UNODC
United Nations Office on Drugs and Crime

Government of Colombia

Colombia

Coca cultivation survey 2013

June 2014

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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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Abbreviations

ADAM	Areas of alternative development Municipal
COP$	Colombian pesos
CLIC	Index of consolidation of zones free from illegal cultivations
DANE	National Administrative Department of Statistics
DEA	US Drugs Enforcement Agency
DIRAN	Colombian Anti-narcotics Police
DNP	National Planning Department
FWFP	Forest Warden Families Programme
GDP	Gross Domestic Product
GME	Mobile Eradication Groups
IGAC	Instituto Geografico Agustin Codazzi – National Carthographic Agency
ICMP	Illicit Crop Monitoring Programme
INCODER	Rural Development Agency
INCB	International Narcotics Control Board
MIDAS	More Investment for Sustainable Alternative Development
m.t.	Metric tons
OAS	Organization of American States
PCI	Presidential Management against Illicit Crops
PRADICAN	Program anti-illicit drugs in the Andean Community
PRELAC	Preventing the diversion of drug precursors in the countries of Latin America and the Caribbean
NPTC	National Plan for Territorial Consolidation
PONAL	National Police of Colombia
SIMCI	Integrated Illicit Crops Monitoring System II
UNODC	United Nations Office on Drugs and Crime
USAID	United States Agency for International Development
US$	United States Dollar
UAESPNN	Unidad Administrativa Especial del Sistema de Parques Nacionales Naturales – National Parks Agency
UPA	Agricultural Production Unit
UPAC	Agricultural Production Unit Coca

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SUMMARY FACT SHEET – COLOMBIA COCA CULTIVATION SURVEY, 2013

	2012	Variation[1]	2013
Net coca cultivation area calculated on 31st December (rounded to the nearest thousand)[2]	48,000 hectares	-	48,000 hectares
Pacific region	18,969 hectares	-2%	18,562 hectares
Central region	10,405 hectares	-15%	8,815 hectares
Meta-Guaviare region	6,550 hectares	16%	7,623 hectares
Putumayo-Caquetá region	9,843 hectares	22%	11,989 hectares
Amazon region	653 hectares	-43%	375 hectares
Orinoco region	1,323 hectares	-41%	782 hectares
Sierra Nevada region	47 hectares	-9%	43 hectares
Area affected by coca[3]	135,000 hectares	-34%	89,215 hectares
Average fresh coca leaf yield[4]	3,700– 4,700 kg/ha/year 4,200 kg/ha/year	-2.4%	3,600– 4,600 kg/ha/year 4,100 kg/ha/year
Potential fresh coca leaf production	188,900 tm - 293,800 mt 241,300 mt	-14%	178,900 mt - 237,500 mt 208,200 mt
Potential cocaine hydrochloride production	262 mt - 405 mt		249 mt – 331 mt
Weighted average coca leaf price	COL $2,476	-9.5%	COL $2,242
Average coca leaf price at production sites	US$ 1.4/kg $ 2,589/kg	-22%	US$ 1.1 /kg $ 2,014 /Kg
Average coca paste price at production sites	US$ 1,025/kg $ 1,844,250/kg	2.4%	US$ 1,011 /Kg $ 1,889,093 /kg
Average cocaine price in major cities	US$ 2,468/kg $ 4,447,462/kg	5.9%	US$ 2.521/kg $ 4,710,658/kg
Accumulated aerial spraying	100,549 hectares	-53%	47,053 hectares
Reported manual eradication	30,486 hectares	-28%	22,056 hectares
Cocaine seizures[5]	188,021 kg	-11%	166,732 kg
Heroin seizures	464 kg	-13%	403 kg
Illegal laboratories destroyed[6]	2,480	-5%	2,344
Total value of coca leaf production and coca derived farm products[7]	US$ 381 Million	-18%	US$ 313 million[8]
Percentage in GDP[9]	0.2%	-	0.2%
GDP within agricultural sector	3%	-	3%
Number of households involved in coca cultivation	65,300	-6%	61,700
Gross average annual income per person of coca leaf production and paste / base[10]	US$ 1,150	-13%	1,000 US$
Poppy cultivation area	313 hectares	-5%	298 hectares
Potential opium latex production[11]	7.9 mt	33%	10.5 mt
Potential heroin production	0.9 mt	44%	1.3 mt
Average price of opium latex within the production site	US$ 634/kg	75%	US$1,112 /kg
Average price of heroin	US$ 11,661/kg	-20%	US$ 9,295 /kg

1. Figures are rounded up to the next number
2. Corresponds to the coca crop area as from 31st December 2013
3. The affected area is the geographical sum of illicit crop presence derived from aerial spraying, manual eradication techniques and the annual census. UNODC has produced the aforementioned two reports; the aerial spraying report is carried out by DIRAN.
4. Manufacturing data presented from 2013 has been adjusted within this report and is not comparable to data published within the 2012 report. Details of adjustments and the 2009-2013 series are presented in annex 3 of this report. It is calculated using the parameters established during the previous year and the modified 2013 parameters to enable this comparison.
5. Of the total seized, 130.916 kg were seized at national level and 35.816 kg corresponds to operations carried out at international level using informed supplied by the national police.
6. Includes cocaine laboratories and manufacturing infrastructures for the processing of coca paste and cocaine base
7. Corresponds with brut earnings without discounting manufacturing costs
8. Net earnings within farms, minus manufacturing costs, are estimated at US$ 194 million
9. Yearly GDP as outlined by the Colombian Government (DANE). Illicit crops enclave
10. This income does not include manufacturing costs.
11. Corresponds to opium dried in an oven

EXECUTIVE SUMMARY

The methodology employed by SIMCI is based on medium quality satellite image analysis and field validation. From this the scale of coca cultivation can be calculated. For areas without any information or if the images are cloudy or distorted by other factors, the calculations are based on trends. The historical series has changed since 2009; coca cultivations in Colombia are becoming smaller. As data is obtained from the coca crop area, a framework can be drawn up within the areas allowing complementary investigations to be carried out to integrally characterize the phenomenon. The data obtained from the coca crop area will complement data collection surveys and fieldwork tests. These enable estimation of coca leaf production. From these studies, coca leaf transformation efficiency, within cocaine, can be used to estimate cocaine production potential. In addition the report shows complementary information regarding pricing, chemical substances and actions carried out by the Colombian Government in regard to supply control.

The census results show that on the 31st December 2013 Colombia had 48,000 coca crop hectares distributed within 23 of the country´s 32 departments; the same amount as reported in 2012. This is the result of a leverage effect between a marked increase in regions where the phenomenon continues to be present and a general tendency of reduction in the rest of the country. 13 departments displayed a decrease within the coca crop area whilst 7 displayed an increase. 76% of the increase was concentrated in Nariño (+2,444 ha), Norte de Santander (+ 1,829 ha) and Putumayo (+ 1.519 ha); on the other hand, a 77% decrease was noted within Choco (- 1,768 ha), Antioquia (- 1,734 ha), Bolivar (- 1,043 ha) and Cauca (-999 ha). Indigenous reservation participations, within coca cultivations, increased from 11% in 2012 to 13% in 2013, whereas within AfroColombian community councils participation increased from 20% in 2012 to 19% in 2013. The coca cultivation within National Parks increased by 12%.

41% of the coca crop area is found within the 10 municipalities that are most affected by coca crops. These were the top 4 areas for coca production in 2012, confirming that the coca phenomenon continues to exist within Colombia.

In 2013 the trend marked a decrease in coca within a large part of the country, contrasting with a marked increase within the nuclei of stable coca crop. The department of Nariño, where 27% of coca is found, continues to be the region most affected by coca production. Eight departments have less than 100 hectares. For the second consecutive year no coca crops were detected in Cundinamarca whilst the department of Cesar remained on the list of departments most affected. More than half (56%) of all the coca crops within the country are found in 3 departments: Nariño, Norte de Santander and Putumayo. 82% of coca is only within six departments.

With the exception of the Choco, departments displaying a reduction in coca crops, demonstrate consistent behaviour which began a few years ago. The decrease in coca crops within Cauca, Antioquia and Bolivar appear to be related to the appearance of mining activities. Sustainability of coca crops depends on local communities, using alternative activities to ensure an improved quality of life and the freedom to exercise their rights.

The historical analysis of the affected area[12] demonstrates a marked decrease within the area, primarily due to aerial spraying and manual eradication processes. This reduction is concentrated within the Nariño department, where there was an increase in coca cultivation. The concentration of coca crops within areas in which aerial spraying is restricted should also be mentioned. Coca resowing has decreased in the Central, Orinoco and Amazon regions, where the reduction in coca crops is not the result of aerial spraying.

Decrease of coca production within an area is indicated by coca crop productivity. In 2013 coca leaf production and yield were recorded in the Meta – Guaviare and Orinoco regions; for both regions reductions in crops were identified by the coca leaf yield per number of yearly harvests.

The methodology used to estimate potential cocaine production was adjusted to improve the estimation of the product area and to incorporate an adjustment factor to record new tendencies in the alkaloid extraction process. This is external to the Agriculture Production Unit. The potential cocaine production output without any adjustment applied (227 mt - 309 mt) is less than the potential cocaine production output including adjustment (249 mt - 331 mt). Manufacturing data presented from 2013 has been adjusted within this report and is not comparable to data published within the 2012 report. Details of adjustments and the 2009-2013 series are presented in annex 3 of this report. It is calculated using the parameters established during the previous year and the modified 2013 parameters to enable this comparison.

In relation to market dynamics, there was a 22% reduction in coca prices in the regions with the most concentrated levels of production: Pacific (14.3%), Central (17.5%), and Meta-Guaviare (30.7%) according to the information captured through the price system. This behaviour could be influenced by price speculation, from intermediaries and armed groups regarding the increase of coca leaf commercialisation in productive zones and the entry of new actors, in both production stockpiling and

[12] *The affected area is the geographic region in which reports are carried out on illicit crop production, aerial spraying, manual eradication and the annual census. UNODC has produced this data over the past two years; the aerial spraying report was produced by DIRAN.*

the manufacturing process. In studies carried out by the UNODC/SIMCI products containing coca have been detected, this has particularly impacted coca growers. Furthermore, a new price structure has been imposed by armed groups– this does not correspond with traditional market mechanisms.

The tendency for concentration, which has been detected during the last few years, constitutes a warning sign within the current report, in particular within the Catatumbo regions and the southern Colombian border. Here an evident concentration of coca crops has been noted during the last year. However, it should be noted that 13 departments have decreased coca crops. The former is due to a marked reduction in the aerial spraying and manual eradication methods. The only department of those involved in which aerial spraying in 2012 is not at the same level as 2013 is Vichada. In Putumayo crops have increased despite aerial spraying, in Antioquia crops have decreased as has aerial spraying.

Alternative development in Colombia has contributed to the sustainable decrease of illicit crops given opinions regarding the sustainability of livelihood, replacing income from illicit economies. As a consequence, the State has managed to approach vulnerable zones, with a low level of infrastructure connectivity and internal violence. This improves the quality of life for communities within various regions. Furthermore, it has strengthened the rural economy within vulnerable zones. In several cases this has enabled the implementation of innovative strategies which have permitted the certification of products and the identification of niche markets.

During the last decade, Colombia has created an institutional structure in charge of leading and implementing politics for alternative development as an effective strategy for the reduction in the amount of illegal crops. The institutional structure is not only reflected in the formulation and implementation of public policies, but also in the strengthening of community organisational capacities to promote alternative development with a social, entrepreneurial and business vision. In this sense, UNODC has contributed to increase the state capacity and that of civil society to fight against the illicit drugs problem.

Colombia finds itself at a historic moment, in which alternative development provides valuable support within the construction of peace. These programmes should continue their efforts so that in a possible post conflict phase, rural communities can disconnect themselves from illicit economic activities and improve their quality of life.

1. INTRODUCTION

The objectives of the Illicit Crops Monitoring Programme (ICMP) include establishing data collection methodologies and analysis with the objective of increasing the governments' capacity to monitor illicit crops within their territories. It aims to assist the international community in the monitoring of the extension and evolution of crops within the context of elimination strategy, adopted by member states as part of the action plan during Session 53 of the United Nations drugs commission in March 2009. The ICMP currently covers seven countries: Colombia, Bolivia, Ecuador and Peru for coca, Mexico, Afghanistan, Laos and Myanmar for opium poppies and Morocco and Nigeria for marijuana.

Since 1999 UNODC supports the monitoring of coca crops in Colombia and has produced fifteen annual censuses based on satellite image analysis. In the first two censuses (1999 and 2000), the country was partially assessed, but as from 2001 the coverage was extended to cover the entire country to ensure the monitoring of a possible expansion of illicit crops

In August 2010, UNODC signed an agreement with the Colombian government to continue and expand the monitoring and analysis, ensuring Project sustainability until 2014. Within this context, the SIMCI Project was sustained to carry out additional tasks within an integrated approach in relation to the analysis of the drug problem in Colombia. This places regional emphasis on: the monitoring framework within particular areas with fragile ecosystems, Natural Parks, Indigenous Reserves, agrarian border expansion, deforestation processes in addition to providing direct support to the alternative development programmes, National Territorial Consolidation Plan –PNCT and the Forest Warden Family Programme, implemented by the Colombian Government.

The project is supported by an inter-institutional team in charge of ensuring the transferral and adoption of technologies within national beneficiary institutions. SIMCI is a joint project with UNODC and the Colombian Government. The National counterpart is the Ministry of Law and Justice, President of the National Drugs Board.

Since 2011, a strategic line of work has been developed regarding the chemical substances used during the production of illegal drugs. This project is supported by PRELAC, which considers the project to be a focal point.

The project is led by a technical coordinator and comprises of the following engineers and technicians: four experts in digital processing, a field engineer, a cartographic engineer, four specialists in analysis and investigation, a SIG leader, and analytical SIG engineer, four SIG support engineers, a statistician, a logistics and database technician, a programmer and a graphic designer. The team is permanently accompanied by technicians from DIRAN and the Union of National Parks. As from 2012, they also have the permanent accompaniment of a focal point from the PRELAC project.

SIMCI supports studies and investigations carried out by the Colombian Government and by different national and international academic institutions. Furthermore, it facilitates access to its Spatial Data Bank -BIE-, providing technical training and technology transferal to achieve their objectives. These entities are DANE, Departmental Governments, various NGOs as well as other agencies and projects from the United Nations within Colombia and abroad. Through the establishment of an investigative network, SIMCI promotes the analytical use of the data generated and receives expert feedback.

2. RESULTS

COCA CROPS

The census results show that as from the 31st December 2013, Colombia had 48,000 hectares of coca cultivations within 23 of the 32 country´s departments, the same amount as reported within the previous census. Thirteen departments showed a trend in the reduction of coca crops, whilst seven departments showed an increase. 76% of the increase was concentrated within Nariño (+2,444 ha), Norte de Santander (+ 1,829 ha) and Putumayo (+1,519ha); on the other hand, 77% of the reduction in coca crops was concentrated within Choco (- 1,768 ha), Antioquia (- 1,734 ha), Bolivar (- 1,043 ha) and Cauca (-999 ha). This demonstrates that the coca crop phenomenon remains in some departments but continues to decrease within others.

The analysis of a historical series within the affected area[13], demonstrates a marked decrease, principally related to a reduction within the area sprayed and if the area is eradicated using manual techniques. The national scale indicates that the yields continue to decrease and the price of coca leaves remain stable. However, a more detailed evaluation demonstrates that the phenomenon is increasing within Nariño, Putumayo and Norte de Santander.

Table 1 Coca fields per department in Colombia, 2007-2013 (hectares)

Department	Dec.-2007	Dec.-2008	Dec.-2009	Dec.-2010	Dec.-2011	Dic.-2012	Dic.-2013	Change % 2012-2013	% of 2013 total
Nariño	20,259	19,612	17,639	15,951	17,231	10,733	13,177	23%	27%
Putumayo	14,813	9,658	5,633	4,785	9,951	6,148	7,667	25%	16%
Norte de Santander	1,946	2,886	2,713	1,889	3,490	4,516	6,345	41%	13%
Cauca	4,168	5,422	6,597	5,908	6,066	4,325	3,326	-23%	7%
Guaviare	9,299	6,629	8,660	5,701	6,839	3,851	4,725	23%	10%
Caqueta	6,318	4,303	3,985	2,578	3,327	3,695	4,322	17%	9%
Choco	1,080	2,794	1,789	3,158	2,511	3,429	1,661	-52%	3%
Antioquia	9,926	6,096	5,096	5,350	3,104	2,725	991	-64%	2%
Meta	10,386	5,525	4,469	3,008	3,040	2,699	2,898	7%	6%
Bolivar	5,632	5,847	5,346	3,324	2,207	1,968	925	-53%	2%
Vichada	7,218	3,174	3,228	2,743	2,264	1,242	713	-43%	1%
Cordoba	1,858	1,710	3,113	3,889	1,088	1,046	439	-58%	1%
Valle del Cauca	453	2,089	997	665	981	482	398	-17%	1%
Guainia	623	625	606	446	318	301	81	-73%	0.20%
Vaupes	307	557	395	721	277	254	184	-28%	0.40%
Santander	1,325	1,791	1,066	673	595	111	77	-31%	0.2%
Amazonas	541	836	312	338	122	98	110	12%	0.2%
Arauca	2,116	447	430	247	132	81	69	-15%	0.1%
Magdalena	278	391	169	121	46	37	37	0%	0.1%
Caldas	56	187	186	46	46	16	8	-50%	0.02%
Cesar						13	13	0%	0.03%
Boyaca	79	197	204	105	93	10	17	70%	0.04%
La Guajira	87	160	182	134	16	10	6	-40%	0.01%
Cundinamarca	131	12	0	32	18	0	0	0%	n.a
TOTAL	**98,899**	**80,953**	**73,139**	**61,812**	**63,762**	**47,790**	**48,189**	**1%**	**100%**
Rounded total	99,000	81,000	73,000	62,000	64,000	48,000	48,000	%	
Number of affected departments	23	24	22	23	23	23	23		

13 The affected area is the geographical sum of illicit crop presence derived from spraying, manual eradication techniques and the annual census. UNODC has produced this data over the past two years; the aerial spraying report is carried out by DIRAN.

Despite a marked reduction in spraying which has decreased from 100,548 ha in 2012 to 47,503 ha in 2013; crop production decreased within 13 departments. It is worth noting that the only department within which aerial spraying was used during 2012 but not during 2013 is Vichada. In Putumayo crops increased despite the increment of spraying techniques, whereas in Antioquia both the crop produced and aerial spraying decreased.

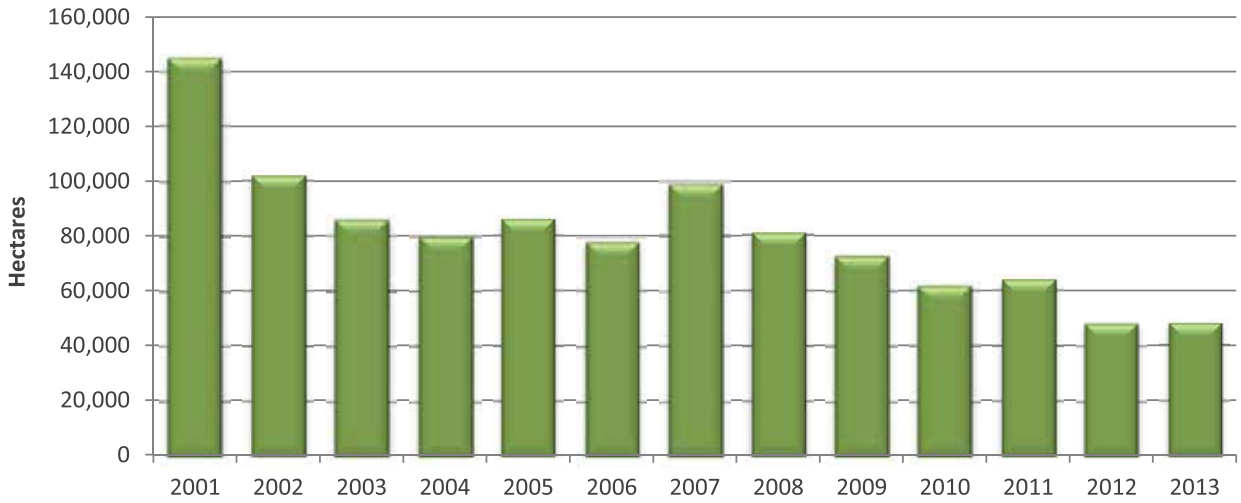
During 2013, there was a marked contrast between overall coca reductions within the country with an increment of the more longstanding coca crop nuclei. Within the department of Nariño, where 27% of coca is produced, this area continues to be the most affected by the presence of coca crops. Eight departments have less than 100 hectares. For the second consecutive year, coca crops were not detected within Cundinamarca, whilst the department of Cesar remained on the list of the departments which are the most affected. More than half (56%) of all coca crops within the country are found within three departments: Nariño, Norte de Santander and Putumayo. 82% of coca produced is within six departments.

With the exception of the Choco, departments in which reduction has occurred demonstrate behavioural consistency from several years ago, the reduction in crops within Cauca, Antioquia and Bolivar appear to be related to the appearance of mining activities. Sustainability depends on local communities finding alternative livelihood which translate to an improvement in quality of life and execution of rights and responsibilities.

It is important to outline that the coca crops detected during the 2013 census occupied 0.04% of the total arable land mass within Colombia. The participation of Indigenous Populations within coca crop areas detected during the 2013 census increased from 11% in 2012 to 13% in 2013.On the other hand, within AfroColombian community councils, participation increased from 20% in 2012 to 19% in 2013. Crops within National Parks increased by 12%.

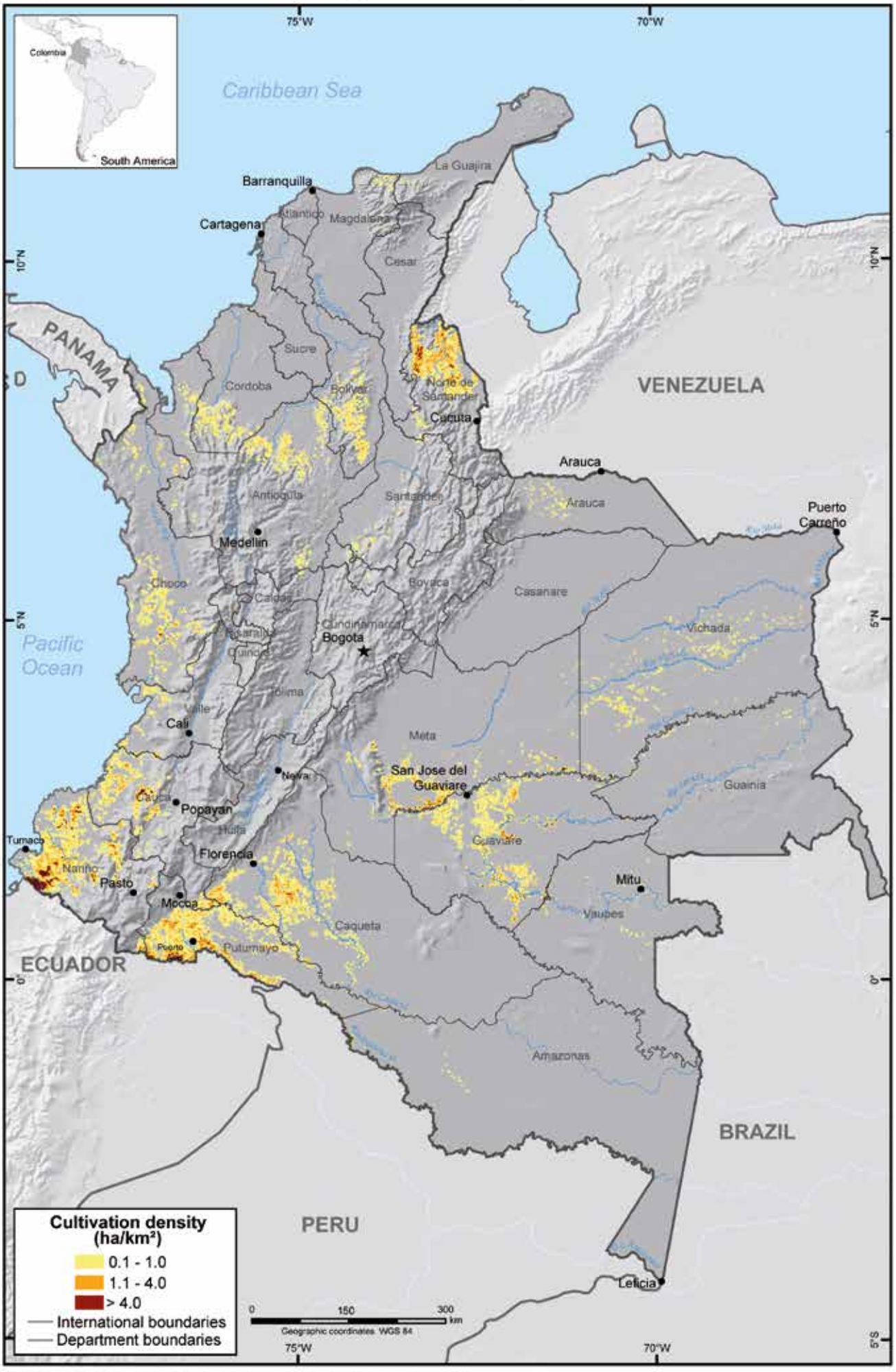
In a similar format to the censuses carried out as from 2001, this census represents the coca crop situation from the 31st December 2013. For this year, the availability of images from the Landsat 8 OLI satellite and the application of a spectral resolution to the spatial resolution providing the panchromatic image, has enabled the improvement of satellite coverage, improving the spatial resolution and reducing the end data corrections.

Figure 1. Coca Fields in Colombia, 2001 - 2013



The Tumaco municipality continues to remain the municipality with the highest number of coca crops within Colombia, with 6,611 hectares representing 13.7% of all coca cultivated within the country. The Cumaribo (Vichada) and Puerto Leguizamo (Putumayo) municipalities have been replaced on the list of the 10 most cultivated areas by the Valle del Guamuez (Putumayo) and San Jose (Guaviare) municipalities. 41% of the coca crop area is found in these municipalities; this is 5 points more than during 2012, confirming the coca phenomenon concentration trend occurring within Colombia

Map 1. Coca cultivation density in Colombia, 2013



Source: Colombian Government - 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

Table 2. The tin municipalities with the greatest cultivated area 2012

Department	Municipality	Coca cultivation (hectares)	% census
NARINO	Tumaco	6,611	13.7
PUTUMAYO	Puerto Asis	2,150	4.5
NORTE DE SANTANDER	Tibú	1,904	4
GUAVIARE	Miraflores	1,779	3.7
NARINO	Barbacoas	1,510	3.1
GUAVIARE	El Retorno	1,314	2.7
CAUCA	El Tambo	1,297	2.7
GUAVIARE	San José del Guaviare	1,231	2.6
META	Puerto Rico	1,101	2.3
PUTUMAYO	Valle del Guamuez	1,093	2.3
Total		**19,990**	**41%**

Coca cultivation dynamics analysis

In Colombia, coca leaf crop distribution maintains a tight relationship with substantial aspects relating to the territory and the coca phenomenon. Amongst these, the following are outstanding: biophysical diversity, cultural and regional territorial diversity, sustainable strategies for cocaine production and the cocaine manufacture process. In this regard, the following aspects for illicit crop dynamic analysis are presented: establishment dynamics, permanence spatial analysis, 2011 regionalisation tendencies and a synthesis of the dynamics expressed as a Municipal Threat Index due to the presence of illicit crops.

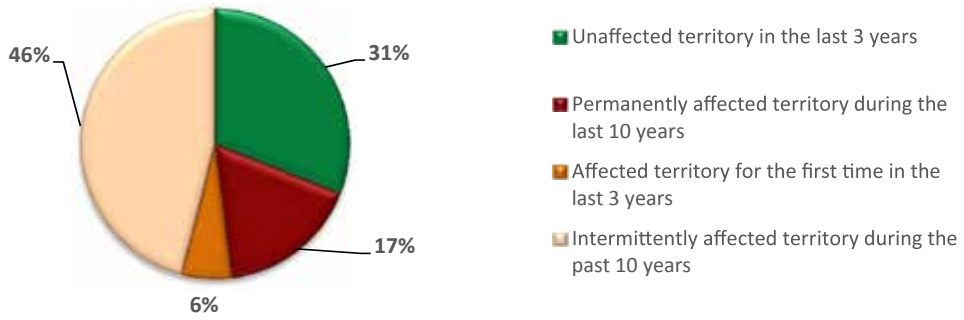
Ilicit crop establishment dynamics

After fifteen years of monitoring, the predominant spatial model for the establishment and abandonment of coca cultivation continues to be applicable. This model is associated with recurrent land occupation within the peripheral areas of the Colombian Andean zone. These occupation processes are summarized as follows: i) ruralisation is an advanced process of anthropic transformation within natural spaces, promoting the abandonment of coca crops and the incorporation of land within the production process ii) The colonization front, combining deforestation, grass growth and subsistence crops alongside illicit crop cultivation iii) Points of colonization, consisting of illicit crop development within a vulnerable hydrography and iv) The rainforest or dry forests, constituting the new area sources for illicit crops cultivation.

The following analysis of coca crop permanence and affectation is based on a framework of areas implemented by SIMCI consisting of 1km² by 5km² [14].

During 2013 the land area affected by coca crops was 247,200 km², 6% less than 2012 (263,200 km²) and 10% less than in 2011 (274,034 km²); this reinforces the crop concentration trend, demonstrated during the last few monitoring reports.

