4	3
DOMINICO-DONDOÑO-APARTADO	30	9
EL CEDRO.LAS PEÑAS.LA BRAVA.PILVI	102	74
EL DESCANSO	3	0
EL ESPINGO	15	14
EL GRAN SABALO	100	109
EL HACHA	22	20
EL PORVENIR - LA BARRIALOSA	14	17
EL QUINCE	2	1
EL SANDE	52	128
EL TABLERO	4	6
EL TIGRE	17	18
EL TRIUNFO	14	1
EL VENADO	8	3
FLORES SOMBRERO	3	1
GABARRA-CATALAURA	5	9
GRAN ROSARIO	341	154
GUACAMAYAS MAMIYARE	1	0
GUACO BAJO AND GUACO ALTO	11	24
GUALCALA	4	7
GUELNAMBI-CARAÑO	4	6
HERICHA	2	6
HONDA RIO GUISA	9	12
HONDURAS	1	1
INDA ZABALETA	100	115
INFI	3	10
INTEGRADO EL CHARCO	7	36
JAIDEZAVI	8	0
JAI-DUKAMA	0	1
JIRIJIRI	1	1
KOGUI-MALAYO ARHUACO	176	90
LA AGUADITA	6	2
LA ASUNCION	9	5
LA CRISTALINA	2	2
LA FLORESTA - LA ESPAÑOLA	1	0
LA FLORESTA-SANTA ROSA-RIO SANQUIANGA	60	32
LA FLORIDA	4	0
LA FUGA	30	25
LA IGUANA	6	5
LA ITALIA	7	1
LA LLANURA	10	2
LA PAYA	3	1
LA SIBERIA	2	2
LA TEÓFILA	1	0
LA TURBIA	220	101
LA UNIÓN CHOCO - SAN CRISTOBAL	3	3
LA YUQUERA	28	35
LAGARTO COCHA	2	0
LAGOS DEL DORADO LAGOS DEL PASO AND EL ROMANSO	125	246
LAGUNA NIÑAL, COCUY, LOMA BAJA AND LOMA ALTA DEL CAÑO	0	2
LAGUNA TRANQUILA	5	9
LLANOS DE YARI (YAGUARA II)	0	1
LOS GUADUALES	5	4
MACUARE	35	50
MAIZ BLANCO	1	1
MANDIYACO	5	2

INDIGENOUS TERRITORIES *	HECTARES IN 2008	HECTARES IN 2009
MATICURU	1	1
MINITAS - MIRALINDO	1	14
MONOCHOA	7	3
MORRITO	0	1
MOTILON - BARI	32	109
MURCIELAGO ALTAVISTA	3	4
NIÑERAS	0	3
NUEVO HORIZONTE	5	2
NUKAK MAKU	40	6
NUNALBÍ ALTO ULBÍ	2	4
NUNUYA DE VILLAZUL	10	11
ORDO SIVIRU AGUACLARA	1	0
PAINA	0	1
PARTE ALTA DEL RIO GUAINIA	17	26
PAUJIL	6	0
PERANCHITO	0	3
PERANCHO	0	5
PIGUAMBI-PALANGALA	5	4
PIPALTA PALBI YAGUAPI	5	4
PLANADAS TELEMBI	3	25
PREDIO PUTUMAYO	701	253
PUADO, MATARE, LA LERMA AND TERDO	4	9
PUEBLO NUEVO-LAGUNA COLORADA	9	32
PUERTO ALEGRE AND LA DIVISA	13	5
PUERTO CHICHILIANO	1	0
PUERTO LIBIA TRIPICAY	3	3
PUERTO LIBRE DEL RIO PEPE	4	0
PUERTO NARANJO-PEÑAS ROJAS-CUERAZO-EL DIAMANTE	6	7
PUERTO NARE	8	16
PUERTO VIEJO AND PUERTO ESPERANZA	6	24
PUERTO ZABALO-LOS MONOS	51	26
PULGANDE CAMPOALEGRE	31	25
QUEBRADA CAÑAVERAL	0	4
QUEBRADA GRANDE	3	4
QUEBRADA QUERA	18	9
RAMOS-MONGON-MANCHURIA	0	3
REMANSO CHORRO BOCON	51	17
RIO CHAJERADO	0	6
RIO GARRAPATAS	1	1
RIO GUANGUI	41	30
RIO PAVASA AND QUEBRADA JELLA	12	2
RIO PUERRICHA	155	78
RIO SATINGA	16	17
RIO SIARE	8	26
RIO TAPARAL	1	0
RIOS CATRU – DUBASA AND ANCOSO	414	82
RIOS CUIARI E ISANA	29	15
RIOS JURUBIDA-CHORI AND ALTO BAUDO	95	27
RIOS MUCO AND GUARROJO	3	5
RIOS TOMO AND WEBERI	3	0
RIOS TORREIDO AND CHIMANI	34	38
ROQUEROS	1	0
SABALETERA SAN ONOFRE AND EL TIGRE	0	1
SAN AGUSTIN-LA FLORESTA	2	0
SAN ANDRES - LAS VEGAS - VILLA UNION	6	5
SAN ANTONIO DEL FRAGUA	6	0
SAN JOSÉ AMIA DE PATO	1	0
SAN JOSE DE LIPA O CAÑO COLORADO	13	37
SAN LUIS DEL TOMO	3	4
SAN MIGUEL	1	1

INDIGENOUS TERRITORIES *	HECTARES IN 2008	HECTARES IN 2009
SAN RAFAEL	1	0
SANANDOCITO	0	12
SANQUININI	0	3
SANTA CECILIA DE LA QUEBRADA ORO CHOCÓ	3	2
SANTA MARIA DE PANGALA	0	7
SANTA ROSA DEL GUAMUEZ	7	8
SANTA ROSA SUCUMBIOS EL DIVISO	3	2
SANTA TERESITA DEL TUPARRO	19	33
SARACURE AND RIO CADA	123	167
SAUNDE GUIGUAY	179	58
SELVA DE MATAVAN	32	33
SELVA VERDE	2	1
SEVER	0	2
SIKUANI DE DOMO PLANAS	11	6
SIMORNA	23	5
TAGUAL-LA PO	2	0
TONINA-SEJAL-SAN JOSE-OTROS	78	24
TORTUGAÑA, TELEMBI, PUNDE, PITADERO, BRAVO, TRONQUERIA AND	18	42
TRONQUERA PULGANDE PALICITO	9	13
TUCAN DE CAÑO GIRIZA LA PALMA	3	16
UNIDO UWA	6	4
VALDIVIA	1	0
VALLES DEL SOL	0	20
VAUPES	340	252
VILLA CATALINA-DE PUERTO ROSARIO	13	7
VUELTA DEL ALIVIO	21	12
WASIPANGA	2	0
WASIPUNGO	1	0
YABERARADÓ	2	0
YAIGOJE-RIO APAPORIS	0	15
YARINAL (SAN MARCELINO)	35	19
YAVILLA II	33	16
ZIT-SEL DEL QUECAL	1	1
Total area	**5,840**	**4,549**

For further information please contact:

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