Figure 2. Regional distribution of permanence

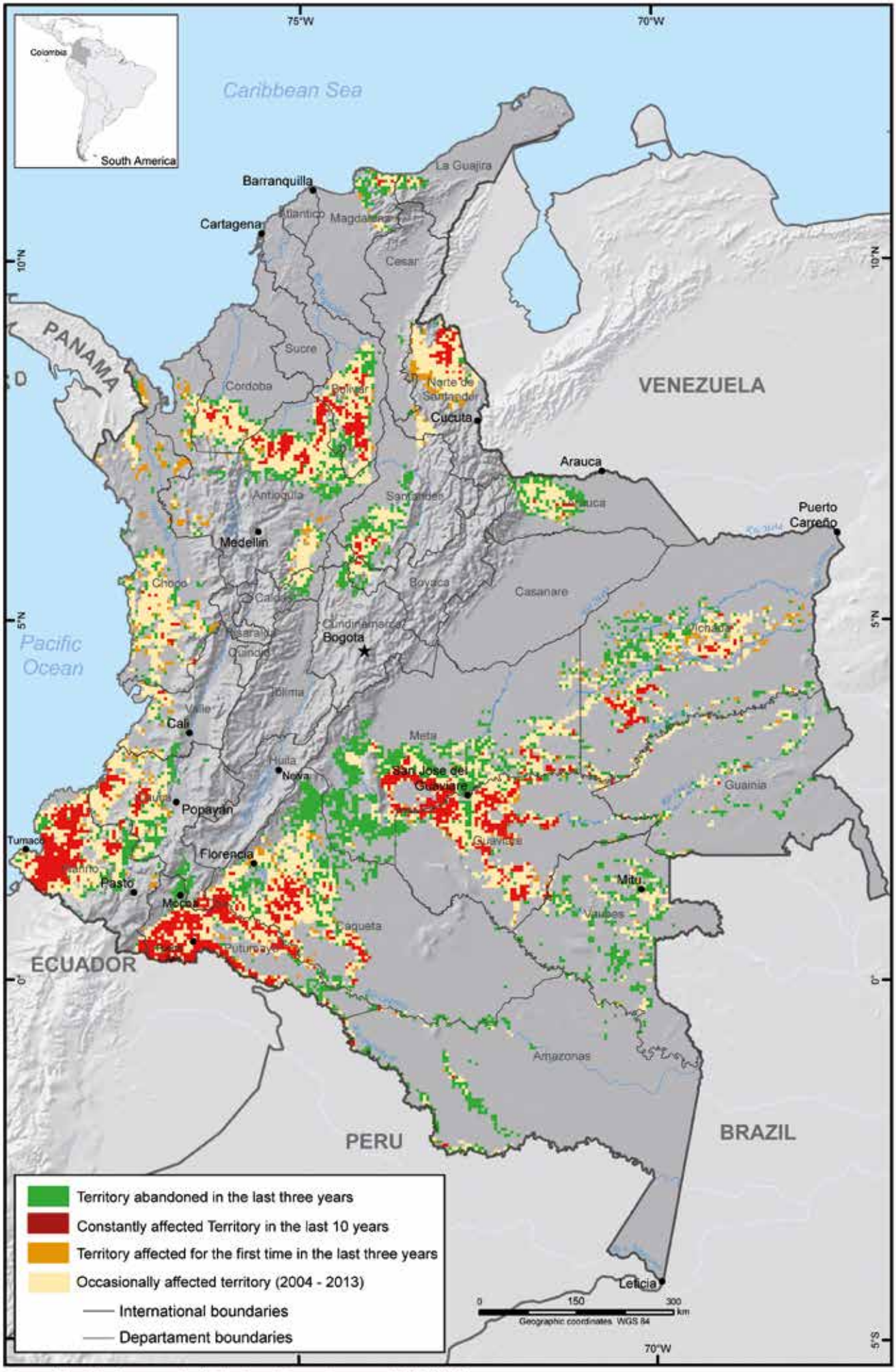


Note: The abandoned territory category refers to zones in which no coca crops have been grown during the last three years.

17% of the territory has been permanently affected by coca crops during the last ten years, increasing the percentage point in relation to 2012. Within this category, the highest quantities of coca crops were detected during 2013. These were principally within the Putumayo-Caqueta, Meta-Guaviare and Pacific regions; and within the Nariño, Putumayo, Meta, Guaviare, Antioquia (Bajo Cauca), Sur de Bolivar and Norte de Santander departments.

14 The dynamic analysis uses the territory affected by coca crops since 2004 as a point of reference. The dynamic analysis does not measure the scale in relation to the coca crop area but rather in relation to the amount of territory affected by these crops.

Map 2. Regional coca cultivation stability in Colombia, 2004 - 2013



Source: Colombian Government - National monitoring system supported by UNODC

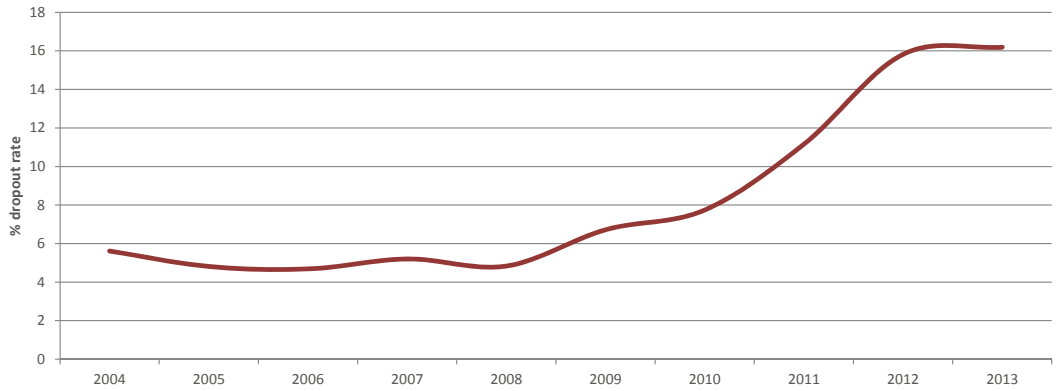
6% of the territory was recently affected (between 2011 and 2013), this category corresponds with the new coca crop areas and expansion zones, which are principally, distributed within the Catatumbo (Norte de Santander department), Pacific (highest concentration within the Choco) and Orinoco (principally within the Vichada department) regions.

46% of the territory is intermittently affected; this refers to areas in which coca yields appear and disappear during each year during the series (2004 to 2013), this is presented within all the regions, more intermittently within the Catatumbo and Pacific regions. In relation to 2012, this has decreased by two percentage points. Of the crops detected in 2013, 4% are found within these territories.

Ultimately, the area abandoned during the past three years has increased in percentage points in relation to 2012, covering 31% of the total territory. Territories were abandoned within the Amazon, Sierra Nevada and Meta – Guaviare regions, with the greatest concentration within the south of the Meta department. Thanks to the dynamics of the 2013 crop, 28% of the territory which was affected during previous years has now been abandoned.

From analysing the territories wihtin 1Km^2 grids, (understood as the last period in which the grid was affected by coca crops, eradication and spraying) an increase in the abandonment of territory has been noted increasing from 4% in 2008 to 16% in 2013.

Figure 3. Rate of abandonment per year 2004-2012



Note: The rate of abandoment in relation to the grids in which no coca has been detected for three years and the grids affected during these three years.

In 2013, 12,455 square kilometres began the abandoment process, as from the year 2008 an increment in the rate of abandonment has been noted, coinciding with a reduction in the areas of sown coca crops in Colombia. Nevertheless, the crop dynamic indicates that only when the three year process without coca is completed, can the territory be considered abandoned.

Table 3. regional distribution of the permanence of coca cultivation (2004 - 2013)

Region	Total		Unaffected area from 2011 to 2013		Area permanently affected from 2001 to 2013		Area affected in an intermittent manner from 2001 to 2013		Area affected as from 2011	
	Km^2	%	Km^2	%	Km^2	%	Km^2	%	Km^2	%
Amazon	22,825	9%	13,775	60%	425	2%	8,050	35%	575	3%
Catatumbo	9,875	4%	600	6%	1,325	13%	6,500	66%	1,450	15%
Central	43,650	18%	13,400	31%	5,750	13%	22,350	51%	2,150	5%
Meta - Guaviare	46,575	19%	17,075	37%	9,725	21%	18,675	40%	1,100	2%
Orinoco	27,025	11%	9,800	36%	2,225	8%	12,700	47%	2,300	9%
Pacific	49,750	20%	9,875	20%	9,725	20%	25,675	52%	4,475	9%
Putumayo - Caqueta	44,125	18%	11,300	26%	11,625	26%	19,350	44%	1,850	4%
Sierra Nevada	3,375	1%	1,875	56%	175	5%	1,150	34%	175	5%
Total	**247,200**	**100.00%**	**77,700**	**31%**	**40,975**	**17%**	**114,450**	**46%**	**14,075**	**6%**

Note:

1.The dynamic analysis was based in 2004 for the current study.

2. Territory is considered to be abandoned when no coca crops have been grown during the last three years.

3. Territory is considered to be permanently affected when coca crops have been continuously grown since 2004.

4. Territory is considered to be intermittently affected when coca crops have been grown in an interrupted pattern since 2004.

5. Territory is considered to be recently affected when coca crops are grown for the first time during the past three years.

2013 Regional Trends

The spatial analysis of the census data allows the regional identification of different dynamics within the phenomenon. In this manner, the territories permanently affected by coca crops are concentrated within the south of the country, along the border with Ecuador (Nariño and Putumayo departments), in Meta, Guaviare, south of Bolivar, in Bajo Cauca Antioqueño and the Norte de Santander, near the Venezuelan border. During the last three years, for the first time territories within the Choco, Vichada, Uraba Antioqueño and Norte de Santander have been affected. It must be noted that the territories abandoned during the past three years are principally found within the departments of Meta (principally La Macarena), Caqueta, Vichada and Vaupes.

Hazard index municipal presence of coca, 2013

The evaluation of changes monitoring proposal, within the index outlining the principle hazard of illicit coca crops, is approximate in relation to the risks presented as a result of the phenomenon within the territory. 2011 was the first time during which this index was constructed for municipalities within Colombia that are affected by the presence of illicit crops. This is based on a historical data series and area framework. This index outlining the threats posed by coca crops within municipalities is based upon the statistics weighted by factors that according to SIMCI, have the most impact on the integral composition of coca crop dynamics within Colombia. These factors are:

Affected area: Net Surface area of coca crops within the geographical study. These include hectares of coca crops and areas of manual eradication and aerial spraying.

Persistence: Number of years affected by coca crops within a 1 km^2 grid.

Expansion: Amount of new grids containing coca crops.

Concentration: Calculated using the Gini coefficient to express the concentration or dispersion of coca crops within a municipality[15].

Re-planting: Rate of re-planted per municipality in relation to the number of eradicated plots.

Abandonment: Demonstrates the trend to abandon coca crops within a geographical category.

The index value presents a standardised 0 to 1 scale, in which values that are close to zero present a smaller hazard and those close to one present a greater hazard. For qualitative studies, the index is split into four types of hazard: very high, high, medium and low.

During 2013, the hazard index varied between 0 and 0.623, whilst during 2012 the index range was between 0.25 and 0.59. Additionally, 25% of the municipalities with the greatest hazard demonstrated an index that was greater than 0.39 whilst during 2012, 25% of the municipalities with the greatest index demonstrated an index greater than 0.43. Therefore, the 2013 hazard index was more dispersed than that of 2012, whereas departments with high hazard indexes during 2012 decreased during 2013.

The 2013 hazard index demonstrates that 288 municipalities (26% of the municipalities within Colombia, 8 more than the previous year) present some kind of hazard. Of these 4% present a very high hazard, 7% a high hazard, 12% a medium hazard and 77% a low hazard. This is presented in absolute terms by an increase of one percentage point within municipalities that present a very high hazard in relation to the previous year. Likewise, there has been an increase of 28 percentage points of low hazard municipalities. This demonstrates that a percentage of the municipalities from the previous year were within the high hazard categories and half migrated to the low hazard category.

This highlights the reduction within the departments Vichada and Guainia where the total amount of municipalities present a low hazard, nevertheless municipalities such as San Martín and San Alberto within the departments of Cesar, Atrato in the Choco, Cajibio in Cauca and Buesaco in Nariño increased their index, increasing from a low to a high hazard.

The index geographical distribution outlines the regional trend in relation to the aggrupation of municipalities according to the hazard intensity. (See Map 3)

15 The Gini coefficient measures inequality. It is used as an indicator of the concentration of coca crops. Values close to one represent the maximum concentration and values closer to zero indicate the greatest dispersion of coca and the highest level of threat, based on the fact that a large amount of the municipality is affected by coca cultivation.

Map 3.Hazard index for municipal coca presence, 2013

Source: Colombian Government - 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

Deforestation due to coca cultivation

Despite the overall coca crop area appearing stable in 2013, 16,334 hectares of woodland that existed in 2012 were cleared as a direct result of coca cultivation (1,027 hectares more than in 2012); of these 58% correspond to the primary woodland, with a high level of complexity, biodiversity and richness.

During the 2001-2013 period 275,588 hectares were deforested to sow coca crops, in 2002 it can be observed that the percentage of coca crop as a result of deforestation processes was 46% and decreased over time to 25% in 2011.

Figure 4 Rate of deforestation due to coca cultivation, 2001 - 2013

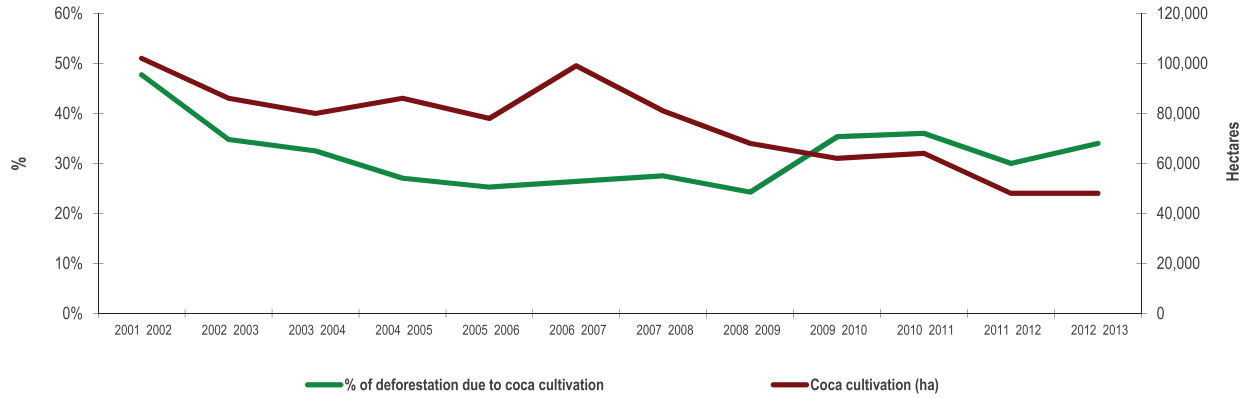
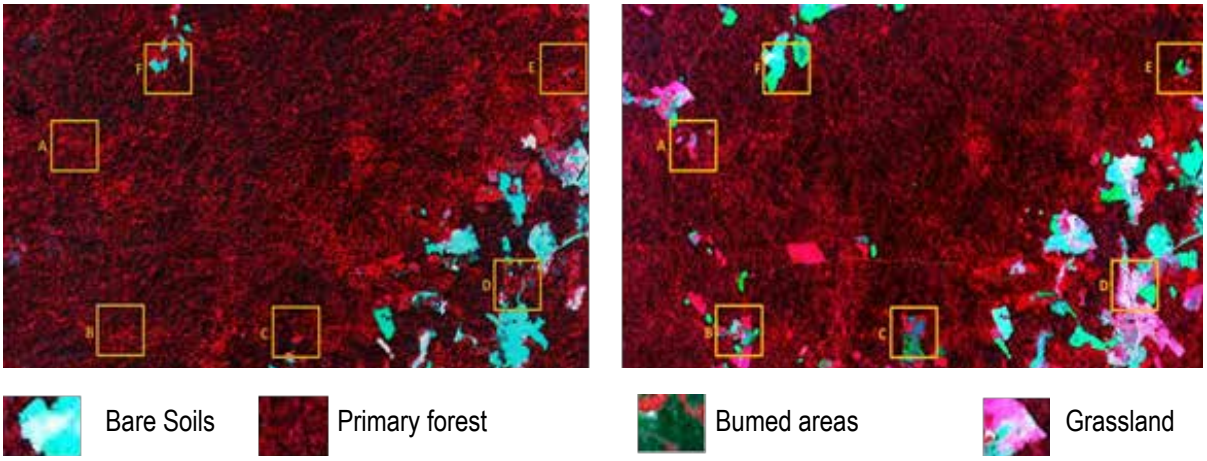
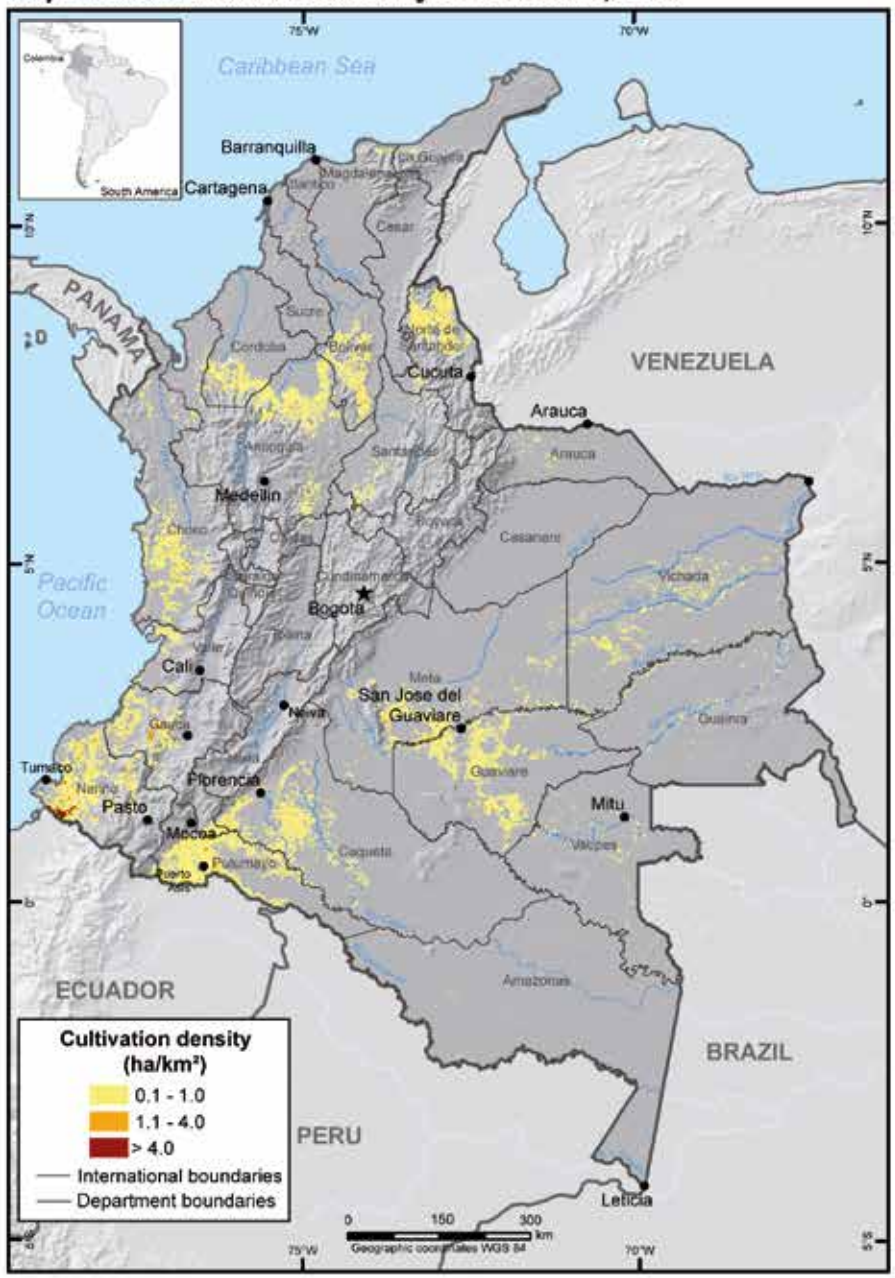


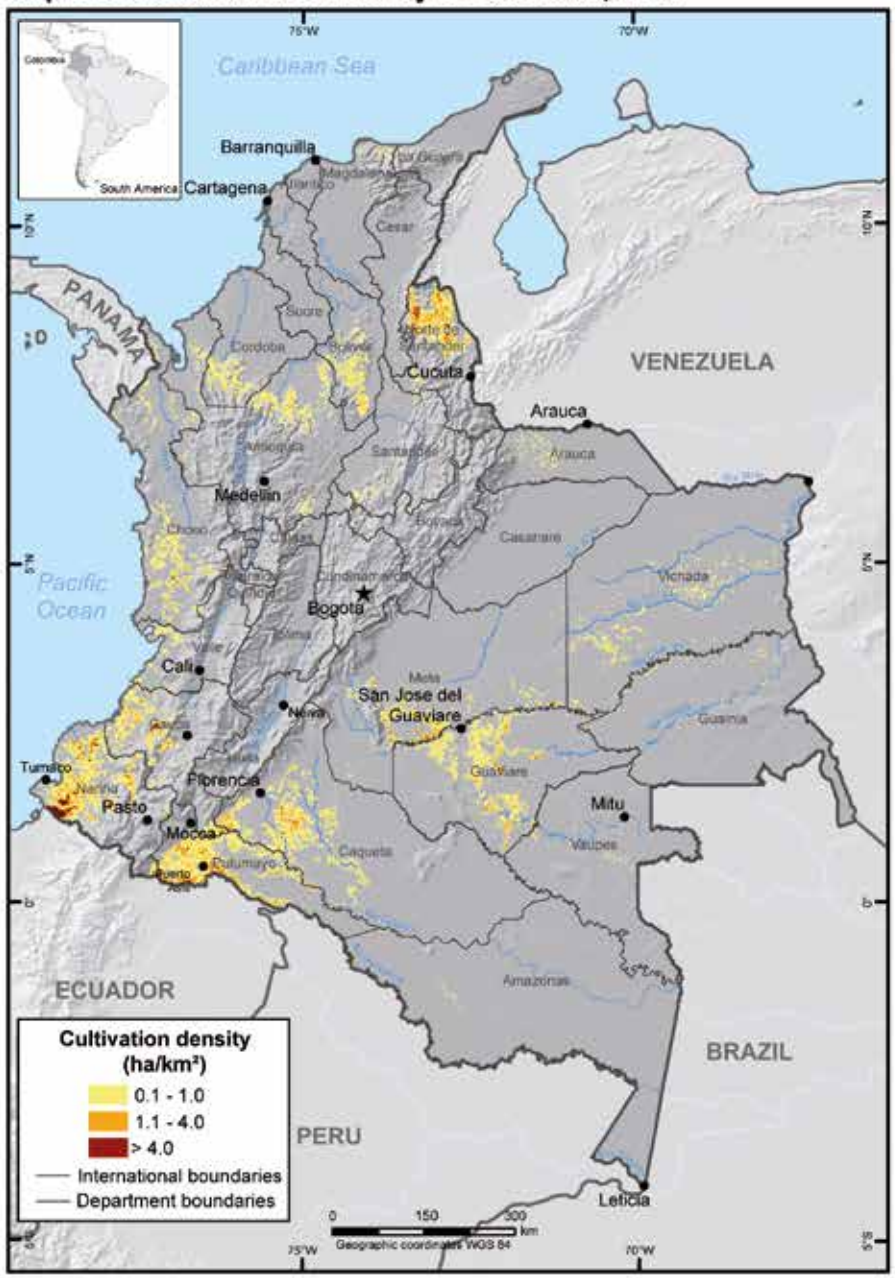
Figure 5. Temporary comparison of satellite images of the municipality of san jose del guaviare, Guaviare department. False colour composition. Left: spot Image, 2008. Right: landsat 8, 2014



Map 4. Coca cultivation density in Colombia, 2012



Map 5. Coca cultivation density in Colombia, 2013



Source: Colombian Government - National monitoring system supported by UNODC
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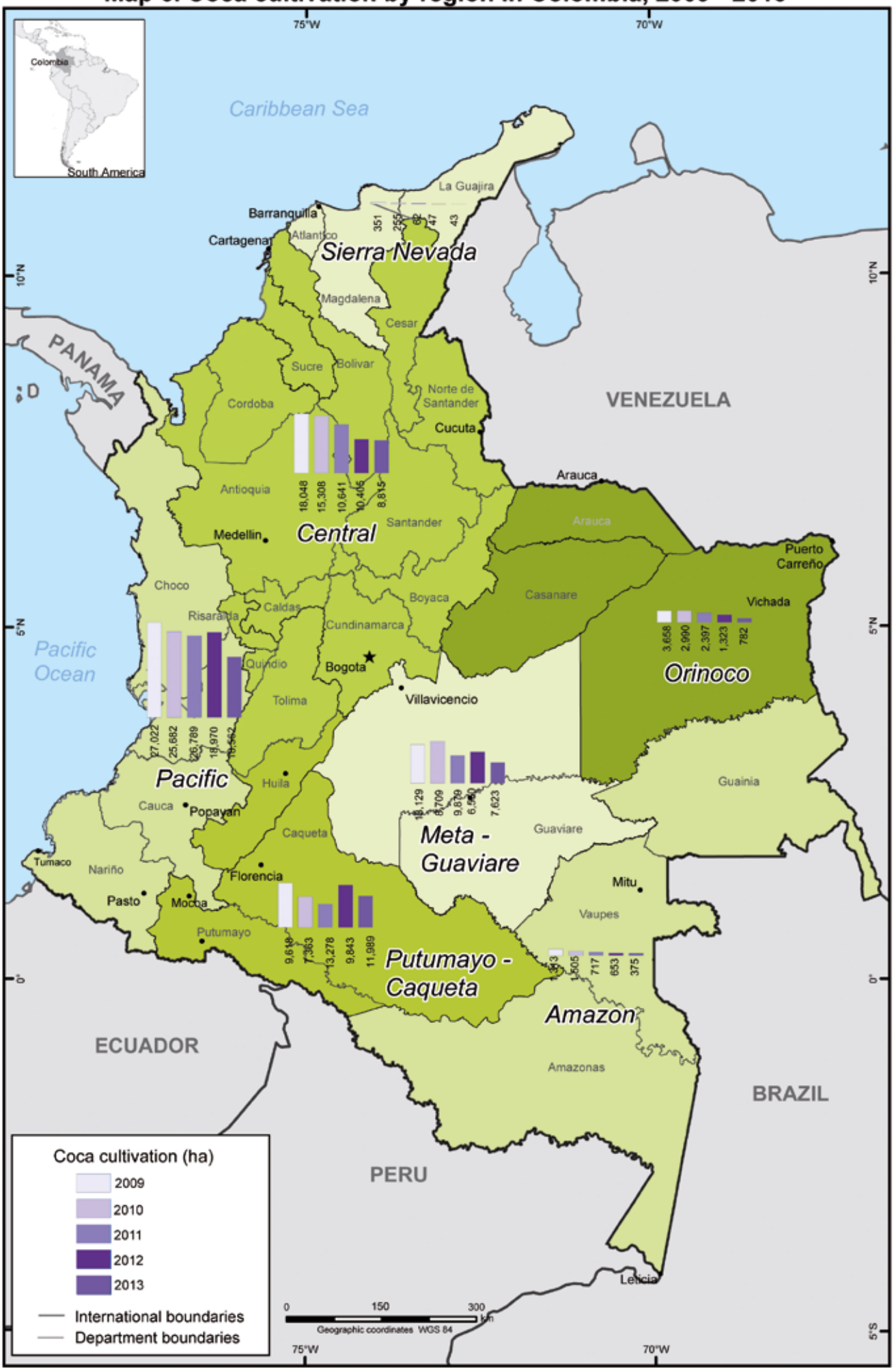
Map 6. Coca cultivation by region in Colombia, 2009 - 2013



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

Historical series analysis

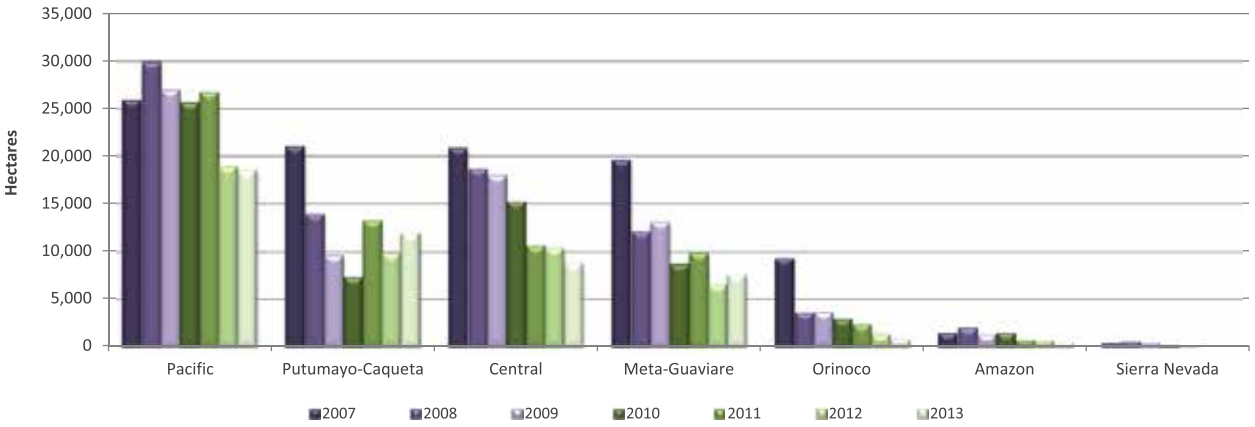
The amount of hectares of coca crops has remained at the same level between 2012 and 2013; nevertheless large increments have been detected within some departments which are compensated by large reductions in coca crops in others. A significant reduction in illicit crops has been noted in the Amazon (-278 ha), Central (- 1,590 ha) and Orinoco (-541 ha) regions; in contrast to significant increases within the Meta Guaviare (1,073 ha) and Putumayo Caqueta (2,146 ha).

According to the 2013 census, 63% of coca crops are found within Pacific and Putumayo – Caqueta regions.

Table 4. coca fields in Colombia by region 2007 - 2013 (in hectares)[16]

Region	2007	2008	2009	2010	2011	2012	2013	% of the total	Change 2012-2013
Amazon	1,471	2,018	1,313	1,505	717	653	375	1	-43
Central	20,953	18,731	18,048	15,308	10,641	10,405	8,815	18	-15
Meta-Guaviare	19,685	12,154	13,129	8,709	9,879	6,550	7,623	16	16
Orinoco	9,334	3,621	3,658	2,990	2,396	1,323	782	2	-41
Pacific	25,960	29,917	27,022	25,682	26,789	18,969	18,562	38	-2
Putumayo- Caqueta	21,131	13,961	9,618	7,363	13,278	9,843	11,989	25	22
Sierra Nevada	365	551	351	255	62	47	43	0.1	-9
Rounded total	**98,889**	**80,948**	**73,000**	**61,812**	**63,764**	**47,791**	**48,189**	**100**	**1**

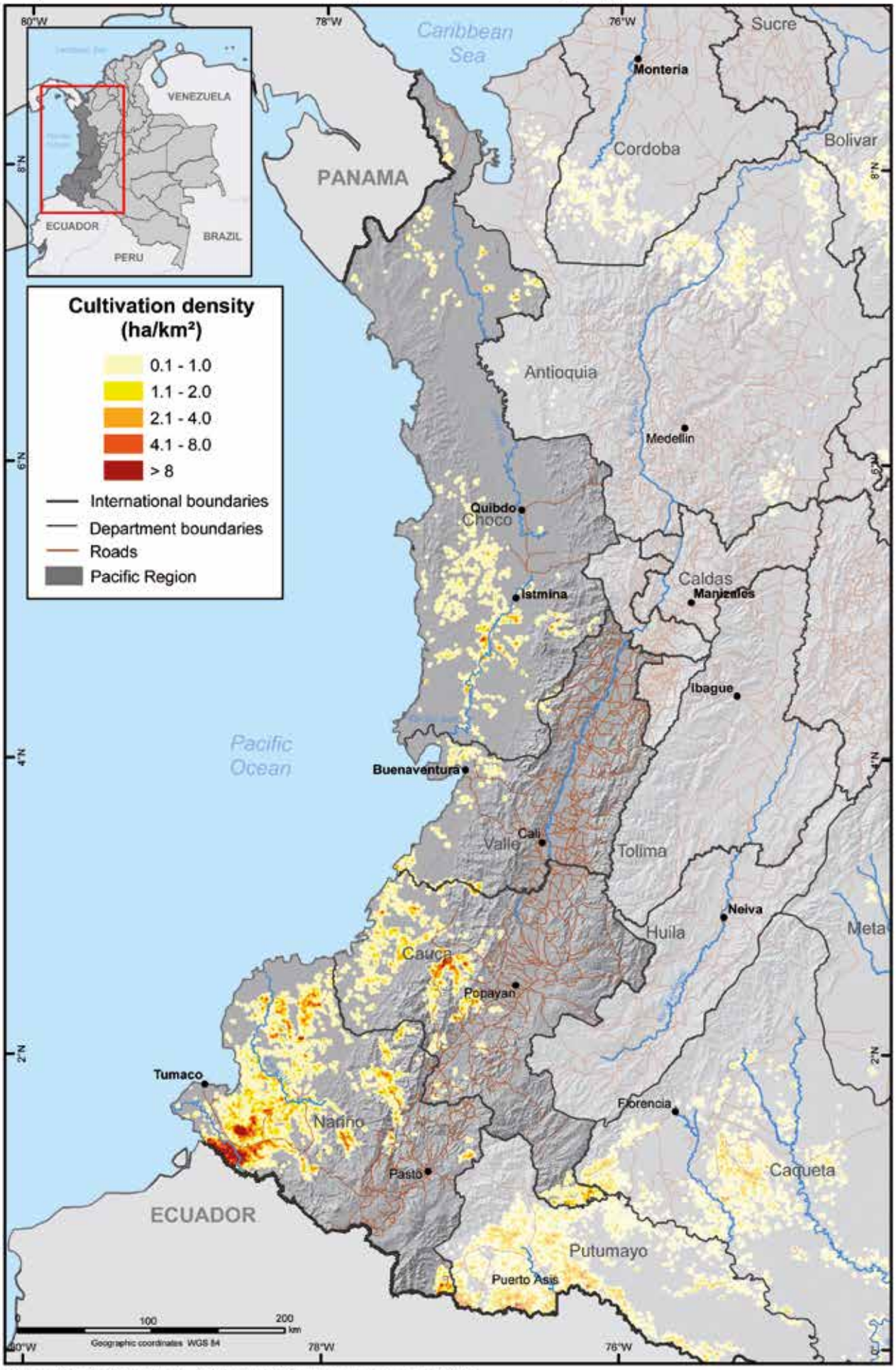
Figure 6. Coca fields by region 2007–2013



Coca fields in Meta - Guaviare

16. *The crop series is in effect from 2009 and refers to small plots.*

Map 7. Coca cultivation density in the Pacific region, 2013



Source: Colombian Government - National monitoring system supported by UNODC

Pacific Region

This region is located to the east of the country, from the Ecuadorian border to the Pacific coast up to the Panamanian border. Its relief consists of the highest territories within Colombia, down to the Pacific Ocean. The constant cloud presence makes the estimation of territories covered by coca crops difficult, for the 2013 census, the department of Choco presented the greatest problem. The coca crops have greatly increased, notably within Nariño (+ 2,444 has) but have decreased within other departments within the region. 38% of coca crops are found within the Pacific region.

Table 5. Coca fields in the Pacific region, 2007-2013 (in hectares)

Department	2007	2008	2009	2010	2011	2012	2013
Nariño	20,259	19,612	17,639	15,951	17,231	10,733	13,177
Cauca	4,168	5,422	6,597	5,908	6,066	4,325	3,326
Choco	1,080	2,794	1,789	3,158	2,511	3,429	1,661
Valle del Cauca	453	2,089	997	665	981	482	398
Total	**25,960**	**29,917**	**27,022**	**25,682**	**26,789**	**18,969**	**18,562**
Annual trend	38%	15%	-10%	-5%	4%	-29%	-2%

A distinct feature of this region is the presence of special territories: 37% of the territory has been declared property of AfroColombian community councils and 13% Indigenous reservations. There are also 16 National Parks. It is important to mention that 70% of the region´s coca crops are found within some of these special areas.

The coca crops within Nariño gained importance during 2002 when they decreased to 40,000 within the Putumayo and Caqueta departments and increased to 7,600 hectares within this department. From 2003, Nariño has remained within the group consisting of the three departments with the greatest level of coca cultivation. It was in first place from 2006 to 2013. The highest level within the historical series occurred during 2007 and since then has appeared to be stable until a large reduction during 2012. However, during 2013 the coca crops once again increased within the department, in particular to the south of the department close to the Colombian border with Ecuador. The aerial spraying operations significantly reduced, to 8,101 hectares sprayed in 2013, this is 21% of what was sprayed during 2012; manual eradication was 62% greater than during 2012.

The department of Cauca shares many similarities with its neighbour Nariño, a large coastal area, high mountainous areas and a rural economy, coca cultivation remained relatively low until 2006. As from 2006 coca cultivation tripled reaching a total of 6,597 hectares in 2009. During 2013, it continued to decrease, having started to reduce during 2012 to 3,326 ha, and the area with the lowest amount of coca crops since 2006.

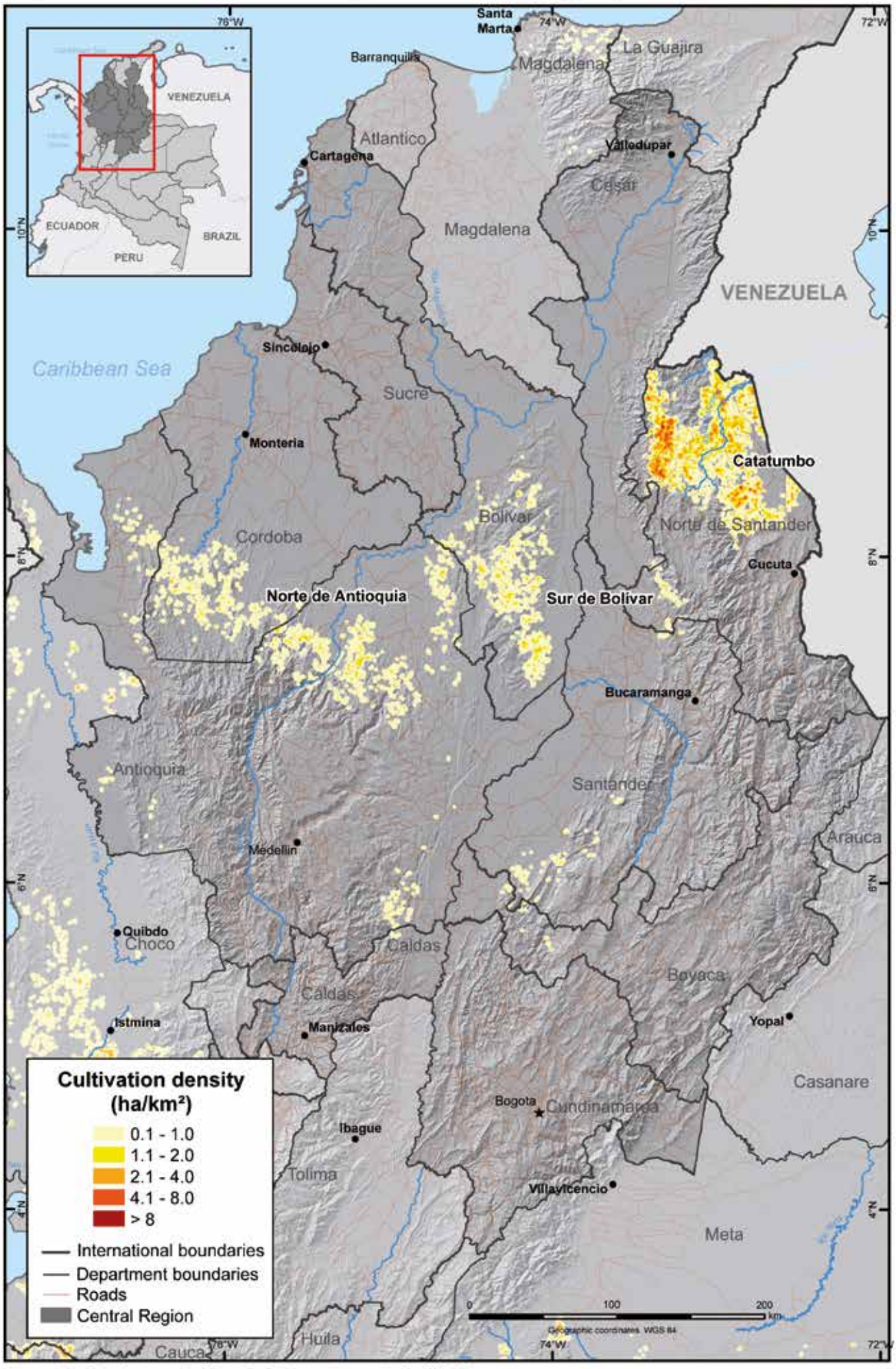
In contrast to the previous year, with a decrease in coca crops greatly concentrated within the mountainous area of the department, the coastal area displayed an increase. During 2013 the level of aerial spraying was only a third of spraying carried out during 2012, whereas manual eradication was 60% of the amount eradicated during 2012.

The department of Choco demonstrates a general trend in increased coca cultivation since 2004, with alternating increments and reductions since 2008. In 2013, 1,661 ha of coca crops were reported, half of the crops reported during 2012; however 7,464 ha were sprayed and 340 ha manually eradicated.

The department of the Valle del Cauca has always registered an area with less than 300 ha of coca crops, but displayed a dramatic increase during 2008 (2,089 ha); displaying a trend in reduction during 2013 of 398 ha, 17% less than in 2012.

Coca fields in Pacific region

Map 8. Coca cultivation density in the Central region, 2013



Source: Colombian Government - National monitoring system supported by UNODC

Central Region

With the exception of the Norte de Santander all the departments within the region show trends for reduction and stability. Excluding the Norte de Santander, the decrease reached 48%; nevertheless there is firm evidence that the territories continue to be vulnerable due to illegal phenomena, in particular in relation to mining. Four departments have less than 100 ha of coca crops: Santander (77 ha), Caldas (8 ha), Boyacá (17 ha) and Cesar (13 ha). In Cundinamarca no coca crops have been reported for the second consecutive year.

Table 6. Coca fields in the Central region, 2007-2013 (in hectares)

Department	2007	2008	2009	2010	2011	2012	2013
Norte de Santander	1,946	2,886	3,037	1,889	3,490	4,516	6,345
Antioquia	9,926	6,096	5,096	5,350	3,104	2,725	991
Bolivar	5,632	5,847	5,346	3,324	2,207	1,968	925
Cordoba	1,858	1,710	3,113	3,889	1,088	1,046	439
Santander	1,325	1,791	1,066	673	595	111	77
Caldas	56	187	186	46	46	16	8
Cesar	-	-	-	-	-	13	13
Boyaca	79	197	204	105	93	10	17
Cundinamarca	131	12	0	32	18	0	0
Total	**20,953**	**18,731**	**18,048**	**15,308**	**10,641**	**10,405**	**8,815**
Annual trend	73%	-11%	-4%	-15%	-30%	-2%	-15%

In 2007 the highest amount of coca crops (20,953 ha) were recorded during the historical series. This initiated a trend in reduction which was maintained at 8,816 ha during 2013, 15% less than reported during 2012. 18% of coca within the country is in the Central Region.

The Central Region consists of nine departments, 72% of the crops are concentrated within the Norte de Santander. For the third consecutive year, only the Norte de Santander department reported an increase in the area of coca cultivation.

The coca crop area within the department of Cordoba has reduced to less than half, 1183 ha were sprayed and 168 ha eradicated manually. The trend in reduction began in 2010 when the department reached the highest level within the entire historical series with 3,889 ha.

In Antioquia, the coca cultivation area has increased since 2007 reaching a maximum level of 9,926 hectares, since then it has maintained a trend in reduction, decreasing to 991 ha in 2013, and the lowest amount in the entire historical series. Aerial spraying has reduced to 944 ha, of which 14% of the territories sprayed during 2012 were almost the same amount as from manual eradication.

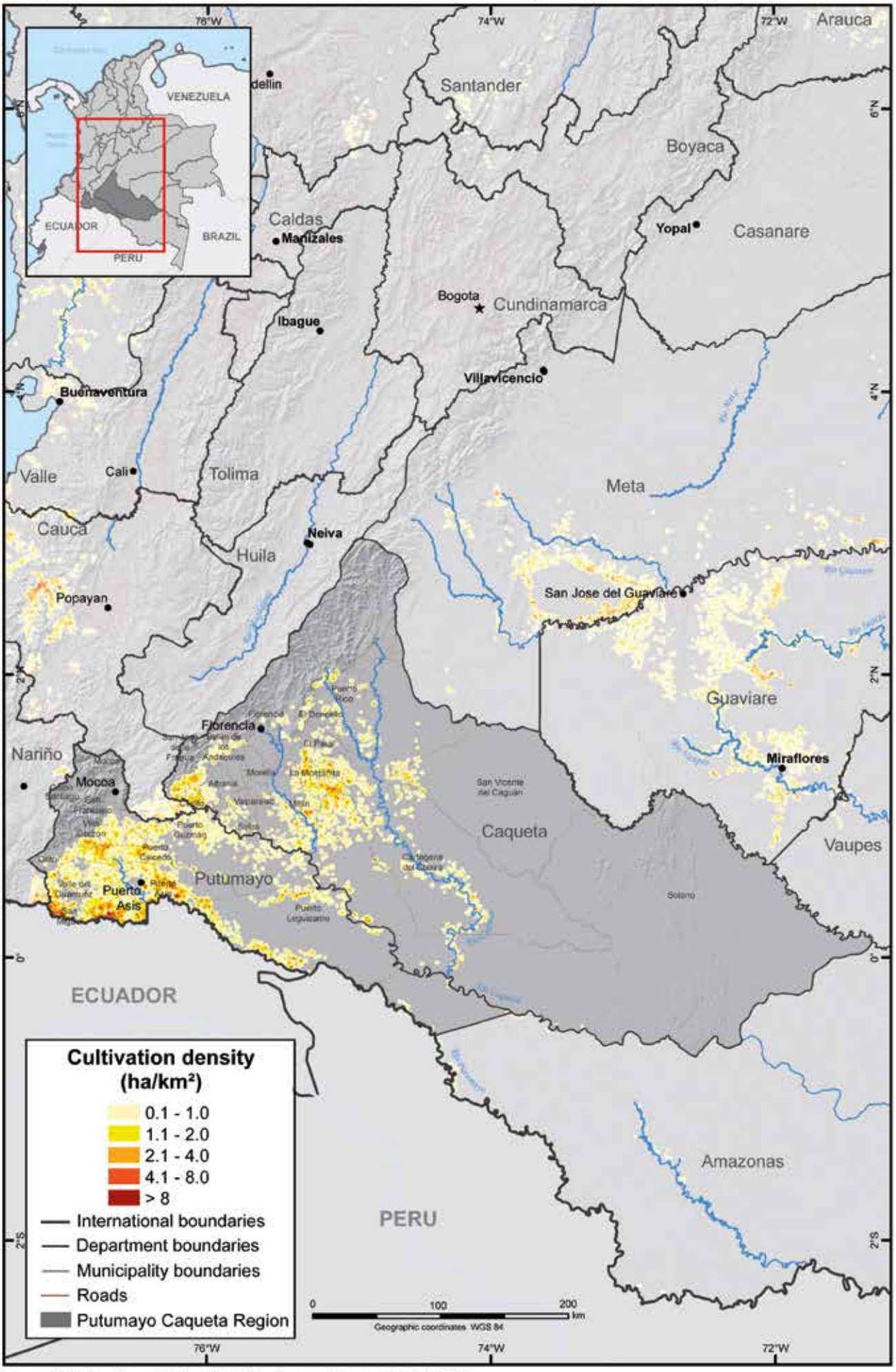
In the department of Bolivar; the coca crops are concentrated within the area known as the Sur de Bolivar; representing between 3% and 8% of the total country between the 2001 to 2006 period. In 2008 the coca cultivation reached the maximum level of 5,847 hectares and as from this year, began a trend in reduction which was maintained up to 2013 when the coca crops reached 925 ha, the lowest amount since UNODC intervention. During 2013 the spraying and manual eradication effort also decreased.

After reaching the lowest level in 2006, the coca crops within the Norte de Santander department began a trend in increment which was maintained up to 2013, reaching 6,345 ha, three times more than the total in 2006 and two thirds of the amount in 2001, the highest amount in the historical series.

The departments of Santander, Boyaca, Caldas and Cundinamarca make up the subregion[17] of Magdalena Medio, demonstrating special characteristics. The trend in reduction in these departments began in 2008, when there were 2.187 ha of coca; with 102 ha in 2013. In Santander, 77ha were detected, in the departments of Cesar, Caldas and Boyaca there are less than 20 hectares of coca crop. The permanence of the last remaining illicit coca crops is of great worry to the Colombian Government, who have designed special strategies designed to confront the vulnerable conditions and threats which have prevented consolidation in the departments free from illicit crops.

17. Based on the geographical continuity of illicit crops the UNODC proposed the definition of subregions to improve understanding of the phenomenon

Map 9. Coca cultivation density in the Putumayo-Caqueta region, 2013



Source: Colombian Government - National monitoring system supported by UNODC

Putumayo – Caqueta Region

The Putumayo – Caqueta region is situated within the south-west of Colombia. In 2001, 42% of the 145,000 ha of coca crops sown were found within this region. In 2004, the crop decreased to 10,800 ha and since then have remained between 7,000 ha and 20,000 ha, without demonstrating a clear trend. In 2013, 25% of coca within the country was found within this region where there was a 22% increase. In both Putumayo and Caqueta there was an increase in coca production.

Table 7. Coca fields in the Putumayo-Caqueta region, 2007-2013 (in hectares)

Department	2007	2008	2009	2010	2011	2012	2013
Putumayo	14,813	9,658	5,633	4,785	9,951	6,148	7,667
Caqueta	6,318	4,303	3,985	2,578	3,327	3,695	4,322
Total	**21,131**	**13,961**	**9,618**	**7,363**	**13,278**	**9,843**	**11,989**
Annual trend	23%	-34%	-30%	-23%	80%	-26%	22%

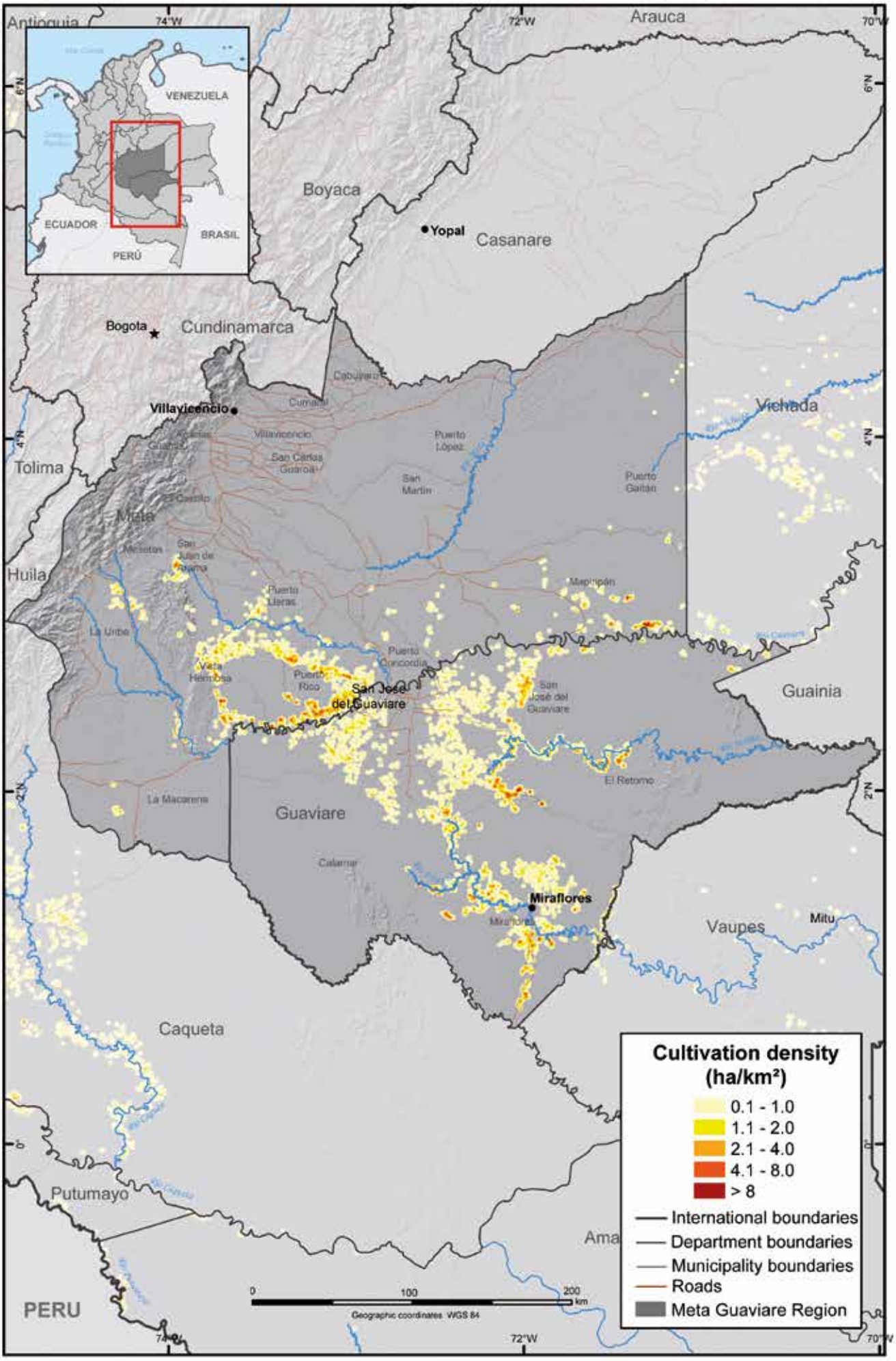
In the Putumayo department, bordering with Ecuador and Peru, the coca crop reached 66,000 hectares (40% of the national total) in 2000. After four years of important consecutive reductions, it reduced to 4,386 hectares (5% of the national total) in 2004, but this trend was modified between 2005 and 2007 with consecutive increments of 105% in 2005, 37% in 2006 and 21% in 2007, from this year onwards there have been alternate increments and reductions without any clear trend. In 2013, there were 7,667 ha, 25% more than in 2012. The increment in the Putumayo is strongly concentrated within the south of the department, in particular within the municipalities of Puerto Asis, Valle del Guamuez and San Miguel. The spraying effort has remained at the same levels as during 2012 with 5,784 ha sprayed in addition to 650 ha of manual eradication.

The coca crops within the Caqueta department reached their lowest historical level during 2010 with 2,578 hectares (4.5% of the national total), followed by a slight yet constant reduction which began in 2001 when 14,516 hectares were reached (10% of the national total). Nevertheless, as from this year onwards there has been a trend in growth maintained up to 2013 with a 17% increase in relation to 2012. During 2013 the crops were concentrated within the foothills to the south of the department and within the Unión Peneya region, a jurisdiction of La Montañita. The aerial spraying operation increased by 35% in relation to 2012, and manual eradication reached 99 ha.

The coca crops within Putumayo and Caqueta maintain the tendency to retain well defined nuclei, within which the crop area increases whilst it decreases within peripheral areas.

Coca fields in Putumayo - Caqueta region

Map 10. Coca cultivation density in the Meta-Guaviare region, 2013



Source: Colombian Government - National monitoring system supported by UNODC
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Meta - Guaviare Region

The Meta-Guaviare region was the area with the highest coca cultivation within the country from 2002 to 2006. As from 2004, a continuous marked trend in reduction began, from 28,509 ha to 6,551 ha in 2012. Nevertheless during 2013, 16% of coca within the country was found within this region and there was an increase (16%) in relation to 2012. The spraying operations reduced to half of those from the previous year and were concentrated within the first half of the year, whilst manual eradication duplicated in Guaviare and reduced to a fifth within Meta.

Table 8. Coca fields in Meta - Guaviare, 2007 – 2013 (in hectares)

Department	2007	2008	2009	2010	2011	2012	2013
Guaviare	9,299	6,629	8,660	5,701	6,839	3,851	4,725
Meta	10,386	5,525	4,469	3,008	3,040	2,699	2,898
Total	**19,685**	**12,154**	**13,129**	**8,709**	**9,879**	**6,550**	**7,623**
Annual trend	-4%	-38%	8%	-34%	13%	-34%	16%

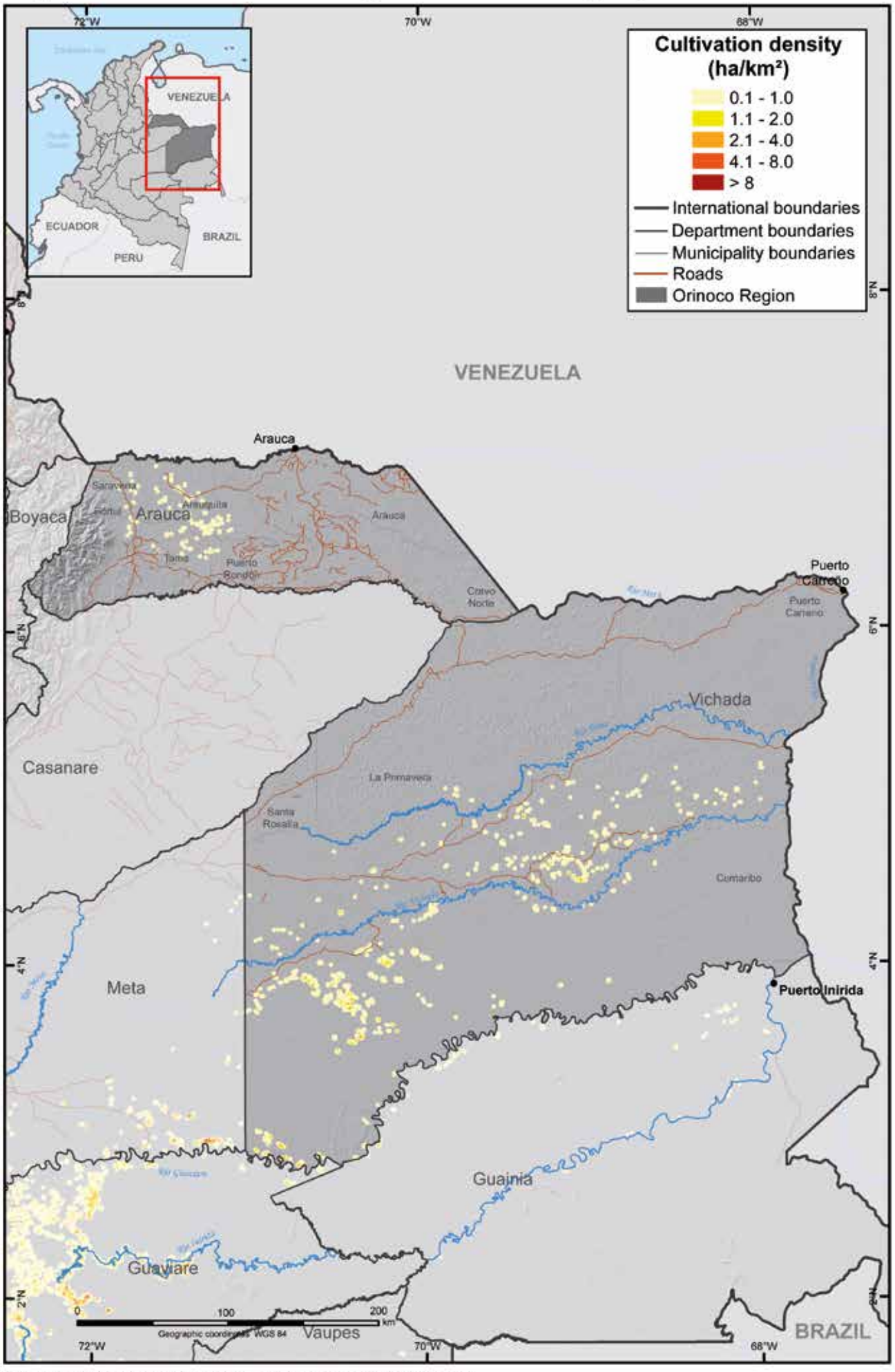
Between 2004 and 2005 the department of Meta had the highest level of coca crops within Colombia. Since then it has continually reduced, reaching the lowest point within the historical series during 2012 with 2,700 hectares. This reduction coincides with the implementation, especially within the zone of La Macarena, the National Consolidation Plan, aimed at strengthening state presence, recuperating a level of security for the population and promoting investment within the private and international agricultural sectors. During 2013 there was a slight increase in coca cultivation (8%) concentrated within the Sierra de la Macarena National Park.

The first appearance of coca cultivation within Colombia was in the Guaviare department, at the end of the seventies. Since then coca cultivation has remained constant within the department. In 2012 the coca crop areas reached the minimum level during the entire historical series (3,851 ha), a seventh of the amount during 2002. In Guaviare there was a general trend in coca crop reduction since 2002, nuanced by the alternation of periods of increase and decrease since 2007. This nuance was maintained in 2013, with a 23% increase prior to a reduction (-43%) in 2012. It is important to be aware of the increase in coca crops within the Sabanas de la Fuga and Lagos del Dorado zones, where crop presence has been reducing for the past five years.

Within the Meta – Guaviare there are two National Parks which are greatly affected by coca cultivation: the National Nukak reserve within the Guaviare department where coca has increased by 39% and the Sierra de la Macarena National Park where coca crops have increased by 12%.

Coca fields in the Meta – Guaviare region

Map 11. Coca cultivation density in the Orinoco region, 2013



Source: Colombian Government - National monitoring system supported by UNODC
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Orinoco Region

The Orinoco region is situated to the west of the country, close to the Venezuelan border. These are areas of plains and highlands, covered with natural grasslands and gallery forests. The coca cultivations are associated with the gallery forests in Vichada and Highland areas in Arauca. The region shows a decrease within the coca crops since 2007, decreasing from 9,334 hectares in 2007 to 782 hectares in 2013.

Table 9. Coca fields in the Orinoco region, 2007 - 2013 (in hectares)

Department	2007	2008	2009	2010	2011	2012	2013
Vichada	7,218	3,174	3,228	2,743	2,264	1,242	713
Arauca	2,116	447	430	247	132	81	69
Total	**9,334**	**3,621**	**3,658**	**2,990**	**2,396**	**1,323**	**782**
Annual trend	37%	-61%	1%	-18%	-20%	-45%	-41%

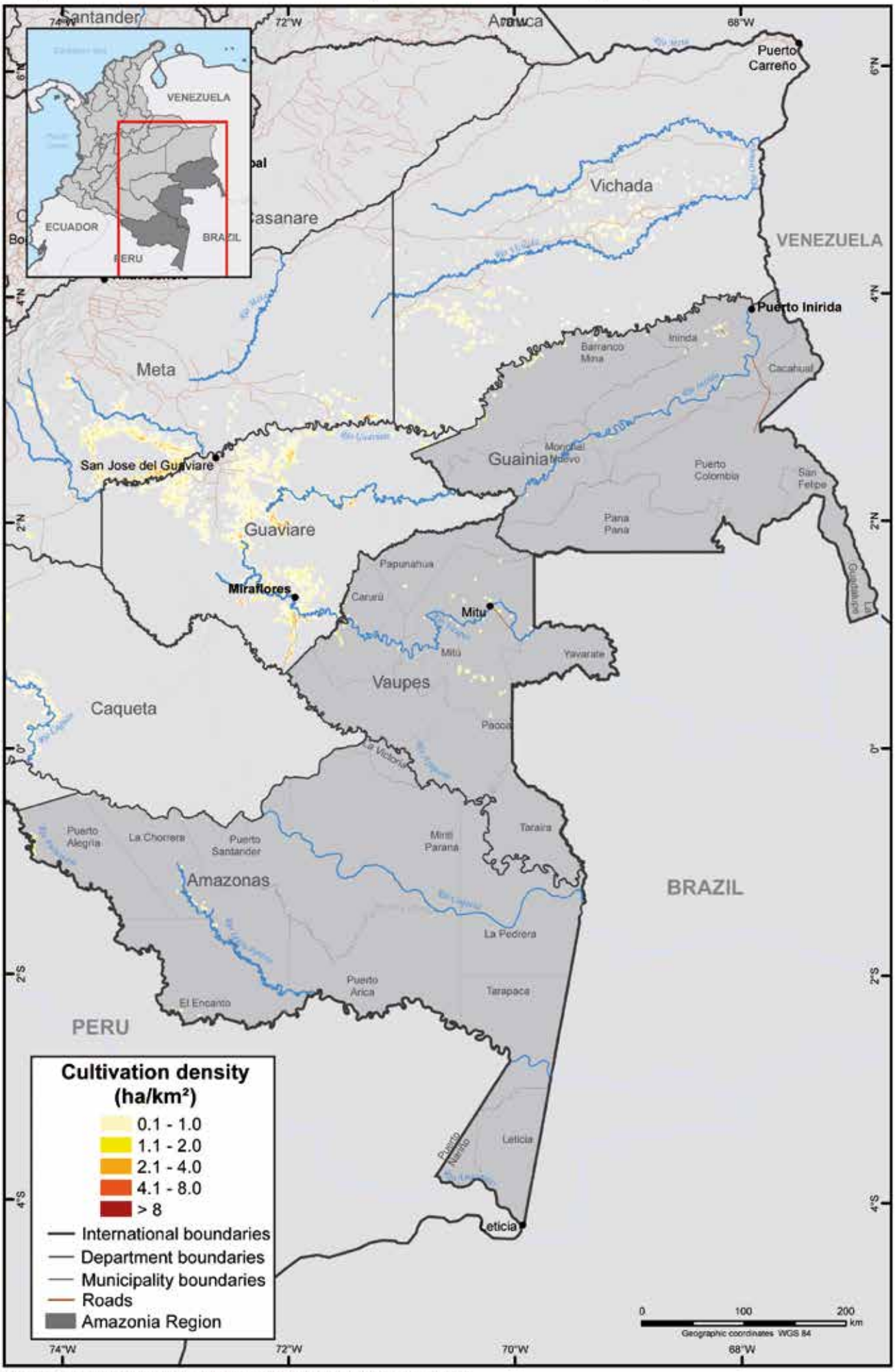
Within the department of Vichada, the coca crop reached its maximum level of 9,200 hectares in 2001 and reduced to 5,523 hectares in 2006. It increased to 7,218 hectares during 2007 and as from this year continued to decrease until 2013, when it reached the lowest level in the entire historical series: 713 hectares. Manual eradication reached 129 hectares and no aerial spraying activities were carried out.

Within the department of Arauca, close to 1,000 hectares of coca were detected for the first time during the year 2000, the highest amount in the historical series was during 2001 (2,749ha) and the lowest during 2013 (69ha). Just as within the neighbouring region of Vichada, during 2007 there was a decrease in coca cultivation enabling the department to enter within the group of departments with less than 100 hectares of coca as from 2012. In 2003 there was a record level of spraying, with 12,000 hectares sprayed. During the last four years no manual eradication activities have been carried out.

Within this region is the El Tuparro National Park which continues to be affected by the presence of coca cultivation.

Coca fields in the Orinoco region

Map 12. Coca cultivation density in the Amazon region, 2013



Source: Colombian Government - National monitoring system supported by UNODC
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Amazon Region

The Amazon region is characterised by a low population density and access related problems as human settlements are along the waterways, with fluvial transport providing the principal means of communication within the region.

Table 10. Coca fields in the Amazon region, 2007 - 2013 (in hectares)

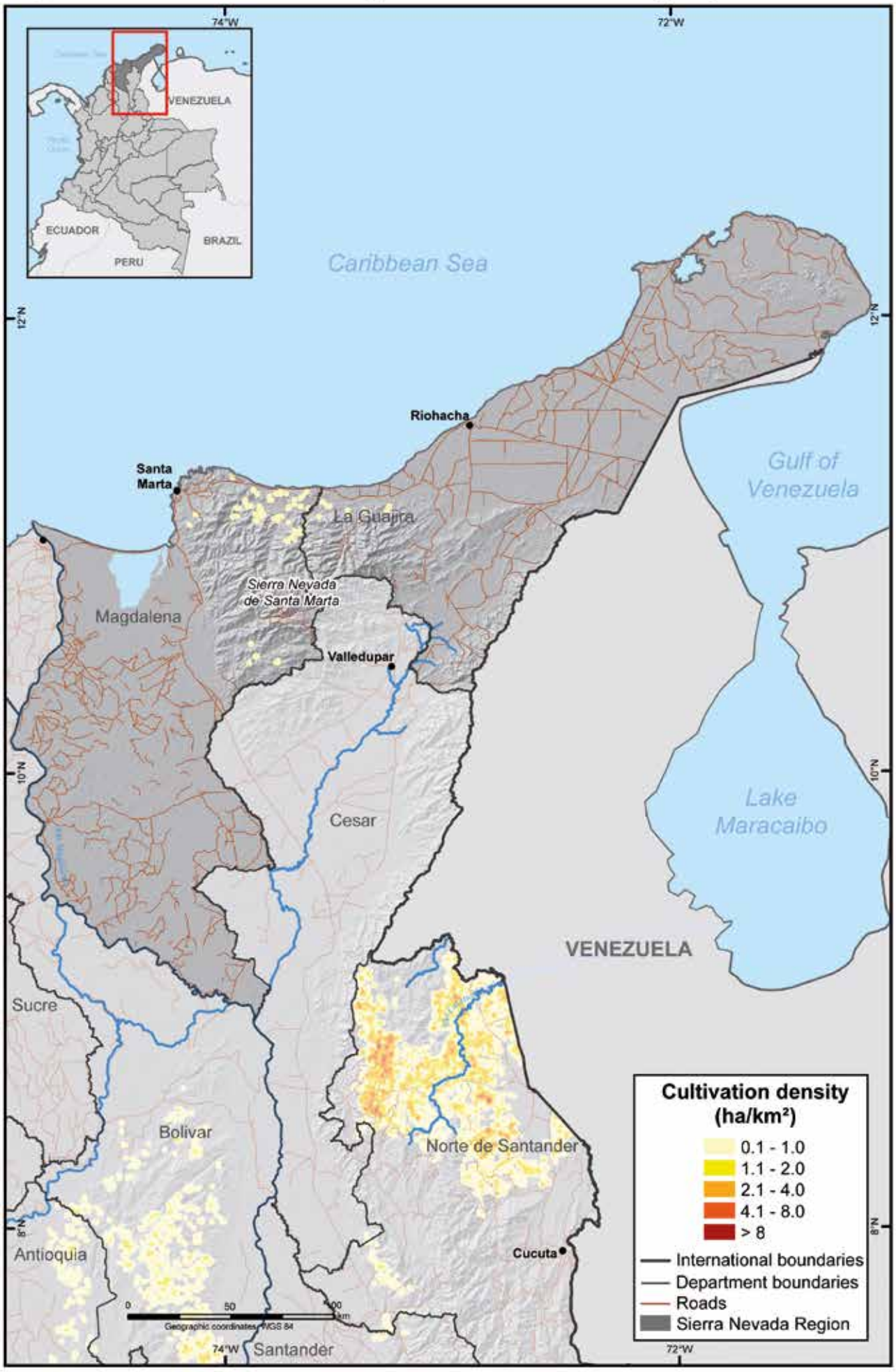
Department	2007	2008	2009	2010	2011	2012	2013
Guainia	623	625	606	446	318	301	81
Vaupes	307	557	395	721	277	254	184
Amazonas	541	836	312	338	122	98	110
Total	**1,471**	**2,018**	**1,313**	**1,505**	**717**	**653**	**375**
Annual trend	-23%	37%	-35%	15%	-52%	-9%	-43%

The Vaupes, Amazonas and Guainia departments, just as within the Putumayo – Caqueta region, belong to the Amazon basin. Although they share various geographical characteristics with the Putumayo and Caqueta, these three departments have not been important centres for coca cultivation and show similar deduction trends. During 2013, coca crops decreased to half of the amount reported during 2012 and represented 1% of coca within the country.

The highest point in the historical series of coca cultivation was during 2001 with 3,768 ha principally concentrated within Vaupes. During 2013, 49% of coca crops were within Vaupes, 29% of the coca cultivation in Amazonas and 22% in Guainia. Coca crops increased in Amazonas but were significantly reduced in Guainia (-220ha) and Vaupes (-70ha). No eradication or spraying activities were carried out within this region.

Coca fields in the Amazon region

Map 13. Coca cultivation density in the Sierra Nevada region, 2013



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

The Sierra Nevada region has a low density of coca crops in relation to the rest of the country. Coca cultivation remained between 500 and 1,500 hectares until 2004, decreasing to 365 hectares in 2007. After a slight increase in 2008, the nucleus reached the lowest level of coca cultivation during 2013 (43 ha) completing a period of three years with less than 100 ha.

Table 11. Coca fields in Sierra Nevada, 2007-2013 (in hectares)

Department	2007	2008	2009	2010	2011	2012	2013
La Guajira	87	160	182	134	16	10	6
Magdalena	278	391	169	121	46	37	37
Total	**365**	**551**	**351**	**255**	**62**	**47**	**43**
Annual trend	-16%	51%	-36%	-27%	-76%	-24%	-9%

Coca crop cultivation has remained within the lowlands between the high mountains in the Sierra Nevada and the Caribbean coast. No spraying activities were carried out in this region since 2005 and in 2013 there were 19 ha of manual eradication reported in Magdalena and 1 ha in la Guajira.

During the past few years, the region has benefited from important contributions within alternative development, conservation and recuperation of ecosystems and environmental strategies, supporting the strengthening of Indigenous cultural traditions. The region is an important tourism centre, with the Tayrona National Park – Sierra Nevada, one of the most important ecological reserves in Latin America, renowned for its biodiversity and the presence of various indigenous groups preserving ancient cultures. The indigenous reserves preserve the ancient custom of coca leaf consumption, the methodology used does not differentiate the variances between coca cultivations for traditional use from cultivations grown for drug production.

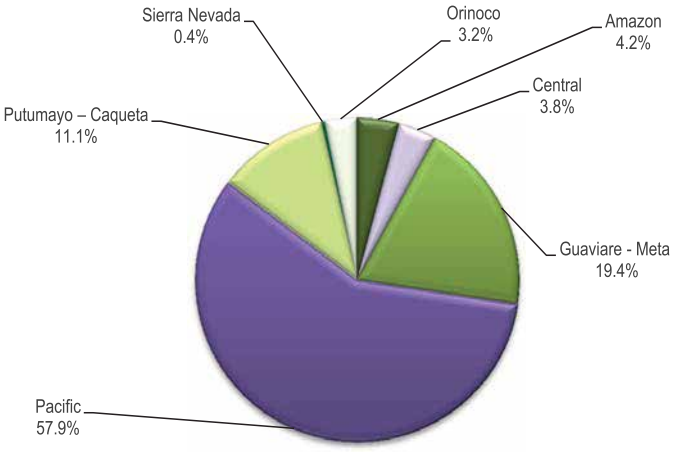
Deforestation in Sierra Nevada region

Coca cultivations within Indigenous Reserves

Information regarding the geographical limits of Indigenous territories within Colombia is reported by the Agustín Codazzi Geographical Institute - IGAC for which the most recent report dates from 2009; after analysing this data using the data from the coca census, a 9% increase was noted, from 5,756 hectares during 2012 to 6,255 ha during 2013. This increase can be observed within the Indigenous territories within the Meta – Guaviare, Central, Sierra Nevada, Putumayo-Caqueta and Pacific regions. The indigenous territories within Orinoco and Amazon regions showed a reduction in coca crops. Coca within indigenous territories represents 13% of the national total.

Annex 4 outlines the coca cultivation areas during the 2012 and 2013 censuses within each Indigenous territory.

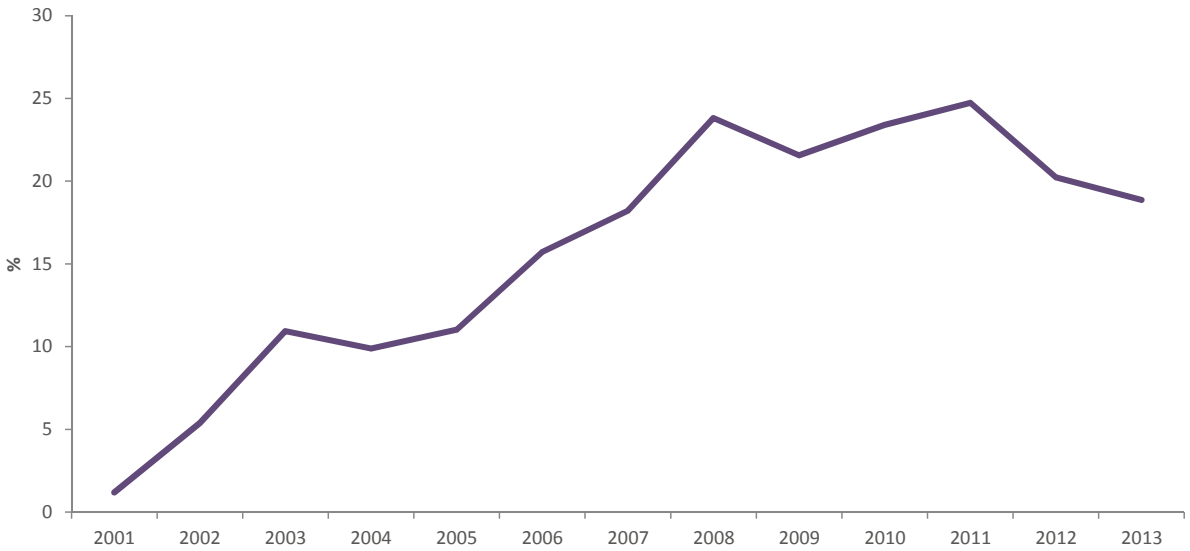
Figure 7. Percentile participation of coca cultivation in indigenous reservations by region, 2012



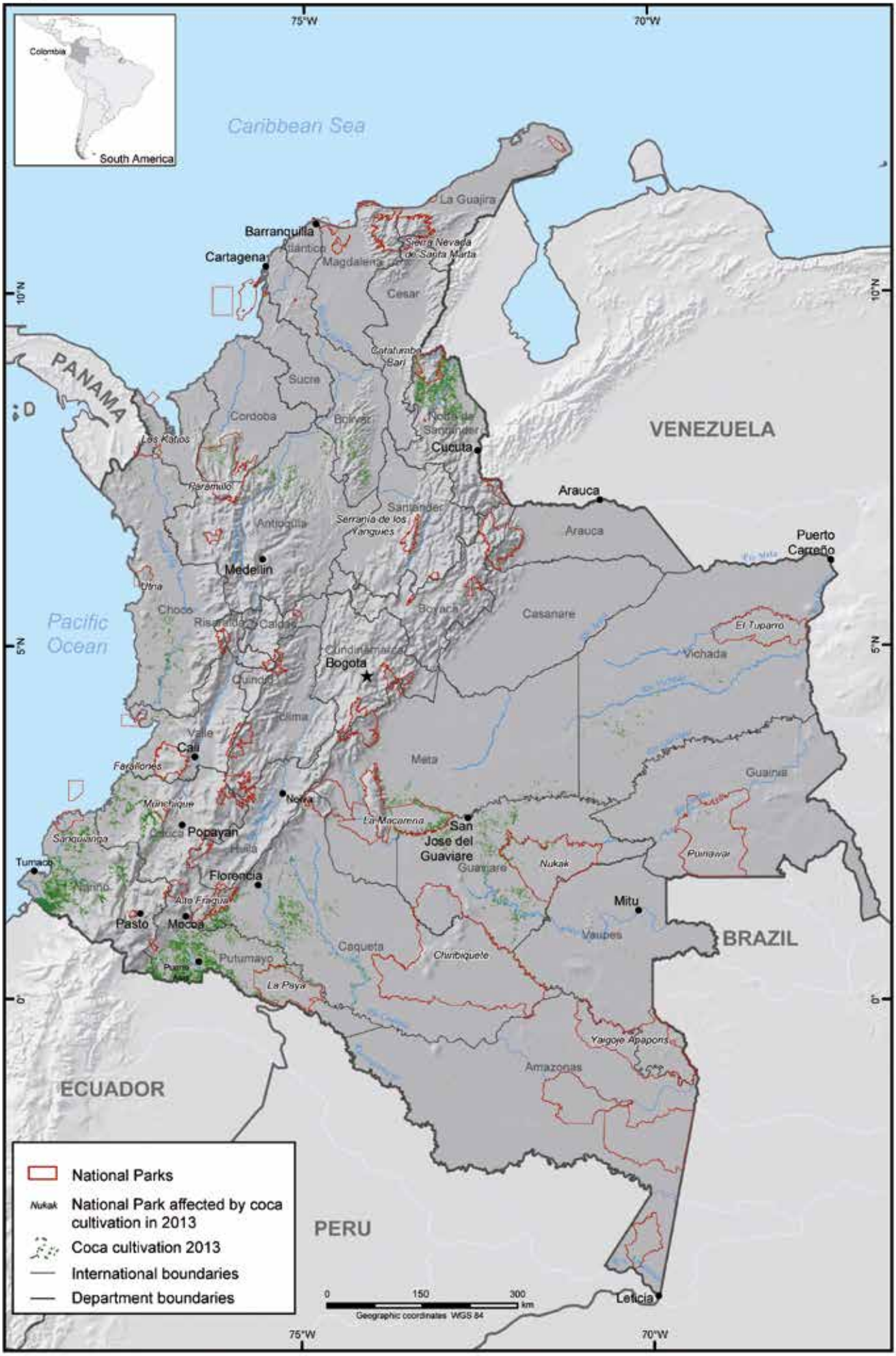
Coca cultivations within the AfroColombian Community Councils

Information regarding the geographical limits of the community councils for Afrodescendents within Colombia is reported by the Agustín Codazzi Geographical Institute – IGAC. In contrast to the national tendency, coca cultivations within community councils show an increase in coca crops from the years 2001 to 2011, with a decrease in crops as from 2012. During the 2012-2013 period, the area of coca cultivation within the community councils varied by -7%, representing stability. This indicates that coca crops within community councils continues to remain at a high level, nearly 19% of the coca within the country is found within these territories.

Figure 8. Percentile participation of coca cultivation in Communal Councils with respect to the national total



Map 14. National Parks and coca cultivation in Colombia, 2013



Sources: Colombian Government; National coca cultivation 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 cultivations within National Parks

The presence of coca cultivations within National Parks has been monitored by the SIMCI since the 2001 census. The data is submitted to the competent authorities to support the identification of actions and projects to ensure the preservation of social and environmental characteristics within the territory.

The National Park limits are defined by the official bodies in charge of their preservation and upkeep. During 2005, these were corrected by satellite imagery supplied by SIMCI, these were newly adjusted during 2012 by UAESPNN and IGAC. The data within the following table is based on the most recent definition.

Of the 58 Natural Parks within Colombia, coca cultivations were found within 17 of these during 2013, two less than during 2012. The coca crop area within National Parks is 3,791 ha, representing 0.026% of the total area covered by National Parks and 8% of the total coca cultivations during this year.

National park coca cultivations increased by 12%. This increase is concentrated within 4 National Parks: Nukak, Sierra de la Macarena, Catatumbo Barí and La Paya, 86% of the coca cultivations within National Parks.

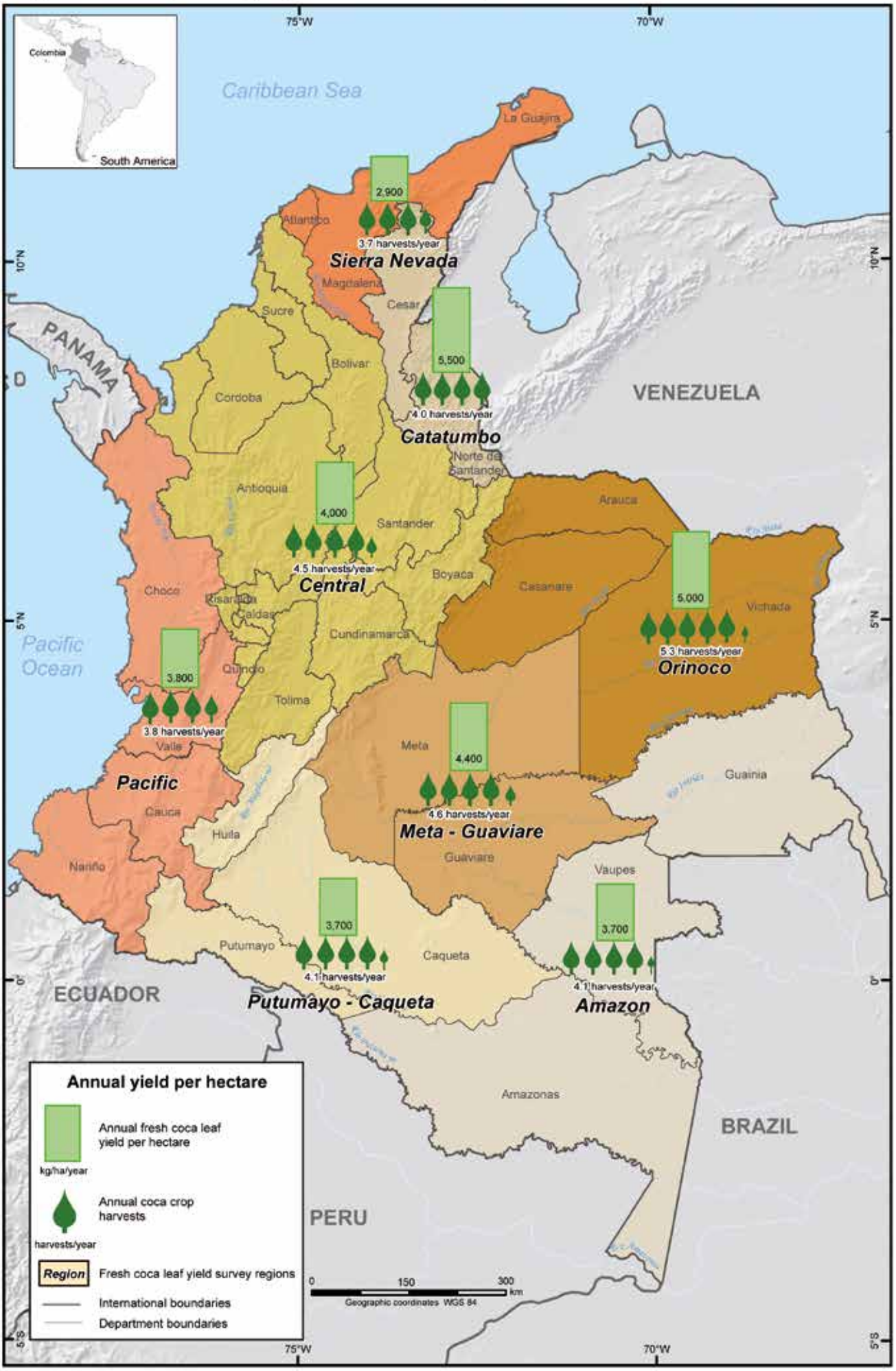
Table 12. Coca cultivation in hectares in National Natural Parks 2011 – 2013[18]

Region	Park	2011	2012	2013
Amazon	Puinawai	42	45	3
	Yaigojé Apaporis	6	9	0
Central	Catatumbo Barí	191	155	298
	Paramillo	446	408	284
	Serranía de los Yariguíes	10	3	2
Meta - Guaviare	Nukak	786	634	882
	Sierra de la Macarena	971	1,466	1,649
	Tinigua	0	5	31
Orinoco	El Tuparro	18	11	6
Pacific	Los Farallones de Cali	79	38	41
	Los Katíos	4	3	2
	Munchique	128	204	117
	Sanquianga	5	7	18
	Utría	1	2	0
Putumayo - Caqueta	Alto Fragua Indi Wasi	6	14	9
	La Paya	500	362	420
	Plantas Medicinales Orito Ingi - Ande	2	5	4
	Serranía de los Churumbelos	1	3	7
Sierra Nevada	Sierra Nevada de Santa Marta	11	4	18
Total		**3,207**	**3,378**	**3,791**

Dynamic of coca crops in Sierra de la Macarena park

18 The data contains area adjustments in relation to the park limits.

Map 15. Coca yield by region in Colombia, 2013



Source: Colombian Government - National monitoring system supported by UNODC
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COCA LEAF, COCA PASTE, COCAINE BASE AND COCAINE HYDROCHLORIDE PRODUCTION

To estimate the potential amount of annual cocaine production within Colombia, the following factors must be considered: i) establishment of the coca production area, measured in hectares; ii) production area capacity, measured in tonnes of fresh coca leaves grown per hectare; iii) alkaloid and cocaine base or coca paste extraction, carried out by farmers or other agents, measured in kilograms of paste or cocaine base produced per tonne of leaves, and iv) crystallization used to obtain cocaine hydrochloride.

It is worth noting that in 2013, two adjustments were made during the methodological processes employed during production calculation and strengthening cocaine precision: the permanence factor used to improve the estimates within the area of manufacture and the differentiation within the cocaine base conversion process incorporating new techniques during the alkaloid extraction process. These adjustments affect the continuation of the historical series, more details relating to its impact and a comparison of estimates with those carried out as part of traditional methodology for the 2009-2013 period can be found in annex 3.

The first adjustment will affect the i) manufacturing area; this corresponds to an estimation of hectares which have produced crops during the year. Within traditional methodology, the production area is calculated based on the average of the previous two censuses. This assumes that the new and abandoned coca crop yields are only produced halfway through the year. If the census measurements enable the identification of areas of coca crop reduction on the 31st December each year, this does not reflect the permanence dynamics of yearly yields. Nor does it account for the influence of external factors such as state intervention, climate and plagues amongst others. For this purpose, an analytical methodology has been developed, to estimate the permanence of coca crops through the construction of a factor which allows for the modelling, yield by yield, of each yearly crop. This is based on the incorporation and systemization of the geo-referenced information, available within the variables that are directly related to forced eradication, aerial spraying and vegetation coverage amongst other factors.[19]

The permanence factor is calculated based on three different types of crops: are they stable, new or abandoned[20]: This aims to include a special analysis of variable behaviour as previously mentioned. Each crop belongs within a subcategory generated in relation to possible external scenarios. The factors vary between zero (0) and one (1), which are directly applied to the area measured within each region. For example, a permanence factor of 1 means that a crop was productive during the entire year, whereas a score of 0.5 indicates that it was only productive for six months. If the permanence factor is zero (0), this indicates that despite coca crop monitoring, the crop was not productive. This indicates that the crop could have been part of interdiction efforts during the entire year[21].

The second adjustment impacts the following ii) alkaloid and cocaine base or coca paste extraction, carried out by farmers or other agents measured in kilograms of paste or cocaine base produced per tonne of leaves. During both traditional and adjusted methodology, the production of coca paste and cocaine base can be differentiated using the agreement made by the manufacturing agent. This refers to either the quantities of the aforementioned products transformed by growers or the quantities of coca leaves that were sold by the producer. This last aspect implies that prior to sale; the process of leaf production is external to the Agricultural Production Unit Coca-UPAC[22]. During coca leaf stockpiling as part of the manufacture process, an external UPAC agent, will carry out different procedures to those from the range of productivity studies[23].

Within traditional methodology, conversion factors relating to coca leaf manufacture and sale are equal to those registered by the cocaine base producer. When the producer increases coca leaf sales and other producers increase

19 Georeferenced information detailing the i) polygons within areas in which manual eradication is implemented by mobile eradication groups GME ii) polygons within the areas sprayed as part of the National Government glysophate spraying programme iii) data from the coca crop census for each cut-off date since 2001, iv) ground coverage recorded in satellite images by SIMCI since the year 2000 v) the images within the coca crop census lacking information due to cloud coverage within these areas

20 The stable area corresponds to the crops identified within the last two consecutive years of the census (t) and (t-1). These are considered to be new crops within the area (t) and did not feature within the previous census (t-1). The abandoned crops refer to the area referenced in the previous census (t-1) and were not featured in the current census (t).

21 In this instance, a sprayed crop will have an unproductive (three month) period, estimated from the crop survival rate. If the crop was manually eradicated, an eight month unproductive period allows the plant to regenerate prior to the next harvest.

22 If the extraction processes are carried out outside of the Agricultural Production Unit by agents differing to the grower, these will continue within the same region due to the high risk posed by transportation. This implies that both leaf manufacture and transformation are directly associated with coca crop areas.

23 The aforementioned refers to information corresponding to interviews carried out with coca farmers in relation to production processes characteristics within UPAC.

stockpiling, the methodology will be adjusted to accommodate a different conversion factor for the transformation of cocaine base. Assuming that the extraction processes are superior to those used by the agricultural coca producer as a result of production scaling and better input usage. This conversion factor was estimated from the results obtained as part of the 33 cocaine base processes, under controlled conditions during the transformation of hydrochloride to cocaine, as part of the framework within the efficiency study carried out by UNODC and the Colombian Government[24]. This will only be released after new information has been received.

Alterations affecting the estimations employed within traditional methodology and adjustments can be seen in the following table:

Table 13. Synthesis of methodological changes within traditional and updated methodology

Estimated value	Indicator variable	Traditional Methodology	Updated Methodology
Annual coca production$_n$ (PHC)	Areas of annual production$_n$ (AP)	AP= average (yearly census$_n$ and yearly censuso$_{n-1}$)	AP= ∑(coca crop census area yearo$_n$, year$_{n-1}$ x permanence factor)
Cocaine base production (PBC) obtained from coca leaf sales: manufactured by agents different to the producer	Factors affecting conversion of coca leaves to base cocaine	The same behaviours can be reported in relation to conversion factors reported by producers as part of productivity studies.	Efficiency during extraction processes is assumed to be greater than the levels registered by the coca producer. A 1.8 conversion factor is obtained, based on productivity studies during the transformation process.

Productivity studies update.

The productivity studies are carried out jointly by the UNODC and the Colombian Government to estimate coca leaf cultivation capacity and the efficiency of extraction processes during the primary production phase. This methodology enables the identification of characteristics displayed by productivity systems, within the Agricultural Production Unit Coca-UPAC, in reference to agricultural practices, selection of variables and crop density amongst other factors.

Given the complexity of dynamics relating to illicit crops within Colombia, there are difficulties preventing this information to be obtained. These are related to access issues, high resources mobility and crop variability.

During 2005, the productivity studies base line was established after the collation of primary material, grouped within eight regions containing territories affected by coca crop production. Due to the high costs and security conditions within zones of influence, only one or two regions can be studied each year. Within the agreement framework employed by the UNODC and the Colombian Government, regional information is collected every 4 years within the country to enable these studies to continue. Currently, two national phases have been completed[25].

Table 14. Year of productivity studies execution, used as a point of reference during the 2013 report

Region	Pacific	Sierra Nevada	Central	Catatumbo	Putumayo-Caqueta	Amazon	Meta-Guaviare	Orinoco
Year of study	2009	2011	2011	2011	2012	2012[(1)]	2013	2013

[1] The productivity studies are not completed within the Amazon region, production estimates are carried out considering results obtained from the Putumayo-Caqueta region.

24 The completion of these processes enables simulation, under strict conditions during coca manufacture, the extraction of the leaf, oxidization and crystallization to produce cocaine hydrochloride. This enables the manufacture chemical substances and variables during coca leaf production. From the results obtained during exercises to date, approximately 1.8kg of cocaine base is produced per coca leaf mt. This is associated with scaled production processes. The aforementioned is in relation to transformation carried out within a live laboratory. Currently the UNODC/SIMCI and the Colombian Government are developing and strengthening the experimental study of alkaloid content within coca leaves as well as laboratory efficiency.

25 In 2005, the information collected during the base line corresponds with the phase I information collated during the productivity study. The regional information between 2007-2010 refers to phase Il. The studies carried out within the Sierra Nevada, Central and Catatumbo regions during 2011, Putumayo-Caqueta during 2012 and the publications within this report referring to Meta -Guaviare y Orinoco correspond with phase III. This phase will be completed during 2014 with the completion of fieldwork within the Pacific region.

At the end of 2013, the third phase has been completed within the Central, Catatumbo, Sierra Nevada, Putumayo–Caqueta, Meta-Guaviare and Orinoco regions. It is estimated that this phase will be completed during 2014, with the completion of productivity studies within the Pacific region. During 2013, field work was completed to collect information from the Meta-Guaviare and Orinoco regions, for which the last updates were during 2008 and 2010.

The methodology employed within productivity studies is probabilistic and enables the extrapolation of information from the population by using a multifactorial approach[26] . The framework is based within the application of harvest test runs and surveys carried out directly with the coca Agricultural Production Unit. It is worth mentioning that when no information can be obtained in relation to coca leaf growers, the geographical component can be used as a reference point to locate the coca crop within an area determined a priori. The location can be obtained from prior annual censuses carried out by SIMCI, within which the population was outlined within framework areas.[27]

2013 productivity studies: Meta – Guaviare and Orinoco regions

During 2013, the sample size within the Meta-Guaviare and Orinoco regions consisted of 450 interviews conducted with agricultural producers, within 150 primary sampling units (1 km^2 grids). This consists of 3 interviews within each primary unit. 400 coca leaf plots were seized for 400 harvest tests. Reduction of coca continued within the area, due to crop performance and the number of harvests per year. This has a direct impact on the potential for fresh coca leaf growth.

Table 15. 2013 Study areas

Region	Area of incidence of coca crops	Coca crops area (2013)
	Hectares	Hectares
Meta-Guaviare	776,679	7,702
Orinoco	183,227	784

Within the Meta-Guaviare region the coca crop area decreased to 25,963 hectares during 2005 and 7,702 hectares during 2013. Fresh coca leaf yields decreased from 9,900 kg/ha/year in 2005 to 4,400 kg/ha/year in 2013, progressively reducing the average crop capacity produced to 6.6 in 2005 and 4.6 in 2013.

Table 16. Changes in fresh coca leaf production in the Meta-Guaviare y Orinoco regions, 2005, 2008, 2010 and 2013

Variable	Measurement unit	Meta-Guaviare			Orinoco		
		2005	2008	2013	2005	2010	2013
Area monitored on 31 Dec	Hectares	25,963	12,154	7,702	9,709	2,990	784
Harvests	Harvests per year	6.6	5.4	4.6	5.4	6.2	5.3
Annual yield of the coca leaf	(kg/ha/year)	9,900	5,100	4,400	7,100	5,000	5,000

26 In reference to sample studies applied during the various selection phases within production units. This type of sampling is in relation to the various selection processes within production units, minimizing costs and improving fieldwork.

27 The framework permits the identification and localisation of units, used as a tool for random selection of elements through geographical referencing and within associated units which are unique, inimitable and identifiable. For a detailed reference of the methodology, the 2005 document "Agricultural characteristics of coca cultivation within Colombia" can be found at http://www.biesimci.org/Documentos/Documentos.html.

The area within Orinoco in which coca has been detected has decreased between 2005 and 2013; from 9,709 hectares to 784 hectares (a 92% reduction). The annual fresh coca leaf production levels have registered a drop of 29.6%, decreasing from 7,100 kg/ha/year in 2005 to 5,000 kg/ha/year in 2010. However, as from 2010 the crop has stabilised and remains at 5,000 kg/ha/year during the 2013 survey. The number of yearly harvests fluctuates between the phases; decreasing from 5.4 in 2005 to 6.2 in 2010 and 5.3 in 2013.

Amongst the principal factors included are: the varieties sown, crop age, use of agricultural practices such as agrochemical usage and factors affecting crops (aerial spraying, manual eradication, climate, plagues and diseases).

The Meta-Guaviare continues to be characterised by cultivations sown as part of monocultures: one crop type. The most popular crop varieties are bitter sweet (Dulce amarga) and bitter (Amarga) (representing a 56.4% and 29.9% of crops). Because of their availability and productivity, it is worth highlighting that the sweet variety, which could correspond to Erytroxilum coca Var Ipadu, was the most popular from 2005 to 2008.

The crop density decrease from 13,803 plants/ha in 2005 to 10,828 plants/ha in 2013, registering a 21.6% reduction. During 2013, it was detected that 57% of the crop was at a productive age of between one to three years old, with around 4.3 tm/ha/year. However during 2008 the majority of the crops were older than four (59%) whilst the maximum yields correspond to plants that are between two and four years old with close to 8,7 tm/ha/year in 2005 and 5,9 tm/ha/year in 2008.

Currently 87% of region´s producers have reported no losses. During cases in which producers have experienced a loss or decrease in their crops, the main causes are related to climate and other factors. During 2005, 44% of producers reported having experienced a loss or decrease in crop production, the principal factors behind this were plague and diseases, whilst 68% of producers noted a loss as a result of climate and spraying during 2008.

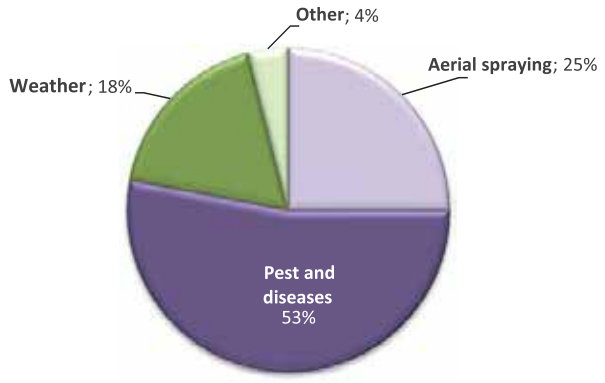
Table 17. Age of coca crops within the Meta-Guaviare region, 2005, 2008, 2013

Age	Meta-Guaviare						Orinoco					
	2005		2008		2013		2005		2010		2013	
	% fields	Yield m.t/ ha/ year	% fields	Yield m.t/ ha/ year	% fields	Yield m.t/ ha/ year	% fields	Yield m.t/ ha/ year	% fields	Yield m.t/ ha/ year	% fields	Yield m.t/ ha/ year
Less than one year old	13.00%	5.7	0.60%	5.5	7.30%	4.2	1.40%	0.7			5.40%	3.4
1 to 2 years old	14.00%	9.6	8.20%	5.5	27.10%	4.4	1.00%	9.2	4.80%	3.7	19.20%	4.1
2 to 3 years old	19.00%	8.8	14.60%	5.9	29.90%	4.2	16.60%	8.5	22.30%	5.7	32.20%	5.1
3 to 4 years old	25.00%	8.7	17.40%	5.9	17.80%	4.3	18.00%	7.3	19.80%	5.6	19.30%	5.7
4 to 5 years old	12.00%	8.3	14.80%	5.8	9.70%	5	16.70%	7	22.10%	5.2	13.40%	4.8
5 years old or more	17.00%	6.3	44.40%	4.5	8.20%	5.1	46.30%	8.1	31.00%	4.5	10.50%	5.2

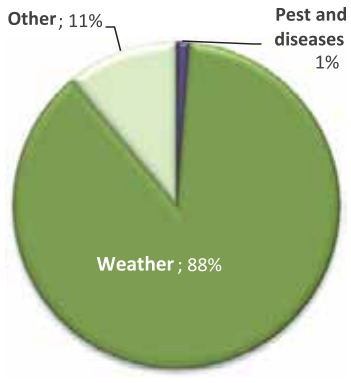
Table 18. Coca crops with decreased or lost yield, based on interviews with coca farmers within Meta-Guaviare and Orinoco

Variable	Meta-Guaviare			Orinoco		
	2005	2008	2013	2005	2010	2013
% fields with loss or decrease	44%	68%	13%	52%	75%	15%
% fields without loss	56%	32%	87%	48%	25%	85%

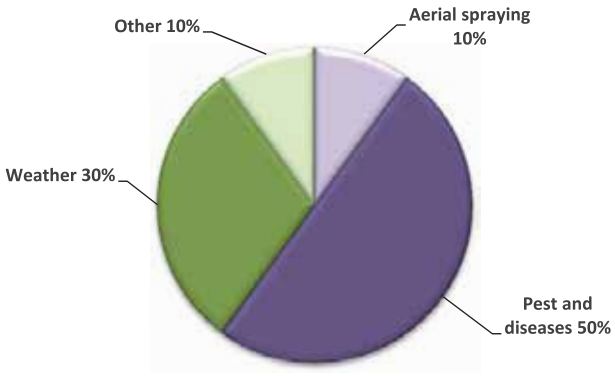
Figure 9. Causes of reduction or lass crops in Meta - Guaviare and Orinoco



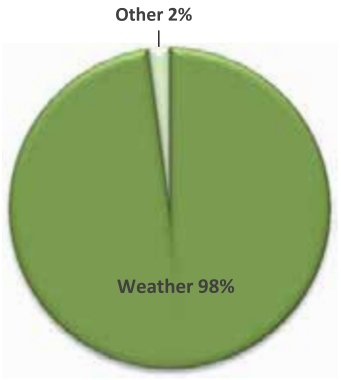
Causes of reduction or lass crops in Meta - Guaviare, 2005



Causes of reduction or lass crops in Meta - Guaviare, 2013



Causes of reduction or lass crops in and Orinoco, 2005



Causes of reduction or lass crops in and Orinoco, 2013

During 2005 and 2010 more than half of the coca crop within Orinoco was over four years old, whilst in 2013 51.4% of the crop produced was between one and three years old with an average yield of around 4.6 mt/ha/year. Crop density decreased from 13,886 plants/ha to 10,027 plants/ha (a 27.8% reduction). Coca producers (15%) within the region reported losses or decrements within crop production, mostly related to climate (98%), the same trend as noted during 2010 (75%).

The Peluceña coca variety continues to predominantly grow within the Orinoco region. However its presence within coca yields has decreased from 68% in 2010 to 33.9% in 2013. This is due to increased cultivations of bitter sweet coca (Dulce amarga) (33.9%), bitter coca (Amarga) (24.7%) and wild coca (Silvestre) (12.6%) coca crop varieties. During previous phases, these crops did not exceed the 4.6% average. Coca producers report that the selection of coca crop variety depends on its availability within the market.

In both the Meta-Guaviare and Orinoco regions, there has been a reduction in the use of agro chemicals during crop cultivation.

Coca crops can be sown at various times throughout the year and their frequency can be based on climatic, agrological and agronomic factors (soil quality, change of/use of herbicides, pesticides and fertilisers), aerial spraying, manual eradication and the varieties sown, amongst other factors. In some occasions, the crop frequency is determined by the coca market instead of the crop maturity.

Within the Meta-Guaviare region the average amount of harvests per year decreased to 55 days (6.6 harvests per year) in 2005 to 79 days (4.6 harvests per year) in 2013. In the case of the Orinoco region, the yearly harvests have remained stable at around 5.3 harvests (69 days).

Table 19. Yearly coca harvests regional average, 2005-2013

Region	Based measurement (2005)	Actual measurement [1]
Amazon[2]	3.9	4.1
Catatumbo	4.5	4
Sur de Bolivar	3.3	4.5
Meta-Guaviare	6.6	4.6
Orinoco	5.4	5.3
Pacific	2.5	3.8
Putumayo-Caqueta	3.9	4.1
Sierra Nevada	3.4	3.7
Average yield of coca leaf	4.5	4.1

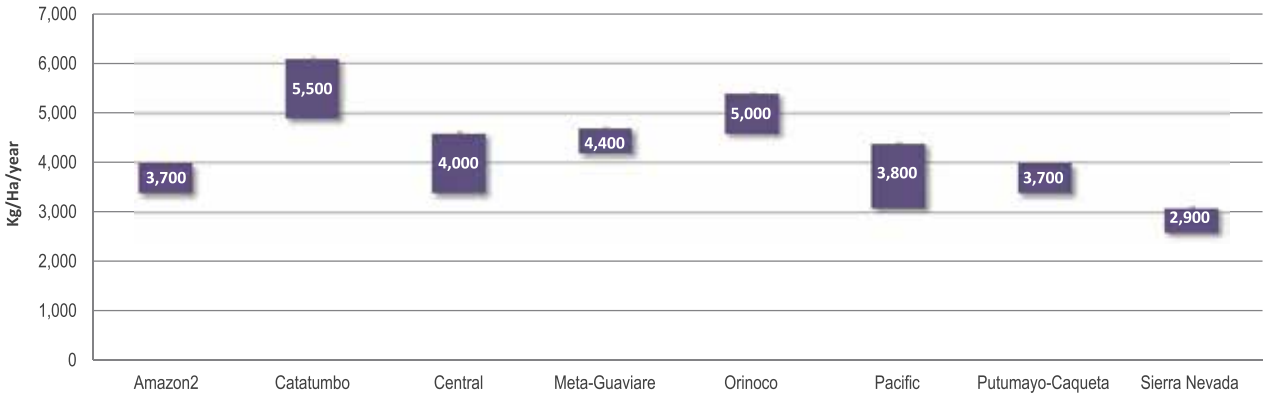
Note:
[1] The years referenced during the productivity study can be found in table 14.
[2] The productivity studies have not analysed information from the Amazon region as production estimates are carried out with the inclusion of results from the Putumayo-Caqueta region.

Table 20. Average annual yield per region in Colombia

Region[1]	Annual yield of fresh coca leaf kg/ha/year	Lower boundary of the 95% reliability interval (kg/ha/year)	Upper boundary of the 95% reliability interval (kg/ha/year)
Amazon[2]	3,700	3,400	4,000
Catatumbo	5,500	4,900	6,100
Central	4,000	3,400	4,600
Meta-Guaviare	4,400	4,200	4,700
Orinoco	5,000	4,600	5,400
Pacific	3,800	3,100	4,400
Putumayo-Caqueta	3,700	3,400	4,000
Sierra Nevada	2,900	2,600	3,100
Average yield of coca leaf	4,100	3,600	4,600

Note:
[1] The years referenced during the productivity study can be found in table 14.
[2] The productivity studies have not analysed information from the Amazon region as production estimates are carried out with the inclusion of results from the Putumayo-Caqueta region.

Figure 10. Regional annual average of coca leaf yield (reliability intervals)[28]



The distinction between coca paste and cocaine base is not easy to establish. This is due to the fact that the terms used by producers are interchangeable. In this case, reference is made to cocaine base as producers note the use of potassium permanganate during coca leaf processing.

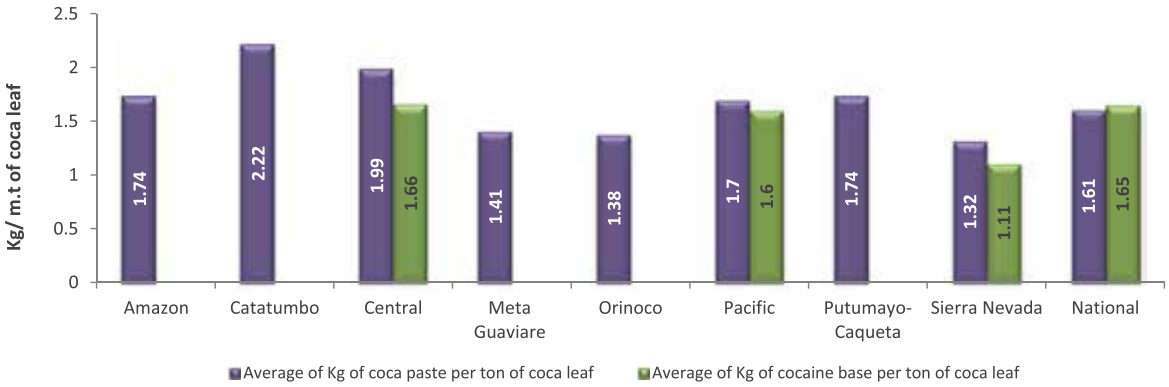
28. The limits were obtained from the 95% confidence interval.

Table 21. Regional average, in kilograms of coca paste and cocaine base obtained per metric tonne of coca leaves, 2005, 2008, 2010 and 2013

Variable	Meta-Guaviare			Orinoco		
	2005	2008	2013	2005	2010	2013
Kg basic coca paste/m.t of coca leaf	1.53	1.5	1.41	-	1.12	1.38
Kg cocaine base/m.t of coca leaf	1.52	1.5	-	1.73	-	-

Within regional updates, expertise employed during the extraction process of alkaloids from coca paste resulted in yields of se 1.41 Kg/tm of fresh coca leaves registered in Meta-Guaviare and 1.38 Kg/tm of fresh coca leaves in Orinoco. According to the coca producer report, the inputs required for the coca leaf transformation process are relatively similar within all regions and face no limitations in relation to the availability of chemical substances. During restricted events, substitute substances can be used during the process. It is reported that gasoline is the product which is most used during the paste and or cocaine base production process. The producers can substitute gasoline for ACPM and ammonium or water to a lesser extent.

Figure 11. Coca paste and cocaine base regional average obtained per metric tonne of coca leaves



Note:

[1] The years referenced during the productivity study can be found in table 14.
[2] The productivity studies have not analysed information from the Amazon region as production estimates are carried out with the inclusion of results from the Putumayo-Caqueta region.

During 2005 the alkaloid extraction processes were associated with the Agricultural Production Unit Coca-UPAC, during which the growers themselves carried out the direct transformation process of fresh coca leaves to coca paste or cocaine base (65% of producers). During the last few years, the trend for coca leaf production has been copied by third parties (63% of producers). In the case of the Meta-Guaviare and Orinoco regions the prevalence of farm based alkaloid extraction by the producer (86% and 95% of the PAC respectively), continues the commercialization of fresh coca leaves within these areas (corresponding to 14% and 5% of the PAC).

Table 22. Division of work during the fresh coca leaf sale and production processes

Region	% coca growers that sell coca leaf	% coca growers that process coca paste	% coca growers that process cocaine base
Amazon	64%	36%	0%
Catatumbo	82%	18%	0%
Central	59%	8%	33%
Meta-Guaviare	14%	86%	0%
Orinoco	5%	95%	0%
Pacific	78%	21%	1%
Putumayo-Caqueta	64%	36%	0%
Sierra Nevada	91%	4%	5%
All regions	63%	35%	2%

Note:
[1] The years referenced during the productivity study can be found in table 14.
[2] The productivity studies have not analysed information from the Amazon region as production estimates are carried out with the inclusion of results from the Putumayo-Caqueta region.

POTENTIAL COCA LEAF, COCA PASTE, COCAINE BASE AND COCAINE HYDROCHLORIDE PRODUCTION

The productivity studies enable information to be obtained, not only in relation to fresh coca leaf yields, but also in relation to the transformation process of the coca leaf to coca paste or cocaine base. The estimates within this chapter are carried out by applying the two techniques previously mentioned: permanence factor and the factor for base cocaine conversion, as referred to during 2013 and 2012

Table 23 Productive area, coca yields and coca leaf production per region, 2012-2013

Region	2012			2013		
	Estimated productive area	Annual yield of coca leaf Kg/ha/year*	Production of coca leaf	Estimated productive area	Annual yield of coca leaf Kg/ha/year*	Production of coca leaf
	Hectares		m.t	Hectares		m.t
Amazon	759	3,700	2,800	617	3,700	2,300
Catatumbo	3,959	5,500	21,800	5,604	5,500	30,800
Central	6,643	4,000	26,600	4,543	4,000	18,200
Meta-Guaviare	9,360	5,100	47,700	8,072	4,400	35,500
Orinoco	2,089	5,000	10,400	1,278	5,000	6,400
Pacific	20,661	3,800	78,500	16,818	3,800	63,900
Putumayo-Caqueta	14,410	3,700	53,300	13,783	3,700	51,000
Sierra Nevada	61	2,900	200	45	2,900	100
National	57,941	4,200	241,300	50,760	4,100	208,200

Note:
[1] The years referenced during the productivity study can be found in table 14.
[2] The productivity studies have not analysed information from the Amazon region as production estimates are carried out with the inclusion of results from the Putumayo-Caqueta region.
[3] Annual cultivation area production estimates are estimated based on the permanence factor and crop yield
[4] Coca leaf production is rounded up to the nearest hundred.

The data indicates the trend in reduced production, estimated from fresh coca leaves. It has decreased from 241,300 mt in 2012 to 208,200 mt in 2013[29], registering a 13.7% drop in the productive area to 12.4% in the annual coca yields of fresh coca leaf per hectare to only 2.4%. If the census area, established from 31st December appears to remain in the same level between 2012 and 2013 (48,000 hectares), the estimates relating to production area directly include crop behaviour within hectares reported in censuses from the last three years.

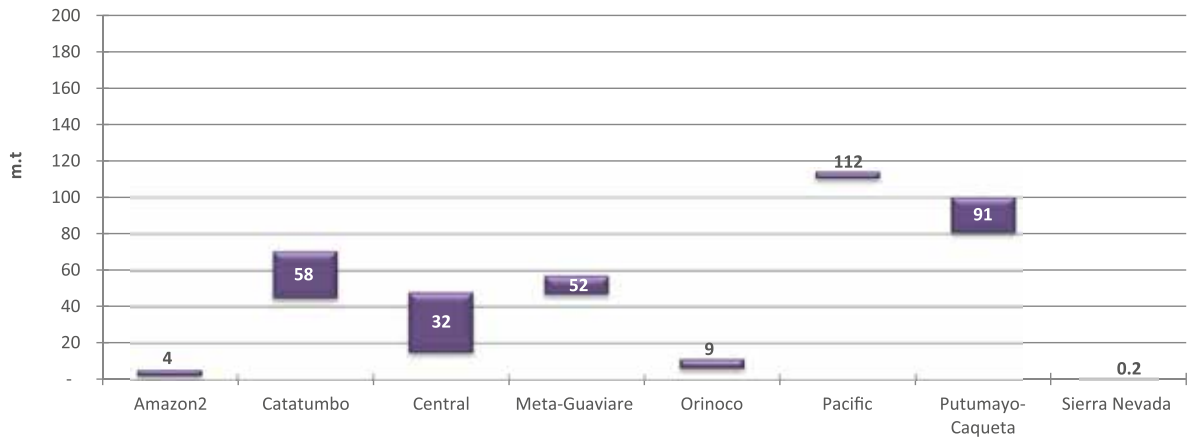
In the national context, considering that 35% of growers process coca paste, within the total estimated production of coca leaves (208,200 mt) around 76,219 mt is transformed into 123 mt of coca paste. 123 mt of coca paste is equivalent to 121 mt of base cocaine, if this paste to base conversion method is used. In addition, it is estimated that 2% of producers directly process cocaine base, obtaining around 11 mt of cocaine base. This requires around 6,697 mt of coca leaves. The remaining fresh coca leaves (125,300 mt) are directly processed into base cocaine, by another agent,[30] producing 252 tm. Consequently, the potential base cocaine production, from coca paste and the direct coca leaf production, decreased from 412 mt in 2012 to 358 mt in 2013[31].

Apart from the results obtained during productivity studies, coca paste and base cocaine production estimates and the conversion rates used (average level of base cocaine purity=81% base cocaine to cocaine hydrochloride 1:1), base cocaine production during 2013 was equivalent to 249 - 331 tm of pure cocaine[32]. Considering the different parameters

29 The potential production of fresh coca leaves is estimated based on the variation within cultivated hectares from the past two censuses. These oscillate between 188.900 mt - 293.800 mt in 2012 and 178.900 mt - 237.500 mt in 2013
30 In accordance with the productivity study it is estimated that 63% of national coca producers sell the fresh leaf
31 The potential production of cocaine base is estimated based on the variety within crop hectares, varying during the past two years mt - 500 mt in 2012 and 307 mt - 408 mt in 2013
32 For cocaine production estimates, data obtained during the productivity studies and elementary transformation processes are used (base cocaine leaf) along with data obtained from the US Government in relation to the secondary transformation processes (base cocaine hydrochloride at 1:1) and base purity (81%). Potential cocaine hydrochloride production is estimated based on the variety within the cultivated hectares which oscillated during the last two censuses between 262 mt – 405 mt in 2012 and 249 mt - 331 mt in 2013.

obtained during cultivation, extraction and alkaloid refinement processes, it is estimated that in relation to the potential production of 7 Kg of base cocaine per hectare of sown crop and 5.7 Kg of cocaine hydrochloride per hectare of crop sown[33].

Figure 12. Estimated cocaine base potential production, 2013



Note:[1] The productivity studies have not analysed information from the Amazon region as production estimates are carried out including results from the Putumayo-Caqueta region.

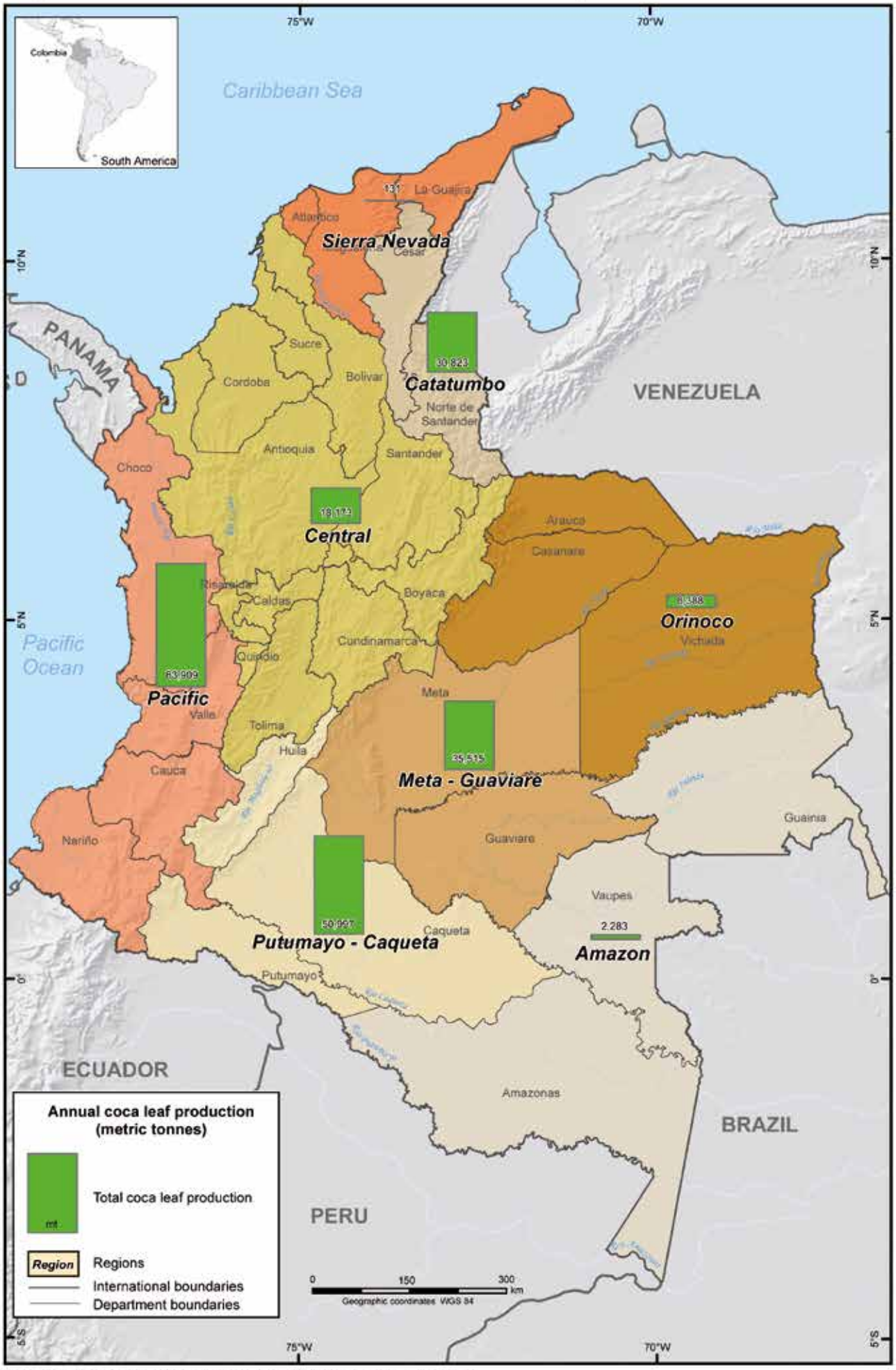
[2] Cocaine production estimates are carried out within the annual production area, estimated based on the permanence factor, distribution of work and the sales and transformation process of coca leaves, crop yields and extraction processes within each of the regions within the study, under controlled conditions. The purity percentage is not calculated within the estimates.

[3] Potential production estimates are determined based on interval calculations of 95% of the annual coca crop area. Based on these intervals and establishment of parameters, the production potential in relation to the highest and lowest limits of confidence intervals can be calculated using coca yields, coca paste and cocaine base and the market structure based on productivity studies and the coca conversion rate during the transformation process. The aforementioned is a result of the minimum and maximum production potential estimates within different links of the chain associated with the variety of coca hectares within the coca censuses.

If no market for pure cocaine hydrochloride exists, the obtained result of 290 tm can be used as a point of reference to compare production levels with those in other countries. It has been identified that cocaine has varying grades of dilution or ´´adulteration´´ within the consumer market distribution chain. In accordance with the results from studies carried out by SIMCI/UNODC, the Colombian Government and other institutions such as PRADICAN and PRELAC, it has been found that other substances are used to "cut" cocaine within Colombia, the most common are caffeine, lactose, lidocaine, creatinine and manitol. In addition to the aforementioned, several processes use rindex category substances such as diltiazem and levamisole; ii) the drug is modified directly within production laboratories, with substances that have marked pharmaceutical effects, which increase the alkaloid effects and are harmful to human health.

33 These estimates correspond with the national scenario, in which all crops are extracted in cocaine base and refined within cocaine hydrochloride

Map 16. Annual coca leaf production in Colombia, 2013



Source: Colombian Government - 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

PRICES [34]

Within any market, price is the mechanism used for exchange. The drugs and chemical substances production market is no exception. This exists not only because the substances are on offer but also as individuals are looking to acquire these products. Price acts as a mediation mechanism between all parties. Price monitoring contributes to a better understanding of the drug and substance production market.

Before carrying out an analysis of the marketing trends and coca leaf and derivatives prices, illicit market needs must be established. This is where all actors outside of the law converge, and during many occasions, determine the prices or marketing patterns. These are not always in accordance with the traditional laws of supply and demand that are present in other illicit markets with similar products[35].

During 2013, just as during the previous year, an increased number of growers preferred to sell the coca leaf prior to the coca paste extraction process. This growing trend, which has now reached 63% within coca producers. This trend converges with the establishment of specialist laboratories for the extraction of coca paste and refinement of cocaine base. It is possible that the concentration of coca paste production is being reflected within coca leaf prices, a kilogram was sold at an average of$2,014/kg (US$1.1/kg), a 22% decrease in relation to 2012.

When the price of coca paste is analysed, despite the marked decrease in production (which fell by 14.4%) the price has remained constant, with the price remaining at $1,889,093/kg (US$1,011/kg), scarcely 2.4% more than the previous year.

The 2013 price of base cocaine has decreased by 3%, remaining a $ 2,616,344/kg (US$1,432/kg); however, the prices registered in the different regions vary between $2,000,000/kg and $3,700,000/kg, in relation to market dynamics. The trend to process cocaine base outside of the Agricultural Production Unit Coca-UPAC (only 2% of producers use direct production at the farm) combined with the marketing of reoxidised base[36]. The aforementioned contributes to the strengthening of the coca market hypothesis changes, to better separate manufacturing processes and varying production risks between other agents. This could explain how it is not only the base cocaine prices that are variable but also specialization of the alkaloid extraction processes, as fresh coca leaf stockpiling is carried out by different Agricultural and Coca-PAC producers.

A 5.9% increase can be observed within the price of cocaine hydrochloride in Colombia, marketed at $4,710,658/kg (US$2,521/kg) in 2013. This could be the result of decreased production which fell by 13%. By any means, cocaine hydrochloride prices remain relatively stable, despite advances in the traffic of other nodal points. In this current report, cocaine hydrochloride prices are presented for the country´s principal cities.[37]

In Colombia, the prices of products derived from the production and transformation of coca crops retains no logical relation to variations within supply and demand. During the last few years, several hypotheses have been established in relation to the behaviour of a monopsony type market structure within cultivation zones. Here the individual buyer can pressure the production exchange, presenting a controlled price scenario, in which the prices are lower in relation to the prices agreed within the competitive market (a high number of buyers and claimants).This situation forces producers to adopt the enforced conditions. Under these conditions, changes within the prices could be interpreted as an incentive or disincentive for production, marketing and trafficking.

34 Since 2005, UNODC/SIMCI has a drug price and derivative products information system that is based on the collection and systemisation of data obtained during the different manufacturing processes within the principal cities in the country. For 2013, pricing data within Colombia has been collated in cultivation areas and within areas influenced by manufacture, thanks to the work of persons linked to the UNODC programmes and the National police anti-narcotics department (DIRAN).

35 Just as those generated during economic activities, rural crops and manufacture of chemical products.

36 Reoxidised base is the product of the oxidation process, used to clean the impurities and homogenize enabling the best quality of cocaine hydrochloride during crystallisation. Different prices have been detected in relation to this type of product, in excess of $3.000.000 per kilogram.

37 Cocaine hydrochloride prices are obtained via the National Police of Colombia - antinarcotics department (DIRAN) from Police command reports within different cities.

Table 24. Average coca leaf and derivative product prices, 2008-2013

Product	2009		2010		2011		2012		2013		% change 2012-2013	
	US$/ kg	´000$/ kg	US$/ kg	´000 $/ kg	US$/ kg	´000 $/ kg	US$/ kg	´000 $/ kg	US$/ kg	´000 $/kg	US$	´000$
Cocaine [1]	2,147	4,587	2,439	4,623	2,468	4,556	2,473	4,447	2,521	4,711	1.9	5.9
Cocaine base [2]	1,249	2,674	1,475	2,795	1,407	2,596	1,499	2,696	1,432	2,616	-4.5	-3
Coca paste [2]	956	2,048	1,015	1,923	1,003	1,852	1,025	1,844	1,011	1,889	-1.4	2.4
Coca leaf [2]	1.3	2.8	1.3	2.5	1.3	2.4	1.4	2.6	1.1	2	-25.1	-22.2

Source: UNODC-SIMCI, DIRAN and UACT.
Note:
[1] The prices are recorded within the principal cities. Purity levels are not known.
[2] The prices correspond with the registrations recorded at production sites.
[3] The average TRM for 2013 is COL$ 1,869.

Given the illegal and clandestine character of the coca market, the monopsony feasibility is maintained within the implementation of a series of strategies used on behalf of the buyer. These transcend market mechanisms, favouring their maintenance within highly vulnerable areas within social and institutional settings. It has become evident that within certain zones, coca cultivation creates economies where the exchange of goods and services is in the format of an exchange between the sale for production and the commercialisation of coca leaves and its products. This relates to the scarcity of money in circulation, providing a coercive incentive for these types of economies within the territories.[38].

In addition to the aforementioned, factors such as public order, the amount of fresh coca leaves on offer, climate, access and transport issues and possible changes within the production process (standardisation of intermediate products), could influence levels of commercialisation.

During the price behavioural analysis, the purity levels within coca paste, cocaine base and cocaine hydrochloride are unknown. This variable is determined the commercial presence within differing markets. Complementary secondary information, in relation to the purity of cocaine hydrochloride, forms part of the analysis of seizures carried out within the United States[39].

There is a differential margin between prices determined by new products emerging during marketing and transportation, displaying a tendency to increase as a result of traffic intermediation. This differential is affected depending on the point at which transactions are carried out. In the case of coca leaf prices and coca products derived from extraction, whilst the commercialisation of these products increases, the relation with producer zones decreases. However in the case of cocaine hydrochloride there are considerable increments within transit and consumer countries.

Based on the studies carried out by SIMCI and PRELAC/UE, with the participation of supervisory authorities within Colombia and the variation of prices reported within the World Drugs Report, it is possible to schematize cocaine pricing dynamics from the producer to the wholesale manufacture at the end destination. As explained previously, one kg of cocaine hydrochloride, with a purity of around 80%[40], costs around US$2,521 within a manufacturing zone. The same kg once at the port of shipment, is marketed at around US$2,800/kg. Subsequently, within a transit country such as Costa Rica or Guatemala, it could cost US$10,000 or US$15,000, or increase to US$ 17,000 if in Mexico. Subsequently, the price will continue to rise depending on the final destination of the same kg once marketed. If the price is for wholesale, this can reach between US$20,000 and US$25,000 in Miami. If the kg is transported to the north of the country its price will continue to increase. In relation to cocaine marketing within the European market, the price can vary between €30,000 and €57,000. If, finally, it is destined for the Asian market or the Australian market it can reach over US$150,000. Currently there is no direct relation between cocaine purity and market price.

Within this context, evident concern is expressed by the international community in relation to the dynamics presented during production, marketing and trafficking of drugs. As long as a tendency for the international mobility of inputs, resources and intermediary products for cocaine manufacture is observed.

38 This type of phenomena have been evident within productivity studies fieldwork and within the pricing system developed by the UNODC and the Colombian Government. The order of magnitude is unknown.
39 The cocaine hydrochloride purity figure from the drug seized by the United States Government was the following for the following years: 2007 (83%), 2008 (79.2%), 2009 (75.2%), 2010 (73.4%), 2011 (75.1%) and 2012 (77, 7%).
40 In accordance with SIMCI and PRELAC/UE , it has been possible to establish what other substances the cocaine hydrochloride is cut with within manufacturing regions in Colombia (Levamisole, Caffeine, carbohydrates, etc.) at approximately 20%

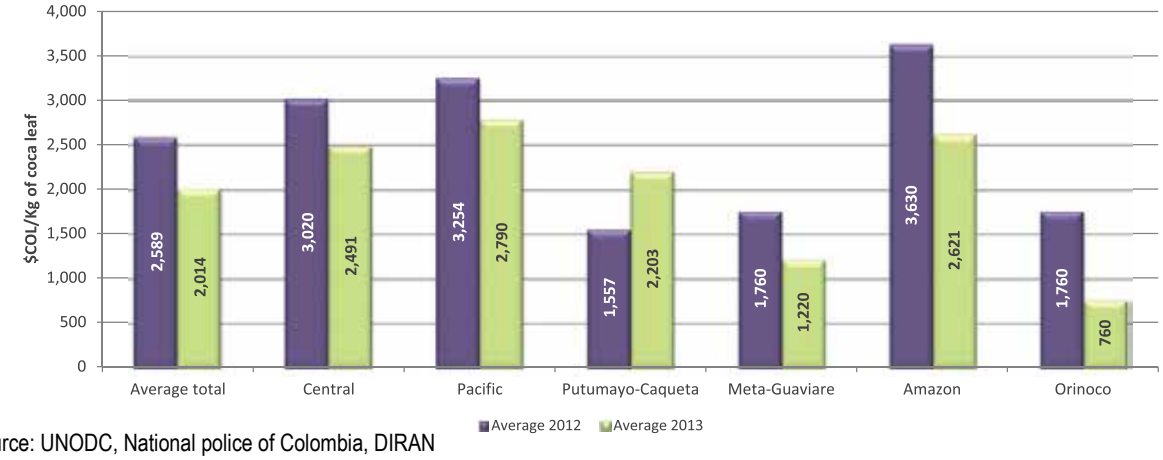
The profit margins created between production zones and final destinations have determined the trafficking of cocaine and its intermediary products during the past few years. This diversifies the mobility and marketing of inputs, resources and intermediary products, with the apparent objective of minimizing the risks and increasing profits. The new tend consists of the trafficking of considerable quantities of base cocaine into transit countries or final destination countries, where the product is refined and converted into hydrochloride. This approach is evident in dismantle of laboratories for base cocaine hydrochloride conversion within countries in South and Central America and within Europe.

Coca leaf prices

In 2013, the average price of fresh coca leaves was reported at $2,014/kg (US$1.1/kg) a 22% decrease in price in comparison with the previous year. Within the regional, decreases in price were registered in Orinoco (56.8%), Meta-Guaviare (30.7%), Amazon (27.8%), Central (17.5%), and Pacific (14.3%). It is important to mention that despite these decrements, the price of coca leaves within the Pacific region continues to be the highest in the country.

In the case of the Putumayo-Caqueta region, there was a 41.5% increase in the price of coca leaves in relation to 2012. The increase in coca prices within this region can be explained by the appearance of a new coca leaf variety within the Pringa María, Amarga (bitter) o Caturra strains, for which the price varies at around $60,000 ($4,800/kg). This is the situation within the Doncello and Florencia municipalities within Caqueta, just as within the Villagarzón municipality in Putumayo. In the Pacific region, especially within the Nariño department, a price differentiation can be noted between the Caucana ($2,750/kg) and TingoMaría ($3,200/kg) coca varieties. It is worth mentioned that in both Nariño and Putumayo there have been an increase in the coca crop area during 2013.

Figure 13. Average fresh coca leaf prices according to regions, 2012-2013

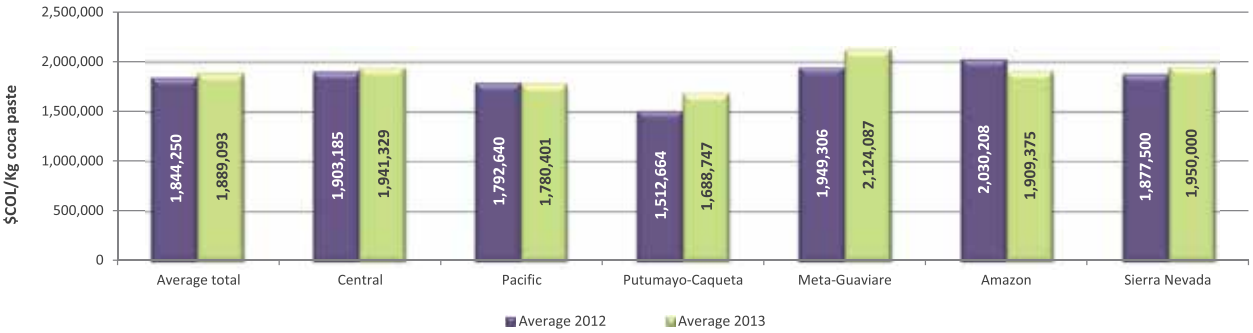


Source: UNODC, National police of Colombia, DIRAN
Calculation: UNODC - SIMCI

Coca paste prices

During 2013, the average price per kilogram of coca paste was recorded at $1,889,093 (US$1,011/kg), with a 2.4% increase in relation to the same price period during the previous year. Price increases have been noted within the regional setting, in the Putumayo-Caqueta (11.6%), Meta-Guaviare (9%) y Sierra Nevada (6%) regions, while in Central and Amazonia remained stable and in Pacific a decreased 6% is observed.

Figure 14. Average coca paste prices according to region, 2012-2013



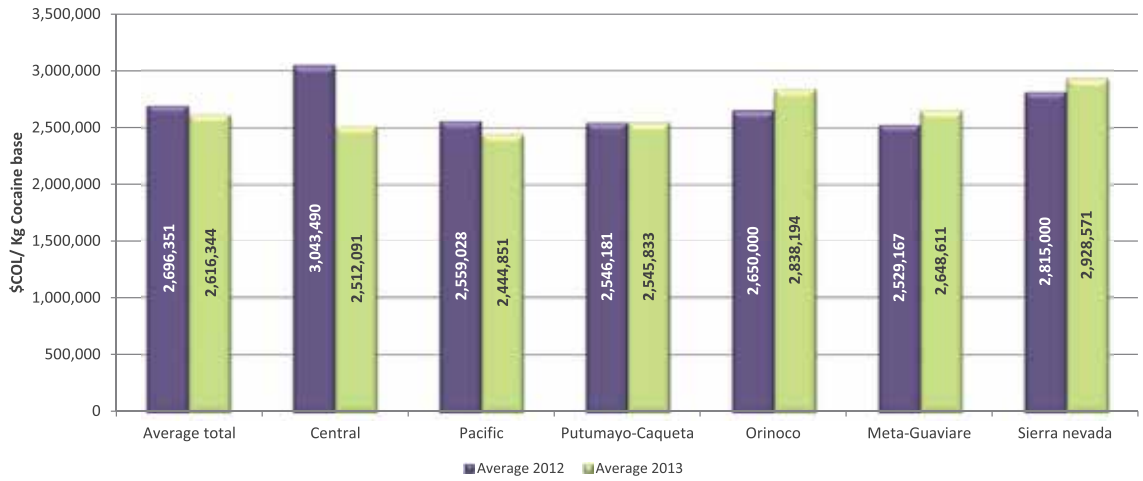
Source: UNODC, National police of Colombia, DIRAN
Calculation: UNODC - SIMCI

It is interesting to note that the number of growers involved in the coca leaf to coca paste processing phase has decreased, prices have steadily begun. It is possible that these new specialist actors involved in the processing and manufacturing of coca paste are driving the price increase of this sub product. At the same time, it is decreasing the price of the coca leaf which they purchase from the coca farmers.

Cocaine base prices

During 2013, the average cocaine base price was registered at $2,616,344 (U S$ 1,432/kg); a 3% decrease in relation to the same period during the previous year. The Central and Pacific regions recorded a 17, 5% and 4. 5% drop in price, whilst the prices increased within the Orinoco (7.1%) Meta-Guaviare (4.7%) and Sierra Nevada (4%) regions. The prices remained stable within the Putumayo-Caqueta region.

Figure 15. Average prices of cocaine base according to region, 2012 - 2013



Source: UNODC, National police of Colombia, DIRAN
Calculation: UNODC - SIMCI

The cocaine base prices are much higher than the coca paste prices (38.5%) this could possibly explain the difference in manufacturing costs for these processes. In the case of cocaine base, the producer must add additional chemical products such as potassium permanganate to eliminate impurities, just as sulphuric acid and ammonium are added to retrieve the product.

Field studies carried out in relation to this topic demonstrate that the producers detected higher earnings when they carried out the extraction process themselves. Nevertheless, with stable prices and faced with the changes during the production process; increasingly expensive input products, smaller yields and increased involvement of third parties and middle men during the sale and manufacturing of coca leaves, the production processes within this chain could be changing, incorporating new manufacturing links as an aim to standardize the intermediate products (base/paste), guaranteeing better quality and a more efficient extraction process.

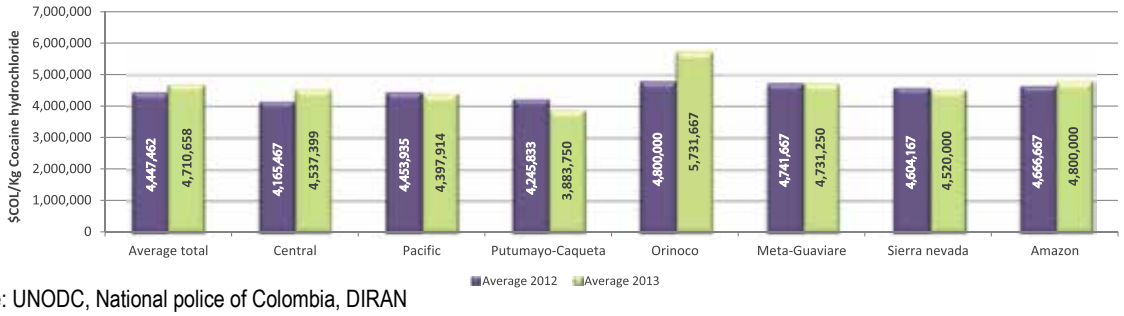
As a result of this standardising trend, there is a market for reoxidised cocaine base. This product is much more valuable as the manufacturing process begins using the stockpiled coca paste and is prior to crystallization. The marketing of this product has been noted amongst laboratories and it is used as means of payment equivalent to that used for further processing[41]. In accordance with information obtained from the pricing system in 2013, a kilogram of reoxidised cocaine base varies between $3,000,000/kg and $$3,700,000/kg, this trend is found within all regions within the country.

Cocaine hydrochloride prices

During 2013, the average price of cocaine hydrochloride was $4,710,658 (US$ 2,521/Kg) demonstrating a 5% increase in relation to the previous year. In a regional setting, the Orinoco and Central regions contributed to this trend, presenting a price increase of 19.4% and 8.9% in relation to the same period during 2012. Decreases in cocaine hydrochloride prices were noted in the Putumayo-Caqueta (8.5%), Pacific (1.8%) and Meta-Guaviare (1.3%) regions. During the last part of 2013, the registered price per kg of cocaine hydrochloride in San Andrés was around $11 million pesos.

41 Preliminary results are in the Characterisation study of the fresh coca leaf to cocaine hydrochloride transformation process carried out by PRELAC/UE and SIMCI.

Figure 16. Average cocaine hydrochloride price according to region, 2012-2013

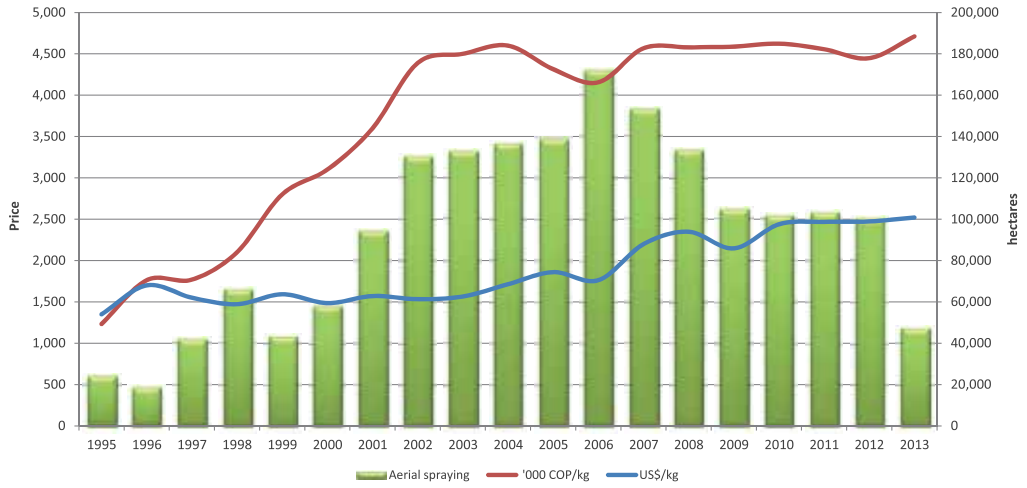


Source: UNODC, National police of Colombia, DIRAN
Calculation: UNODC - SIMCI
Note: Prices reported in the main cities.

In accordance with the information provided by SIMCI/UNODC in relation to the pricing system, the drop in price within the Pacific region, in particular within the Nariño department, could be influenced by a decrease in product quality. This is due to the increment of new producers (with less experience), which has resulted in a recruitment drive of ´chemists´, experts who will be working as part of the manufacturing process of cocaine base to cocaine hydrochloride. This is trafficked to other countries by international cartels.

The prices correspond to data obtained in principal cities within the country, which increase as does the trafficking of the drug to other nodal points. In addition to this, aims to increase the profits made during manufacturing, within the distribution chain to consumer markets, cocaine has varying grades of dilution or ´adulteration´, as a result of its mixing with other substances which could passively or actively interact with the alkaloid. In passive mixes, lactose is used, amongst other substances, to increase the weight of the product. In active mixes, substances such as levamisole, phenacetin and lidocaine are used, not only for the aforementioned purpose but also to increase the psychoactive effects for the consumer.

Figure 17. Average annual cocaine prices and spraying levels, 1995-2013



Source: Prices, SIMCI and DIRAN; aerial spraying, DIRAN

Annual income per hectare of coca crop during 2013

Primary products, the first link during the manufacturing chain, carried out by the Agricultural Production Unit Coca-UPAC, contribute to the creation of particular dynamics, from the creation of supply chains, reoxidation and crystallization processes, to primary products usage as payment within local economies in areas influenced by the crop.

In the first instance, even though fresh coca leaves are produced, the agricultural producers have appropriated the alkaloid extraction processes through the obtention of coca paste or cocaine base, depending on the region. It has been detected that in some regions the market is focused on the sale of fresh coca leaves, produced by armed groups acting outside the law or minifundistas third parties-middle men. In the second instance, the exchange of coca products is socially acceptable in some productive regions within the country, so that agricultural coca producers can access the necessary input products for its production as well as an exchange of goods and services. This consists of a regulation mechanism in relation to the scarcity of money in circulation. This situation can be conceived as an incentive for the perpetuation of this phenomenon within these territories.

During the last few years, the changes in the division of labour and crop expertise trends have directly impacted the reduction in potential earnings for the Agricultural Production Unit Coca-UPAC. The potential coca crop producer earnings are estimated based on the information obtained from prices, in combination with coca leaf performance studies and the division of labour during the sales process, the economic structure of agricultural production units and the transformation of fresh coca leaves.

As a result of the aforementioned, the Agricultural Production Unit Coca-UPAC can estimate potential earnings from the sale of coca derived products from the following processes: i) cultivation from the sale of fresh coca leaves ii) alkaloid extraction from the sale of coca paste, or iii) alkaloid extraction using potassium permanganate to obtain cocaine base for subsequent sale. It is estimated that in 2013, around 61,700 households, with an average of 5 people per household, had income related to these activities. Each household member can earn around US$1,000 per year.

Table 25. Potential annual income for Agricultural producers and Coca-PAC per hectare, during the cultivation and alkaloid extraction process, 2013

Product	Annual price average		Annual income per hectare	
	´000$/kg	US$/kg	´000$/kg	US$/hectares
Coca leaf	2	1.1	11,007	5,922
Coca paste	1,889	1,011	12,589	6,737
Cocaine base	2,616	1,432	12,370	6,771

Note:
[1] The annual yield (kg/hectares) of coca paste and cocaine base corresponds to the production level obtained by the Agricultural Unit and Coca-UPAC producers.

In the first instance, faced by the stability of manufactured fresh coca leaves in relation to 2012 and a large proportion of PAC that sell the leaf, an 18% decrease is estimated in income that the producers potentially could receive for the sale of fresh coca leaves per hectare of crop. This behaviour is primarily due to the drop in price.

The decrease in potential earnings per hectare or crop by 9.8% in relation to the previous year, are due to the sale of base paste produced by UPAC (it is estimated that this is 35% of UPAC). This is explained by two factors: i) hectares where production contributed to the extraction process fell 15.7% during the same period, and ii) 86% of producers in the Meta-Guaviare region produced coca paste (a 10.3% increase in relation to the amount reported in 2008).

It is estimated that 2% of PAC that currently manufacture cocaine base have seen their potential earnings per hectare decrease by around 43%. The differences between these earnings and intermediary costs during the production process highlight the generated value added to the UPACs at national level. The table outlines the estimates for value added during coca cultivation and alkaloid extraction for coca base or cocaine base, differentiating the operator carrying out the process from the agricultural coca producer or a third party[42].

Table 26. Potential annual income for coca leaf derived products per hectare of coca crop, 2013

Product	Production 2013	Prices	Gross income		Net income	
	kg	US$/kg	´000 US$	´000.000 COP $	´000 US$	´000.000 COP $
Coca leaf	125,301,600	1.1	170,100	310,800	141,700	258,900
Coca paste	122,800	1,011	128,100	234,000	45,800	83,600
Cocaine base	11,100	1,432	15,200	27,800	6,100	11,200
Farm production value			**313,400**	**572,600**	**193,600**	**353,800**

Note:
[1] Each process is directly carried out with the Agricultural Production Unit and Coca-UPAC.
[2.] Figures are rounded up to the next number

42 It is worth highlighting that the added value estimates are carried out considering productivity and production studies within the Agricultural Production Unit for coca. The input costs are estimated based on the development of producer price indices, in relation to the input baskets. Within the differentiation of economic agents, the production process is carried out using the labour division and the sale and transformation of coca leaves as a reference. The income was estimated from methodology updates and production estimates.

To calculate the total value of farm based production, the total coca leaf manufacturing process is used, in addition to coca paste and cocaine base production. This is carried out in direct relation to the primary producer (grower). The best available prices for the sale of coca leaves, coca paste and cocaine base are obtained from the farm. The brut earnings from primary manufacture (at the farm) were estimated at US$ 313 million (US$ 194 million discounting production costs).

Nevertheless, the reduction of brut income is not homogenous to coca producing regions. In Putumayo-Caqueta and Catatumbo an average increase in the brut earnings is estimated for agricultural products, with coca at 21.4% and 23.3% respectively in relation to the amount registered in 2012, this is possibly associated with market incentives in relation to increased crop sales and is directed at the changes within the extraction processes. This dynamic will generate the specialisation of cocaine base oxidations processes, in which the the producer uses different agents to aim to homogenise inputs, optimise resources and reduce business risk.

In agreement with the information registered in the pricing system and the previous update of productivity studies, in Putumayo-Caqueta 64% of the growers sell coca leaves at a higher price (41.5% in relation to the previous year), whilst 36% of the producers extract the coca paste alkaloid with a price increment of 11.6%. This scenario results in the generation of economic incentives during coca leaf sale and the extraction of cocaine base paste: in 2008 it was identified that 66% of the growers carried out oxidation at farms (base cocaine production), a process which is not currently used.

In Catatumbo, there was an increase by 41.6% of the potential coca leaf offering, this was the only region with this tendency, as 82% of growers sells the leaf at the highest price registered within the country ($2,700 kg/leaf) whilst 18% carry out alkaloid extraction within the Agricultural-Prodution Unit for coca-UPAC, where prices are decreasing. In this context, the market could be generating incentives for expertise within the extraction process carried out by third parties, as the coca stockpile generates increased performance.

From a macroeconomic viewpoint, the DANE estimates that during the value added from production and transformation of illicit crops represented 0.2% of the national GDP, within which economic activity from illicit crops represented 1.3% of the agricultural, forestry, hunting and fishing sector.[43] The previous estimates correspond with the results from Enclave: illicit crops within the agricultural and industrial phases, Base 2005[44], an investigation with the aim to identify economic flow derived from the production and transformation of illicit crops within the Colombian economy.

43 According to DANE, the Colombian pricing GDP in 2012(pr) was estimated at around $665,441 billion pesos (US$356 billion dollars) whilst the agricultural, forestry, hunting and fishing sector GDP was calculated at $38.368 billion pesos (US$21 billion dollars).

44 In agreement with the study: Enclave: illicit crops within the agricultural and industrial phases Base 2005 series 2000-2010pr, Enclave is a ´virtual´ space belonging to economic territory, which is artificially created to separately register the national economy and activities related to production and illicit crop transformation (except for trade). The illicit crop enclave consists of two phases: a farm where both coca cultivation and cocaine base production are carried out within UPAC, whilst the industrial phase refers to the establishments dedicated to cocaine hydrochloride and heroin manufacture. For more details: http://www.dane.gov.co/index.php/cuentas-economicas/investigaciones-especiales

Poppy cultivations

Poppy cultivations in Colombia decreased from 313 hectares in 2012 to 298 hectares in 2013, a 4.7% drop according to the National Police of Colombia report and through aerial reconnaissance. The crop area was principally detected within Cauca (74%) and Nariño (24%); departments which are also favoured for coca cultivation and illicit drug trafficking. In relation to the registered areas in 2012, Nariño recorded a 64.5% reduction, affecting the national total, whilst Cauca recorded a 115% increase. The UNODC- Colombia did not participate in the generation and validation of areas in which poppy cultivations are detected.

Table 27. Poppy cultivations (hectares) within departments in Colombia, 2003-2013

Department	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Nariño	540	460	475	316	204	24	238	234	229	205	73
Cauca	600	450	538	448	280	126	100	92	102	102	219
Huila	636	1,135	320	114	45	45	11	12	5	4	4
Tolima	1,359	1,090	265	90	170	170	3	3	2	2	2
Cesar	651	675	152	3	7	18	2.5	-			
Valle del Cauca	-	-	-	-	-	-	1.5	-			
La Guajira	240	35	68	-	2	4	-	-			
Caqueta	-	105	132	52	7	7	-	-			
Total	**4,026**	**3,950**	**1,950**	**1,023**	**715**	**394**	**356**	**341**	**338**	**313**	**298**

Source: National Police of Colombia narcotics department, DIRAN (thorough aereal acknoweledgements)

Poppies are grown in small plots (smallholdings) within the country; these are in mountainous areas with altitudes that vary between 1,700 to 3,000 m above sea level, to obtain the low temperatures necessary during several phases of the growth cycle. Poppies cannot be cultivated alongside coca crops due to the biophysical conditions of the crop which cannot adapt to altitudes above 2,200 m above sea level[45].

In relation to interdiction efforts, heroine seizures have decreased 464 kilograms in 2012 to 403 kilograms in 2013, whilst a kilo of poppy latex was confiscated. In respect to production infrastructure, a heroin laboratory was uncovered and destroyed.

During 2012, the increase of poppy cultivations worldwide increased by 15% in relation to the previous year, with a greater amount in Afghanistan (65%) and Myanmar (21%). The poppy cultivation area in 2013 within Colombia (298 ha) represents a 0.1% of the total world poppy cultivations. In accordance with this figure, it can be considered that Colombia has left the international opium supply cycle, highlighting that the monitoring is carried out by aerial detection. Nevertheless, considering the internal country dynamics, the significant increase of the crop within Cauca, the increase of consumer prevalence and the pricing behaviour, warnings should be generated for the Colombian Government and international community.

45 Information extracted from the report "Coca: taxonomical and chorological aspects within Colombia" carried out by Ariza Cortes William curator of the del Herbario Forestal of the Universidad Distrital within the framework of investigation by the UNODC "Agri-cultural characteristics of coca crops within Colombia", 2005.

Table 28. Global poppy cultivation (hectares), 2000-2012

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
SOUTHWEST ASIA													
Afghanistan	82,171	7,606	74,100	80,000	131,000	104,000	165,000	193,000	157,000	123,000	123,000	131,000	154,000
Pakistan	260	213	622	2,500	1,500	2,438	1,545	1,701	1,909	1,779	1,721	362	382
Subtotal	82,431	7,819	74,722	82,500	132,500	106,438	166,545	194,701	158,909	124,779	124,721	131,362	154,382
SOUTHEAST ASIA													
Laos PDR [a]	19,052	17,255	14,000	12,000	6,600	1,800	2,500	1,500	1,600	1,900	3,000	4,100	6,800
Myanmar [a]	108,700	105,000	81,400	62,200	44,200	32,800	21,500	27,700	28,500	31,700	38,100	43,600	51,000
Thailand [b]	890	820	750										
Vietnam [b]													
Subtotal	128,642	123,075	96,150	74,200	50,800	34,600	24,000	29,200	30,100	33,600	41,100	47,700	57,800
LATIN AMERICA													
Colombia	6,500	4,300	4,153	4,026	3,950	1,950	1,023	715	394	356	341	338	313
Mexico [c]	1,900	4,400	2,700	4,800	3,500	3,300	5,000	6,900	15,000	19,500	14,000	12,000	
Subtotal	8,400	8,700	6,853	8,826	7,450	5,250	6,023	7,615	15,394	19,856	14,341	12,338	12,338
OTHERS													
Others countries (d)	2,479	2,500	2,500	3,074	5,190	5,212	4,432	4,184	8,600	7,700	10,500	16,100	13,500
TOTAL	**221,952**	**142,094**	**180,225**	**168,600**	**195,940**	**151,500**	**201,000**	**235,700**	**213,003**	**185,935**	**190,662**	**206,700**	**238,020**

Source: UNODC, world druf report, 2012

Note: The figures in italics are preliminary and can be subjected to revision to check that the information is up to date. The information relating to estimate methods and definitions can be found within the chapter on methodology within the World Report on illicit crop monitoring

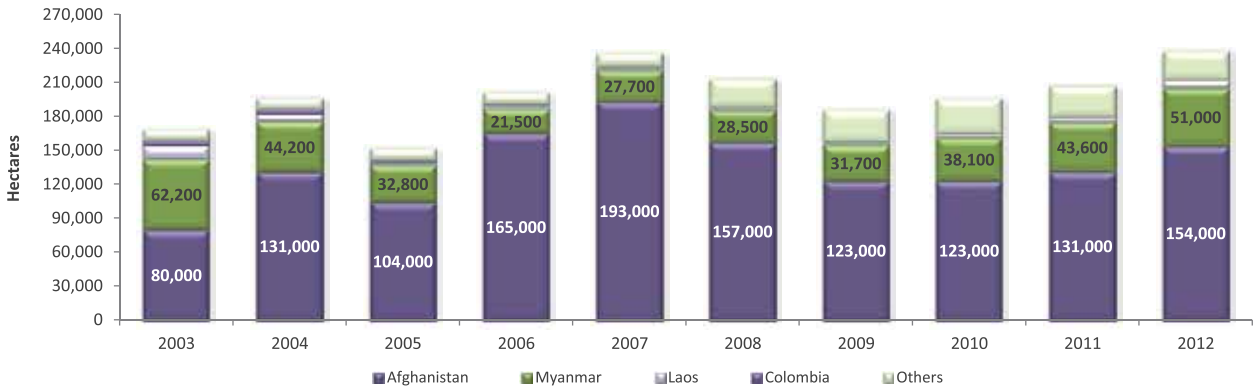
Sources of information: Afghanistan prior to 2003: UNODC, since 2003: National Illicit crop monitoring programme with the support of the UNODC. Pakistan: ARQ, Pakistani Government, US State department. Laos People´s Democratic Republic prior to 1999: UNODC since the year 2000: National Illicit crop monitoring programme with the support of the UNODC. Myanmar prior to 2001: US State department since the year 2001: National Illicit crop monitoring programme with the support of the UNODC. Colombia prior to 2000: various sources since the year 2000: Colombian Government. During the years 2008 and 2009, produced was calculated based on regional yield figures and conversion factors from the US State department/ DEA. Mexico: estimations are based on US government surveys, 2010: UNODC estimates production levels.Areas can be included that were eradicated after survey data was collected within the area.

Due to continued decrease in cultivation, figures for Vietnam (2000) and Thailand (from 2003) were included in the category “other countries”.

The Mexican Government does not back the estimates made by the United States government, these are not part of official figures and the information relating to the methodology used to calculate these figures is not available. The Mexican Government is in the process of implementing a follow-up system in collaboration with the UNODC to estimate the amount of illicit crops and their production.

Plant eradication and seizure reports from varying sources outline that illicit poppy crops also exist in the following sub regions: North America, Africa, Central Asia, Transcaucasia, the Near and Middle East/ Southwest Asia, Intra-South, East and Southeast Asia, Eastern Europe, Southeast Europe, Central America and South America. As from 2008, a new methodology was introduced to calculate poppy crops and opium/heroin crop production within these countries. These estimates are superior to previous figures but have a similar order of magnitude. A detailed description on estimate methodology is available within the World Drug Report.

Figure 18. Global poppy crop (hectares), 2003-2012



Source: World droug report, 2012

Latex and Heroin production

Unlike in Asian countries, in Colombia poppies are sown in the form of latex. If the area detected during 2013 is analysed, kiln dried opium is found in around 19.7 kg/ha/crop. The manufacturing process requires 24 kilograms of poppy latex (equivalent to 8 kilograms of kiln dried opium) to produce 1 kg of pure heroin, according to the United States Government productivity studies. There are two harvests per year within Colombian territory, except in Nariño where there is only one harvest produced per year. The following are the yields per hectare within the principle poppy areas:

Table 29. Kiln dried opium (yield per hectare)

Poppy area	Yield (kg/ha/harvest)
Nariño	16.8
Serranía de Perija	18.4
Cauca Oriental	20.8
Huila Occidental	15.3
Tolima	13.1

Source: US government Nariño (2010), Cauca (2009), Huila Serrania perija and Rolima (2004)

Using the 298 hectares detected in 2013 by the National Police of Colombia as a reference point and the dry opium yield per hectare as reported by the US Government, it is estimated that Colombia produces around 11 metric tonnes of kiln dried opium, representing around a tonne of heroin.

In the global context, the potential production of kiln dried opium was around 4,931 metric tonnes in 2012, with Afghanistan (75%) and Myanmar (14%) as the principle producers. Using this scenario as a reference, Colombia would contribute 0.2% of this production, confirming that its international presence has greatly reduced, to the point that its estimated annual production is not statistically relevant in relation to the international offer.

Latex and heroin prices

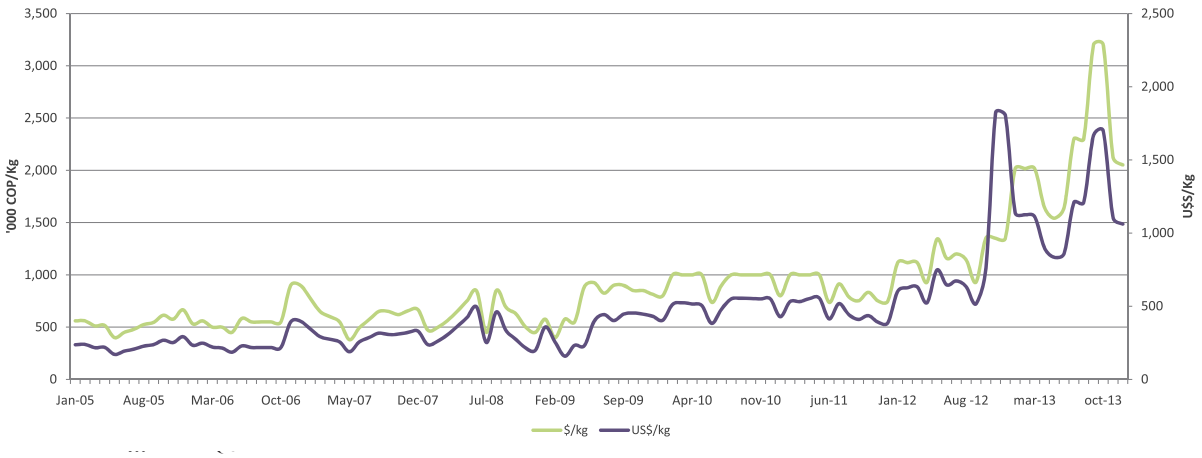
In 2013, the average price for poppy latex was $2 million per kg (US$ 1,112/kg), whilst morphine prices were at around $12 million per (US$ 6,586/Kg). A kilogram of heroin can be sold at approximately $17 million (US$9,295/Kg). In relation to 2012, poppy latex prices have increased by 82.2% whilst morphine and heroin prices decreased by 19.2% and 17.2% respectively.

Table 30. Average latex, morphine and heroin prices, 2008-2013

Product	2008		2009		2010		2011		2012		2013	
	US$/ kg	´000 $/kg	US$/ kg	´000 $/kg	US$/ kg	´000 $/kg	US$/ kg	´000 $/kg	US$/ kg	´000 $/kg	US$/ kg	´000 $/kg
Latex	318	612	358	754	503	953	466	860	634	1,140	1,112	2,077
Morphine	7,369	14,400	7,114	15,162	7,842	14,892	5,804	10,704	8,473	15,241	6,586	12,308
Heroine	9,950	19,550	9,993	21,421	10,786	20,421	10,348	19,101	11,661	20,974	9,295	17,371

Source: National Police of Colombia narcotics department, DIRAN, SIMCI and PCI for latex
Note:
[1] The prices registered in 2013 referring to poppy latex were only reported in litres, whilst these prices were reported in kilos and litres during previous years. In order to guarantee the continuity of this series, it was necessary to convert units (from litres to kilograms) assuming that the density of latex is 1gr/cm^3; superior to opium density (0.95 gr/cm^3; source: MSDH –Opio Mallinchkrod).

Figure 19. Latex prices in Colombia in Colombian pesos and US dollars, 2003-2013



Source: National Police of Colombia narcotics department, DIRAN, SIMCI and PCI for latex
Note:
[1] The prices registered in 2013 referring to poppy latex were only reported in litres, whilst these prices were reported in kilos and litres during previous years. In order to guarantee the continuity of this series, it was necessary to convert units (from litres to kilograms) assuming that the density of latex is 1gr/cm^3; superior to opium density (0.95 gr/cm^3; source: MSDH –Opio Mallinchkrod).

In relation to the opiates market, there is a possible advanced purchasing trend from international organisations; poppy latex is sold in bottled form by the growers who have staggered planting sessions to guarantee that the product is available all through the year.[46]

Decreases in morphine and heroin prices present a shift in the upward trend as reported during 2012. There are greater dynamics employed for heroin and morphine marketing within Nariño and Cauca, related to the increase in internal consumption of these drugs, not only within these regions but also within the principal cities in Colombia[47]; the authorities have identified trafficking characteristics for these substances, with small quantities for export[48].

If the quantities of heroin produced in Colombia become marginal in relation to the worldwide demand[49], there is some level of concern expressed by national institutions and the national community in relation to the supply-demand gap. The estimated amounts available within the country are less than the required amount for internal and foreign consumption (upward trend). In the short and medium term the generation of strategic alliances between UNODC and the Colombian Government will be needed for the development of scientific technical studies which will contribute to a better understanding of the development dynamics for cultivation, as well as during the production, marketing and trafficking, procurement of chemical inputs, intermediary agents and their connections with affected territories.

46 Information submitted by the authorities through the use of work tables with the National Police of Colombia within the framework of strengthening the pricing system of drugs and chemical substances.
47 This problematic has been identified within different studies targeting qualitative/quantitative reports from the Colombian Government, Investigation Centres and Universities, just as within the Ministry of Law and Justice, the Ministry of Health, the Universidad Nacional, Corporación Nuevos Rumbos, Universidad del CES amongst other institutions. Within these studies, the location of a heroin consumption problem has been identified within eight regions in the country, the departments of: Risaralda, Quindío, Manizales, Antioquia, Valle del Cauca, Cauca, Norte de Santander and Bogotá.
48 The aforementioned is consistent with international trends which have been identified as a limited drug trafficking current during the last few years from Colombia to the United States (WDR, 2011).
49 In accordance with the 2012 World Drugs Report, the production of Heroin is at around 314 tonnes whilst the potential production in Colombia is around one tonne.

MARIJUANA CULTIVATIONS[50]

No information in relation to marijuana hectares was available when the report was compiled.[51]. In accordance with the Colombia Drugs Observatory, marijuana seizures increased from 348 mt in 2012 to 410 mt during 2013, a 17.7% increase. The authorities detected and dismantled four greenhouses located within the department of Magdalena. In 2012, 115 greenhouses dedicated to marijuana production were identified, the majority of which were located within Cauca.

Marijuana Production

Marijuana crops are characterized by their need for abundant quantities of water and temperatures above 18°C for optimum growth. The plants can be either masculine or feminine, of which the latter are suitable for consumption. Male plants are a lighter colour, less leaves, are taller, thinner and the branches are more spread out. Female plants are rounder and thicker, of a darker green color, with lots of leaves and the branches are closer together.

After four weeks of normal growth, the male plants produce pollen which fertilises the female inflorescences, around the sixth week a tuft of leaves grows on the plant tip. The planting process is generally carried out in the open air, especially for common cannabis or cannabis sativa. This variety is characterized by its concentration of the active ingredient (Tetrahydrocannabinol-THC) at between 1.6% and 4%. From this method around 3mt are produced per hectare with a crop density of around 15,300 plants per hectare[52].

In the study Chemical characterisation of marijuana varieties grown in Colombia, carried out in 2008 by the National Anti-narcotics department, the Attorney General´s Office and the National Police of Colombia, it mentions that cannabis has two principle varieties in its origins: Índica and Sativa. Some authors mention a third variety: Rudelaris. Currently varying varieties have been developed from hybrid and polyhybrid plants. The aim of the study lies in confirming the possible existence of new cannabis varieties through taxonomic analysis and qualitative analysis of the principle active chemicals: Tetrahydrocannabinol-THC, Cannabidiol-CBD and Cannabinol–CBN from fourty five (45) cannabis plant samples, formed from various young plant specimens taken from the DIRAN and DNE technical team within different parts of the country. The conclusions from this analysis were that the samples from the Sierra Nevada de Santa Marta do not demonstrate the introduction of foreign or exotic Cannabis varieties. Within Cauca high levels of the active substances were noted. According to the taxonomic analysis carried out by the Universidad Nacional, the 45 samples within the study corresponded with the Cannabis sativa species.

Nevertheless, during the last few years the authorities have identified a method of marijuana cultivation within a greenhouse type structure[53]. This method tends to require increased technical assistance as long as increased tests are carried out on the growing process for yields within hectares superior to those registered within normal conditions.

In accordance with the information supplied by the authorities, the Agricultural Unit for marijuana consists of people native to the region who can complete two roles: business owners during the growing process or they are in charge of crop upkeep; in this last instance, the crops can belong to drug traffickers or members of groups outside the law. The marketing of the drug is related to criminal groups with influence within productive regions or urban centres, where territorial control is determined by the market.

To this date, no information from production areas and yields enables the levels of marijuana growth to be established. As well as identifying the transformation processes and agricultural practices characteristics within each of the production regions. The understanding of production dynamics, transformation, marketing and marijuana trafficking presents challenges as it can be easily cultivated both outside and indoors with optimum yields.

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50 The information within the current chapter relates to the compilation of interdiction statistics and qualitative/quantitative studies carried out by Colombian Government institutions aiming to characterize the chemistry and taxonomically the varieties of marijuana, from their yields and production processes. These include authority perceptions compiled within the framework of strengthening the pricing system, carried out by the UNODC during 2013 in relation to production dynamics, commercialization and trafficking.

51 If aerial reconnaissance is used to detect the hectares of illicit crops, implemented by the National Police of Colombia, for this and other methods, the identification of the area in which marijuana is grown within the country is limited. The statistical information is for internal use of the authorities.

52 Results from the Study of Chemical characterisation of marijuana varieties, carried out by the National Anti-narcotics department, the Attorney General´s Office and the National Police of Colombia (2008).

53 Information submitted by the National Police of Colombia within the framework of strengthening drug pricing carried out by the UNODC in 2013

Marijuana prices

Marijuana prices greatly vary and range between $60,000 to $1,000,000 per kg, they are not only influenced by marketing and trafficking margins but also by the existence of heterogeneous characteristics in relation to the active substance and its sales presentation. The authorities have identified not only the marketing of sativa or common marijuana but also market classes such as “Cripi”, “Viuda Blanca”, “Púrpura”, “Punto Rojo”, “Blueberry”, which are sold using a marketing strategy relating to production processes using technical cultivation systems and content related to THC as the active substance. It is important to highlight that studies are being developed which enable the truthfulness of this information to be tested, currently this is done via anecdotes.

The price of a kilogram of common marijuana at production sites in Cauca and Valle del Cauca vary between $36,000 y $60,000, whilst in departments such as Huila, Norte de Santander and Magdalena, amongst others, these vary between $100,000 and $400,000. The prices of emergent classes within crop influenced zones vary between $400,000 and $800,000 per kg. In San Andrés prices have been reported between $2,500,000 and $2,800,000 for a kilo of marijuana, however, no information was obtained in regard to its final destination.

In both medium sized and the principal cities within Colombia, production is measured out for sale using bags or paper wraps[54]. The consumer prices are found within the marketing and crop variety; a dose of common marijuana can be sold for around $1,000 pesos per dose, whilst the class recognized as “Cripi” on the market, can be marketed between $3,000 and $5,000 pesos, approximately. During the commercialisation of marijuana, the related marketing associated to the presentation and use of flavouring within the product can implement an increase in the sale price.

If marijuana is the most consumed drug in the country, there exists a large amount of collected information which has contributed to the generation of hypotheses as well as specific dynamics for this problematic. Inasmuch as no systematic follow-up for the strategic variables for production, marketing and trafficking monitoring is produced[55]. This can relapse into erroneous dimensions and magnitude orders that limit the institutional response. Efforts to generate systematic information need to be increased, with the completion of technical scientific investigations aiming to comprehensively strengthen the strategies used in the fight against drugs.

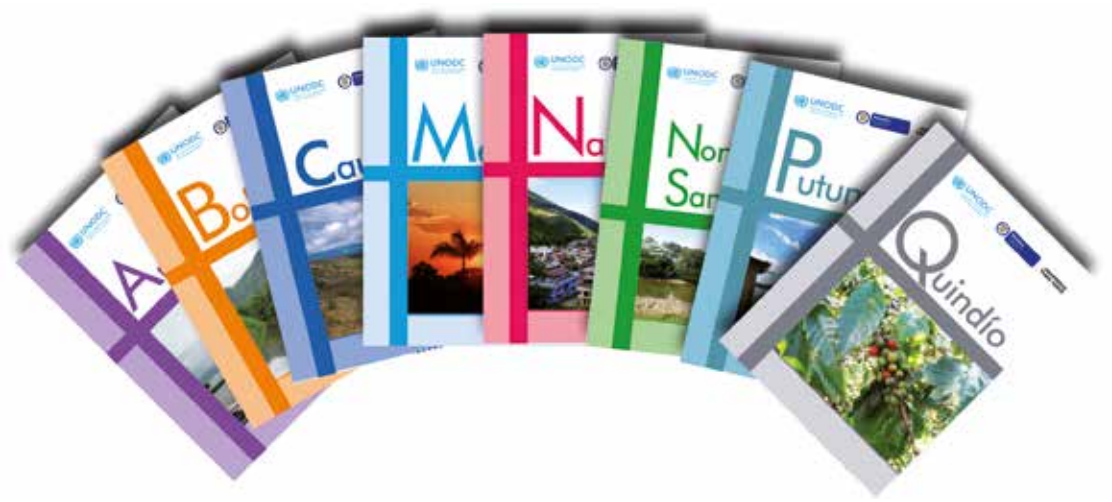
54 In accordance with the information submitted by the National Police of Colombia-DIRAN, the doses can vary between 4 to 8 grams depending on the type of consumer and marijuana quality (impurities, seeds, etc.); at marketing sites, “bows” are sold weighing between 25 and 50 grams.

55 Just as the characterisation of production methods, varieties, transformation processes, yield per hectare, harvest frequency, product and sub products, chemical characteristics, agent types and organizational structures amongst others.

RELATED INVESTIGATIONS AND STUDIES

Regional Baselines

The “Regional Baselines project” is a joint initiative with the Integrated System for Monitoring Illicit crops within the UNODC and the Ministry of Law and Justice. The main objective is the promotion of integral analyses of the illicit drug phenomenon at departmental level, offering a geo-territorial vision at supply level in relation to drug consumption and connected crimes. Departmental understanding of drug trafficking enables the creation of public policies aimed at combating vulnerable factors that have enabled the expansion of this phenomenon across all national territory, removing communities from illicit activities. During phase I of this project the departments of Antioquia, Bolivar, Cauca, Meta, Nariño, Norte de Santander, Putumayo and Quindío were involved.



Focus

The territory acts provides the scenario in which all the different dynamics associated with the illicit drug phenomenon converge, in particular, processes associated with the consumption, trafficking and related crimes. A study of these dynamics addresses three focus points: vulnerability, geography and public policy. From the vulnerability focus, social, economic, political and environmental factors are analysed which have enabled the entry of illicit crops into each one of the departments studied. The geographical focus enables the integration and geo-spatial integration of the vulnerability factors, presence of threats and the institutional responses to the illicit drugs problem. The public policy focus guides the departmental analyses towards the identification of various key points for the creation of recommendations focused on public policy.

Methodology

Based on the identification and priority of variables for each of the themes studied (offer, consumption, connected crimes and political actions) follow-up indicators have been created, operationalizing the variables and guiding the search for information. The construction of regional base lines requires the extensive search of information within local institutions and social organisations. This approach within departments enables the different regions to advance within the organisation and operation of drug trafficking and enables the creation of different analyses and public policy recommendations, considering the different stages and levels affected by drugs within the territory.

Products obtained

The products obtained include qualitative and quantitative information obtained from national, departmental and municipal institutions within fieldwork carried out in each of the departments studied. This information is consolidated in an Atlas, organized within a database and presented within analytical documents for each of the departments.

Departmental Atlases

The departmental Atlases for the illicit drug phenomenon unites the variables with the selected and prioritised indicators, according to the themes as mentioned above. It is a compilation of data sheets which include a) maps displaying the geographical presence of the drug problem b) the most recent statistics for this problem and c) a synthesis of the public

policy actions to prevent the drug problem. Each Atlas has four sections: 1) general description of the department, 2) analysis of the primary vulnerability variables that have enabled drug trafficking within the territory, 3) analysis of the types of threats associated with drug production (illicit crops and drug manufacture, consumption – type of drugs available, retail-trafficking, micro trafficking and laundering related activities) and 4) description and specialization of the actions carried out by the national and local governments to counter effect the illicit drug phenomenon within the department.

Database

One of the objectives of this study is the specialisation of the different factors influencing drug production. These being socio-economic, political and biophysical which are obtained from different sources and indices that are constructed at the crossover point of two or more of these factors. To achieve this, a large amount of information was collected and ordered using a unique code corresponding to each different municipality, the source for which was the National Statistics Department – DANE. This information can be entered into the municipality referenced database (geodatabase[56]) and the data obtained specialised at municipal level.

Analysis Document

An analysis document was created for each department using the primary and secondary information obtained during the study. These documents describe the drugs phenomenon at a departmental level and explain the territory vulnerability and persistence, or lack of, of drug related phenomena.

Study Outlook

This Project has commenced phase II which will be implemented within the Caldas, Caqueta, Choco, Cordoba, Guaviare, Santander, Valle del Cauca and Vichada departments. The objective of this new phase is the advanced construction of an internal and regional focus of the drug trafficking phenomenon, integrating and involving municipal and departmental government agents to contribute in this change. As the understanding of the drugs phenomenon advances at a departmental level, this strengthens the capacity to contribute to interpretative framework and methodology which assist not only with the deeper understanding of this problem but also to suggest recommendations for the creation of integral, effective and focused public policies.

Illegal phenomena dynamics within the territory

The increase in mining over the course of the last few years has influenced the dynamics of several zones within Colombian territory, characterized by the presence and cultivation of coca crops. These zones have continued to decrease their participation in illegal activities but have begun to share their territory with a new activity: alluvial gold mining.

During the past three years, the coca cultivation area has remained very marked within the Cordoba, Antioquia and Bolivar departments, in which zones with a high coca crop presence have gradually reached different stages of natural regeneration. Additionally, mining tracks have started to be found along the river banks.

Table 31. Coca crop area percentage change within alluvial gold mining regions, 2013

Department	2011	2012	2013
Antioquia	-42%	-10%	-64%
Cordoba	-72%	-4%	-57%
Bolivar	-34%	-11%	-53%

Through the interpretation of satellite images and aerial reconnaissance of the project during 2013, the reduction in coca cultivations and increase in mining tracks has been noted in the Cordoba, Antioquia, Choco and Cauca departments (Guapi, and Timbiqui municipalities). Mining tracks were also detected within the Putumayo department, in the Puerto Asis, Villa Garzon and Puerto Guzman municipalities – areas known for coca cultivation.

56 The Geodatabase is a model that allows the storage of various types of data, both geographic and descriptive (tables).

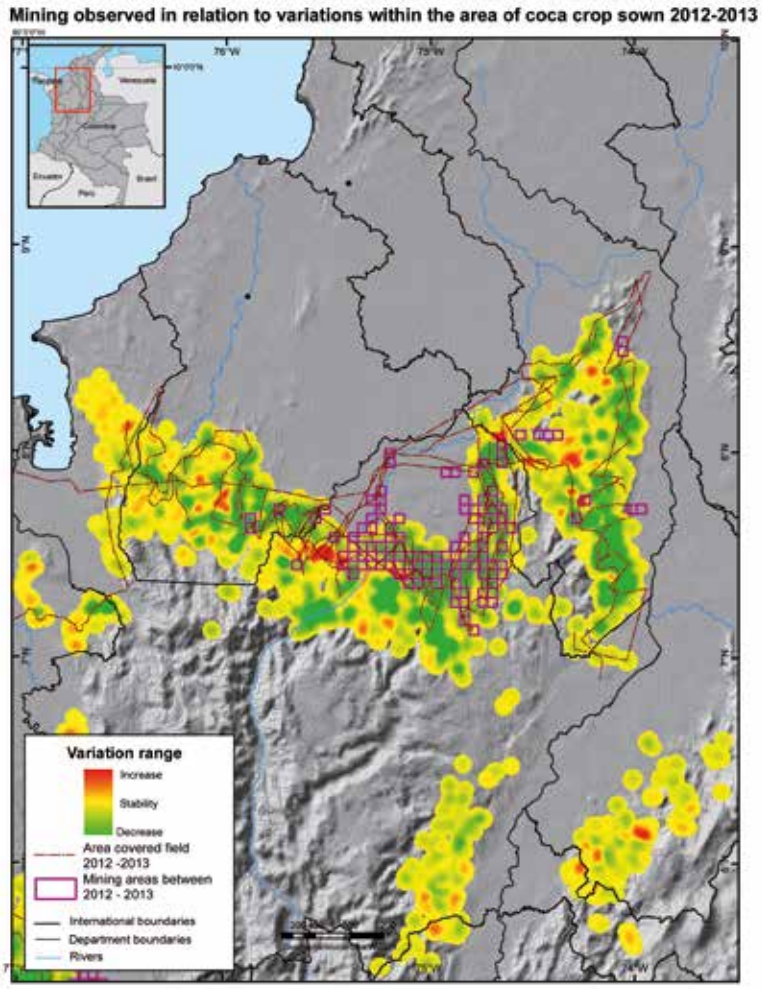


Figure 20. Coca crop variation in relation to mining 2012-2013, Central region

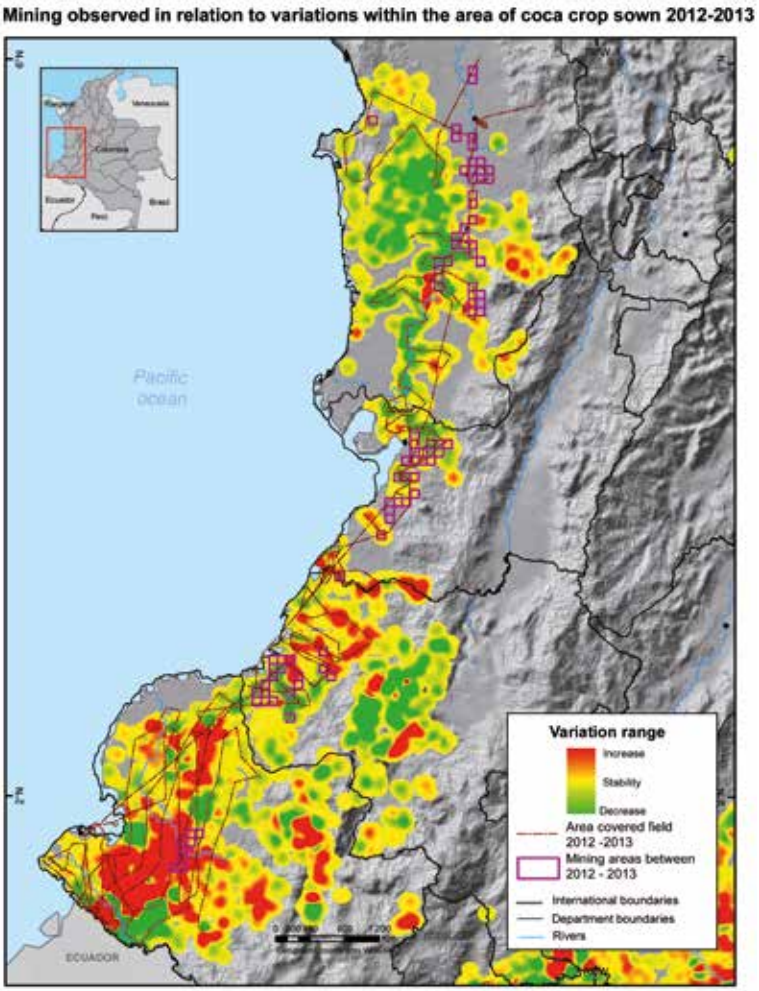
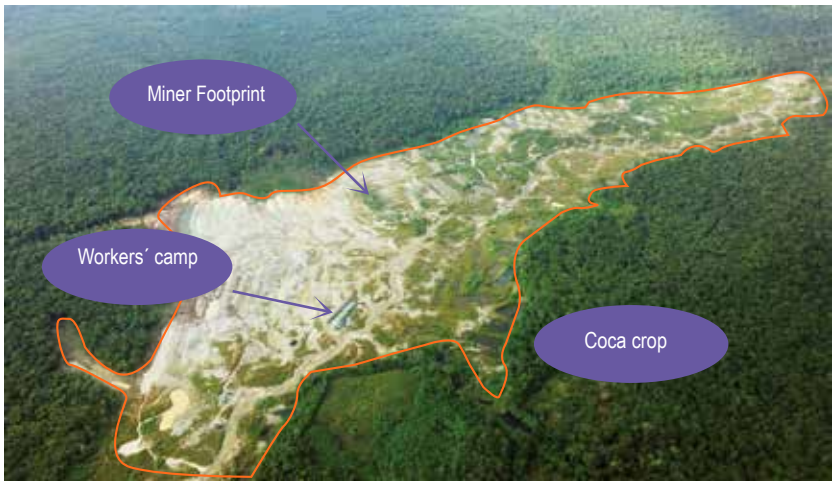


Figure 21 Coca crop variation in relation to mining 2012-2013, Pacific region

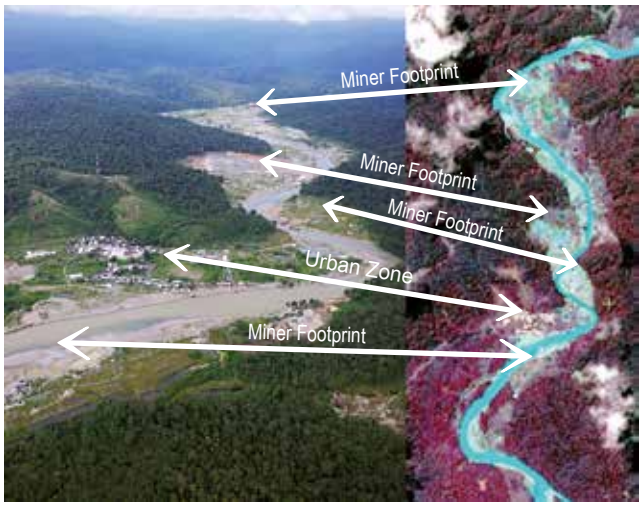
In these regions, not only is there change in the vulnerability dynamic within the territory but there is also rapid and drastic change of the landscape, due to deforestation, erosion and changes in the river course.



Outlined in orange: the mining limits detected from flyovers over territories shared with coca crops.

Outlined in orange: the mining limits within territories shared with coca crops.

The dynamics detected during the flyovers have deepened the relationship between these current phenomena within the territory, not only within the geographical setting but also within a social and economic context.



Panoramic of affected area with mining footprints and its corresponding satellite images.

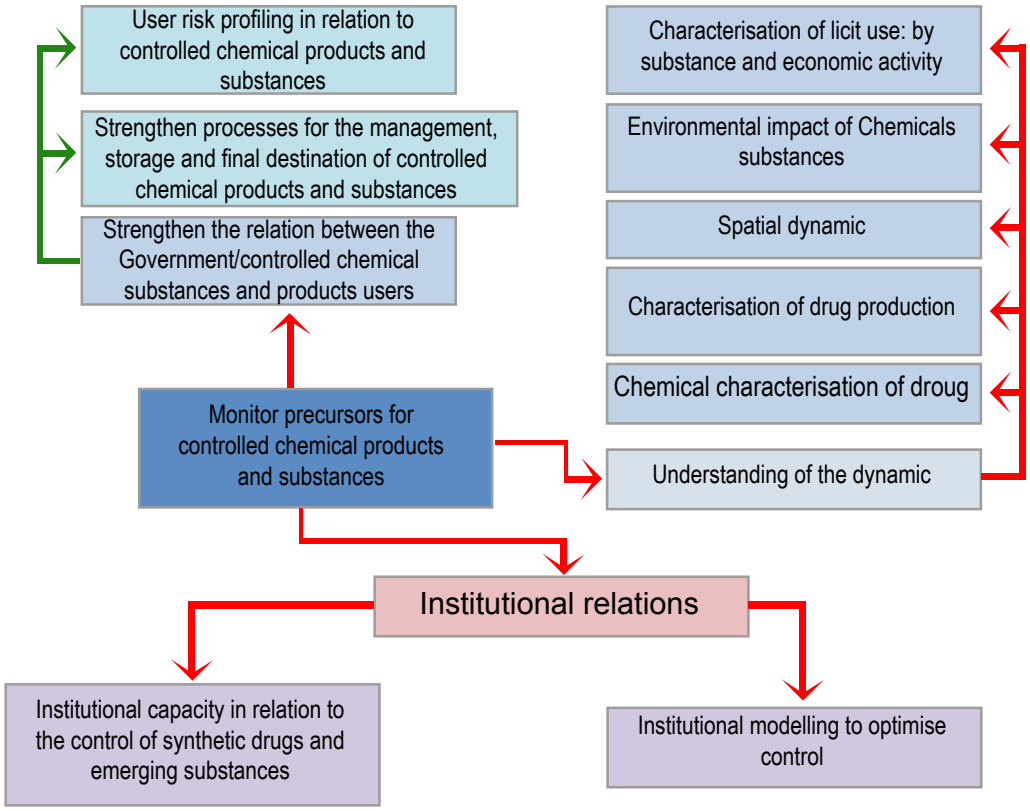
Through the use of satellite technology and the support of flyovers, the project has detected mining tracks within different regions in Colombian territory. The detection and monitoring is based on remote sensors, in combination with an investigative model, enabling an understanding of these phenomena within the territory via a geographical approach and estimation of the vulnerability level.

INTERNAL MONITORING OF CHEMICAL SUBSTANCES WITHIN COLOMBIA

The Ministry of Law and Justice (MJD) and the United Nations Office on Drugs and Crime –UNODC/Colombia, coordinated by SIMCI and PRELAC/UE, began the design and development of an internal system in 2013, for the monitoring of controlled chemical products and substances submitted to checks by the National Narcotics council. The internal approach outlin

ed by the MJD and the UNODC for the development of a chemical substance monitoring system, allows for the clear differentiation of products that are aimed at characterizing and strengthening illicit processes. For a better understanding of illicit processes, work needs to be carried out within both dynamics to achieve the development of internal strategies, strengthening institutions in the completion of more effective tests in relation to legal processes and the neutralization of illegal processes.

Figure 22. Chemical substances and controlled chemical precursors monitoring



The monitoring system enables the establishment of a collision from three different known perspectivas: i) relations between control institutions and controlled Chemicals products and substances users in possession of a clearance certificate for the trafficking of narcotics –CCITE[57], for which the module on the development of risk profiling, tasks aimed at conceptual tool design have been advanced, such as manuals and technical guides which outline good practices for the Management, storage and final destination of Chemicals substances; ii) interinstitutional relation, within this context the advancement of increased institutional capacity diagnostics within Colombia in order to tackle the problem of synthetic drugs, emerging substances and precursors within the definition of institutional modelling to maximise the resources and focus efforts on high value objectives and, iii) understanding of licit and illicit dynamics through the creation of studies enabling the obtention of factual and real evidence, necessary for the implementation of politics and the design of strategies ensuring the most effective results.

Government Relations – Controlled chemical products and substances

For the development of a monitoring system, work on the understanding of the relation which exists between the different controlling authorities and the controlled chemical products and substances users within the CCITE- were considered. It is important, within the understanding that it is necessary to implement strategic Government alliances

57. To combat illicit drug production the Colombian Government exercises control on the offer and demand of chemical substances necessary for transformation. This strategy requires the expedition of The certificate of report on the trafficking of narcotics (CCITE) which, as its name indicates, certifies the lack of records fundamentally required for the trafficking of narcotics, displacement, illicit enrichment and its connections, against natural or legal persons in favour of the creation and authorization depending on the user need, purchase, consumption, distribution, production, storage and import of chemical substances submitted to quantity and quality control.

with the entrepreneurial sector, enabling the establishment of better practices within each one of the sectors: increased interest and responsibility by the users and more refined and adecuate Governmental controls in relation to national circumstances.

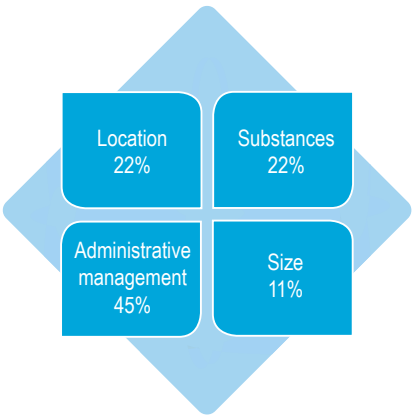
CCITE User risk profile

The most important aim in relation to the chemical substance monitoring systems, in both institutional administration and operation, is to avoid the diversion of these activities towards the illicit drug industry.

The development of a methodology to profile risks faced by CCITE users, strengthens the administrative and operational control processes, enabling maximum administration of financial resources and logistics within the institutional order. This minimizes the possibilities of user substance misuse, focuses the resources towards vulnerabilities and known threats. The methodology practical terms act as a support tool during the issue of quotas, the speeding up of CCITE processes for the first time during certificate renewal and replacement processes. The user risk profiler consists of a tool which enables the DIRAN Chemical Control unit to obtain a greater level of efficiency during physical user inspections.

To design this methodology, a round table of exports was created to outline, using uniform criteria, the probable level of risk of substance misuse by an associated applicant. This not only relates to the risk posed by the activity and substance use but also relates to the threats and vulnerabilities which arise from the location and connections within the territory. In order to achieve a profile rating, a system is used which allows thee exogenous company factors to be considered, such as endogenous factors related to effective management enabling the obtention of a global qualification.

Figure 23. Risk profile categories for businesses using Clearance Certificates



The IT tool enables the creation of four main risk categories in relation to the geographic location of the business and/or subsidiary, the size of the company, the controlled chemical substances which are due to be modified by the company and/or branch and the administrative behaviour both before and after the expedition for permission to manage controlled chemical substances.

The risk profiler is currently in a testing phase within the Information System for Controlled Chemical Substances SICOQ administered by the MJD and DIRAN.

Strengthening of the management, storage and disposal of controlled chemical substances and products

The objective of this component within the monitoring of chemical substances is to strengthen the control and inspection processes, considering the storage, use and disposal of products and chemical precursors in Colombia. For this purpose, the need to identify the specialist technical information requirements in relation to storage, use and disposal of the different areas for the administrative control of substances, products and chemical precursors is equal to the need to adapt and consolidate technical documentation regarding storage, use and disposal, designed to be consulted by authorities and users.

The development of all types of technical instructive type documents, leaflets, manuals or informative guides has three main aims: i) create clear conceptual tools for both users and authorities in charge of controls, in particular in relation to controlled chemical products and substance inspections ii) create academic tools for structured training, aimed at

creating a compromise between all the actors involved in control responsibility and iii) contribute to the socialisation of rules between the authorities and users in relation to the use, storage and disposal of chemical controlled products and substances.

The development of this work is in accordance with and complies with the guiding principles established within the United Nations Convention against the Illicit trafficking of narcotic drugs and psychotropic substances, for which it is necessary and crucially important that the Government strengthens alliances and synergies within businesses using controlled chemical products and substances. Particularly within aspects concerning shared and common responsibility, preventing any attempt at misuse in illicit industries.

The documents drawn up will be applicable within all national territory; this means that their use should not present restrictions within any region of the country and they can even be applied within the international setting, if they are seen to possess a specific technical character, directed at the users who will design them.

Interinstitutional Relations

If relations between businesses using controlled chemical substances in possession of a –CCITE permit for their management and the controlling authorities are fundamental to refine control processes, these are no less important than the relations which exist between different Government institutions.

These entities that are involved within the control system are numerous, with diverse visions, missions and activities carried out to complete this aim. Because of this, mechanisms and strategies need to be implemented to facilitate the coordination processes and information exchange, the establishment of strategic alliances for the development of joint and coordinated activities. Equally important is the creation of a diagnostic to understand what is needed to face new challenges presented by synthetic drugs, emergent substances and the control of precursors during their production.

Institutional Modelling to optimise chemical substance control

The control of chemical substances in Colombia is developing as a collective activity, within which different visions, plans, efforts and strategies are implemented within various sectors in accordance with institutional missions, visions and objectives. As a result of this multi-institutionalism, participants in the different chemical substances control activities have noted the presence of certain tensions in both the regulations required by processes as within operational work modalities. The reason for this is feasible, this is not only due to the duplicity of functions but also due to the neglect of effective controls, which are not explicitly outlined in some institutions.

This panorama becomes yet more complicated when the control objectives diversify, involving yet more actors within processes. This is the case for synthetic drug precursors which have increased in both number and diversity, whilst the controls are generally static. This is not only in relation to the control of several chemical substances which are frequently used during the extraction and refinement of natural origin alkaloids, the dynamic has demonstrated that with the incursion of synthetic drugs, the number of precursors exponentially multiplies. This does not only refer to chemical substances but also over the counter medicines (flu prevention), industrial products (acrylic glue, solvents, etc.), natural substances (sassafras, khat), which further complicate control processes.

Due to the above, and with the aim to identify options to improve administrative control of precursors, substances and chemical products the Ministry of Law and Justice within strategic alliance with UNODC, has created proposals for institutional modelling, developing the diagnostics for national legislation and institutional regulations, identification of the operative capacities of controlling authorities, interactions between controlled chemical products and substances users and the different controlling authorities, the processes or activities in which the duplicity of force or institutional voids and regulations were established and finally the proposals, suggestions, recommendations or institutional alternatives for the control of precursors, substances and chemical products will be studied by the Ministry of Law and Justice – Sub-Directorate for the control and taxation of chemical substances and narcotics.

Institutional capacity to deal with the problem posed by synthetic drugs

The objective of this component within the Chemical Substance Monitoring System in Colombia is the development of strategic conceptual tools to control synthetic drugs, emergent substances and chemical precursors, via i) the

contextualisation of the national situation in relation to the global drug problem in relation to the manufacture and trafficking of synthetic drugs, emergent substances and chemical precursors and ii) identification of the institutional situation, at both central and regional level in relation to the administrative, interventionary and legal capacities to confront this problem.

The study provides for state of the art revision at global, national and regional level, enabling the contextualisation of the country´s reality in regard to problematic posed by synthetic drugs, emergent substances and chemical precursors. The completion of a diagnostic of institutional capacities and strengths, at national and regional level to address the problem, an action plan design and the creation of a strategic document, consolidating the information obtained within this present study and the respective recommendations and alternatives which enable the execution of a timely control of synthetic drugs and emergent substances.

The development of this component is based in synthetic drugs; it is not a completely new phenomenon within countries in the region, especially in Colombia. On the other hand, in line with globalization phenomena, real time communication and technological advances, especially within the organic chemistry synthesis, it has been observed that these types of drugs are not an exclusive phenomenon within first world countries. They are present within different parts of the world and Colombia is no exception. If there are no indicators that prove the production of synthetic drugs and emergent substances in Colombia, this demonstrates that the consumption is at a steep incline, in particular within the young population.

The synthetic drugs problematic presents significant weaknesses within important settings such as the administration of justice, principally translated in the lack of communication of numerous attorneys and judges in relation to the precursors used during their production. There is no clarity within the requirements and institutional structure enabling the respective control to be enforced. Customs authorities do not have the technical information which enables them to develop efficient control in relation to substance and precursor smuggling.

Understanding the chemical substances dynamics

The Chemical substance monitoring system has created a centre for the production of technical information from studies and investigations enabling better understanding of chemical substances and precursor dynamics within all areas (licit and illicit). To complete this objective the System carries out investigations, responding to the need for essential knowledge to design intervention policies.

Characterisation of licit use

The objective of the investigation is to characterise the trends within the illicit use of chemical substances monitored within Colombia, through an estimate of their offer, demand and use. This is the same as an analysis of the licit market access mechanisms dependant on the type of user (importer, producer and consumer). This study constitutes an important tool for the control authorities, enabling the adjustment of administrative and operational controls. Furthermore, it acts as an input from which to estimate licit requirements.

The work is carried out in two phases: the first using qualitative surveys, CCITE user perceptions in relation to the controls within businesses and the relation between entities that carry out administrative and operational controls for the government. The second phase analyses the results within an explorative survey, in relation to the usage trends and marketing dynamics for chemical substances, carried out from filling in a questionnaire designed for this study.

To carry out an investigation of the usage trends, 485 companies using controlled chemical substances were interviewed, sending the necessary information to establish a description of the dynamics that could be determined from the different CCITE user qualities. This was a pilot study, subject to methodological regulations in relation to the objectives and established range as well as the dynamics presented by this, within the different CCITE user modalities (qualities), as in those inherent to the chemical industry in general. This suggests that an analysis of the trends should be interpreted as this, and not as a general representation of the CCITE chemical industry user.

Characterisation of drug production

In order to understand the dynamics for chemical substance use during the extraction, refinement and alkaloid conversion processes of coca, SIMCI in collaboration with PRELAC/UE, began the investigation “Characterisation

of the coca leaf to cocaine hydrochloride transformation process in Colombia" in 2011. This has provided relevant information, not only within the cocaine production processes in different regions of the country, but also during different production phases: i) the production of coca paste; ii) alkaloid refinement to produce cocaine base iii) homogenisation processes for cocaine base – reoxidation; iv) conversion of cocaine base to cocaine hydrochloride.

Currently, the first study of cocaine hydrochloride production characteristics is being carried out in Colombia, where apart from determining the varieties used during the process over the past two years, analysis of the sub product and final product market, it also analyses the marketing dynamics for chemical substances used during the process and the substances used for cutting the drug.

Chemical characterisation of drugs

The studies in relation to the chemical characterisation of drugs within Colombia began within the government[58] approximately five years ago, with the aim of generating important information for the authorities that develop drug demand and drug offer activities. This work is being carried out with the Technical Investigation Unit –CTI, the National General Attorney´s office and the National Police of Colombia. The project aims to determine the purity of cocaine destined for international markets and the concentration of alkaloid within coca leaves. The project is supported by the technical department of the Ministry of Law and Justice, with the aim of characterizing the chemical composition of opiates within Colombia.

In accordance with the chemical characterisation studies carried out by the Colombian government, one of the greatest dangers for consumers of illicit drugs is determined by the variety of chemical substances used to produce drugs, produce drugs (in the case of synthetic drugs) or to increase their effects amongst other factors.

Recent studies carried out by SIMCI and PRELAC have revealed that a considerable percentage of cocaine produced in Colombia is produced (cut) with numerous pharmaceutical substances, with physiological and toxicological effects on consumers which are often much more dangerous than the drug itself. It is worth highlighting that a considerable percentage of cocaine hydrochloride leaving laboratories within manufacturing countries is already adulterated with substances such as levisamole, phenacetin, Caffeine and diltiazem, with a marked physiological effect on consumers. The process of drug cutting continues during the entire manufacturing chain and is carried out at least four times before reaching the final consumer. During these processes of drug "cutting", countless substances, some with pharmalogical effects associated with the drug (psychotropics) and others without any effects on the central nervous system but with marked toxicological effects, which affect the heart (coronary medicines), liver and kidneys.

Spatial-Geographic dynamics of chemical substances

This product enables the establishment of spatial dynamics for licit and illicit activities carried out using controlled chemical substances in Colombia. The methodology was delivered in the design and development of technological tools (Information technology) integrated into the geographic module of chemical substances within the Colombia Drug Observatory, managed by MJD.

The results enable the creation of a national map of chemical substance dynamics, and the correlation of variables from licit and illicit activities, this enables the elaboration of analysis and intervention strategies based on the geographic information at different levels (national, departmental and municipal). In addition to this study, it enables the establishment of bases to create a geographical information system, centred in the georeferencing of related activities to illegal dynamics, in both the setting of chemical substances in relation to detours, illicit crop cultivation, human trafficking and narcomenudeo amongst others.

The current geographical model for chemical substances relies on the database of seized chemical substances, imported chemical substances in addition to information related to business use of controlled chemical substances within the country. All the information presents different levels of disaggregation, dependant on the databases contributed by institutions generating the primary information. This tool is an important source of information for the development of studies and investigations, at both state level and at an academic and individual investigative level.

58 The National Department of Anti-narcotics completed their first studies of the chemical characterisation of drugs in Colombia. In coordination with the CTI of the National General Attorney´s Office and DIRAN, the analysis of marijuana produced in the country was carried out. Within the context of the DROSICAN Project, in 2010 the DNE worked in coordination with DIRAN in the characterization of synthetic drugs sold in Bogota. In 2012 the MJD and the CTI/FGN with the support of PRELAC/UE, within the context of the PRADICAN project, completed a chemical characterization of cocaine consumed in Colombia

ALTERNATIVE DEVELOPMENT

By completing its mandate, UNODC supports the Colombian Government in the development, implementation, monitoring, follow-up and evaluation of illicit crop reduction strategies in Colombia. As part of the annual report on illicit crop monitoring within the country, this chapter outlines the global politics context for alternative development and several instruments used in Colombia to reduce the offer of illegal substances. It will expose relevant data, obtained through monitoring and monitoring of alternative development programmes during the last ten years.

Alternative Development as global politics

The Colombian state, in reaffirming its international agreement in relation to the design and implementation of antinarcotics politics, including the prevention, control and sanction within all the links of the drug trafficking chain, has subscribed to the Single Convention on Narcotic Drugs of 1961; the Convention on Psychotropic substances of 1971 and the Convention against illicit Traffic in Narcotic Drugs and Psychotropic Substances of 1988.

In addition to the international conventions, United Nations statements have established concepts, criteria and principles for the implementation of alternative development within different countries. Currently, these statements do not have a legally binding character for the signing countries, they represent a compromise for the promotion and completion of the proposals that they outline[59].

The 1998 Political Declaration on drugs, provided a definition for alternative development and established the principles for international cooperation and material in the fight against drugs. To complement this work, the Political Declaration on drugs of 2009, established the need to apply a balanced criteria over the long term, to confront the cultivation of illicit plants used in the production of narcotics and physcotropic substances, just as the importance to outline innovative strategies in support of alternative development. The Lima Declaration on Alternative Development from 2012 is the most recent instrument that counts on the promotion of alternative development. This presents the guiding international principles, and recognises this type of development as part of a sustainable and effective strategy for the control of illicit crops, reaffirming the need to undertake politics and programmes on drug material, in relation to their development.

Considering this context, Colombia has looked to implement international premises through the formulation of national politics. The most important of these have been the CONPES 2734 from 1994, the 3218 from 2003 and the el 3669 from 2010. CONPES 2734, documents the politics established by the National Programme for Alternative Development – PDA, paving the way for the uninterrupted establishment of alternative development programmes. These have aimed to developed social and economic development processes, with emphasis on environmental conservation within areas affected by illicit crops.

CONPES 3218 from the year 2003 proposed a new direction within the Alternative Development programme – PDA, which for the years 2003 and 2006, concentrated on the generation of illicit conditions and opportunities for productive and sustainable employment within the rural labour force, through Productive Projects Programmes and Forest Ranger family programmes[60].

Previously, considering the need to consolidate an internal and complementary focus in relation to the directorates included within CONPES 3218, CONPES 3669 was created in 2010, an action plan using strategies contracted within a transversal perspective, aiming for articulation with other entities that were impacted by the internal manual eradication processes of illicit crops and alternative development within Colombia.

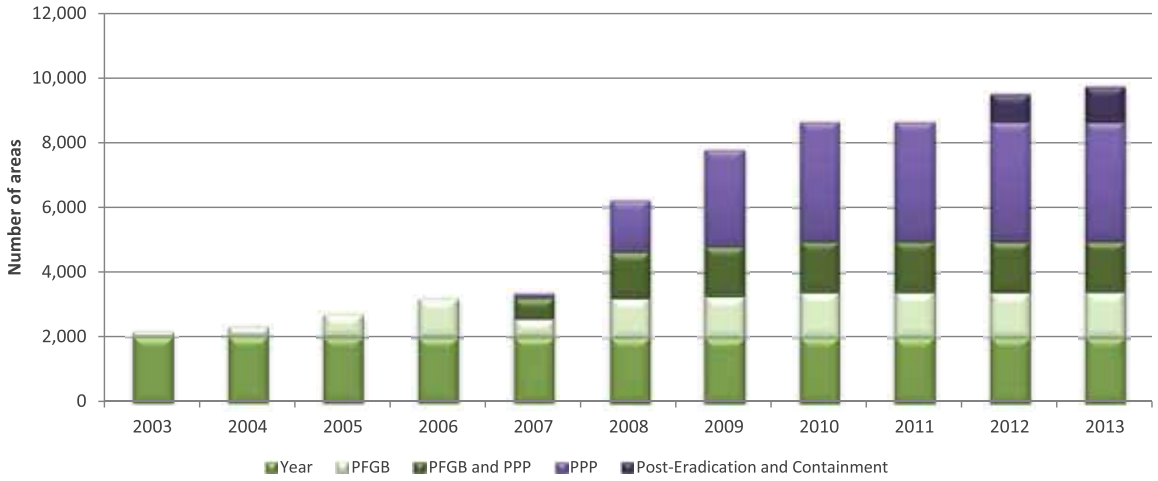
The last decade of Alternative Development in Colombia (2003 – 2013)

Hereafter, the results from the principle programmes for Alternative Development that the Colombian State has executed during the past ten years will be shown for: the Forest Ranger family programme (PFGB), The Productive Projects programme (PPP) and the results obtained as part of the contention and post-eradication strategies, as part of the Special Administrative Unit for Territorial Consolidation.

During the outlined period, the Colombian state created alternative development programmes that have promoted economic and social development within territories that have been affected and violated by the presence of illicit crops. The PDA has intervened in 7,734 areas within 361 municipalities within the country, (see map No. 19) and has benefited more than 156,000 families that were linked to illicit crops or were at risk of cultivating them.

59 Document CONPES 3669 from 2010. Available at: https://www.dnp.gov.co/LinkClick.aspx?fileticket=uqaISHu7xDo%3D&tabid=1063
60 Document CONPES 3218 from 2003. Available at https://www.dnp.gov.co/Portals/0/archivos/documentos/Subdireccion/Conpes/3218.pdf

Figure 24. Areas reached through Alternative Development



Source: UNODC, project COL/K53 - Component 5

Internal monitoring[61] by the UNODC has enabled the efficiency of alternative development programmes to be checked, identifying the possible weaknesses and outlining good practice that should be replicated. During the monitoring years, UNODC has confirmed that 4,6 million hectares have been cleared of illicit crops within areas reached by alternative development projects.

The Forest Ranger family programme

The Forest Ranger family programme -PFGB- is aimed at families that are directly involved with illicit crops or at risk of becoming so. It promotes manual eradication and volunteering, as all beneficiary families are associated with local councils such as Community Action Councils (Juntas), Afro colombian community councils or Indigenous communities.

The programme provides an economic incentive to not cultivate illicit crops: it is hoped that woodland will recuperate and be preserved through the establishment of legal and sustainable activities. It also promotes the saving[62] as part of a conditional incentive to co-finance productive projects or purchase land. In addition the PFGB provides technical assistance to strengthen community work, the creation of organisations and the implementation of environmental management strategies.

The families entering the programme commit to, through individual contracts and collectives, maintain their areas free from illicit crops. The definition of politics for “areas free from illicit crops”, enables the beneficiaries to recognise these commitments. The government can ascertain that 2,934 areas were freed from illegal crops during the implementation of the programme.

Between 2003 and 2013 seven phases were created, during which several changes were made in relation to the duration of the intervention as an incentive amount offered to families.

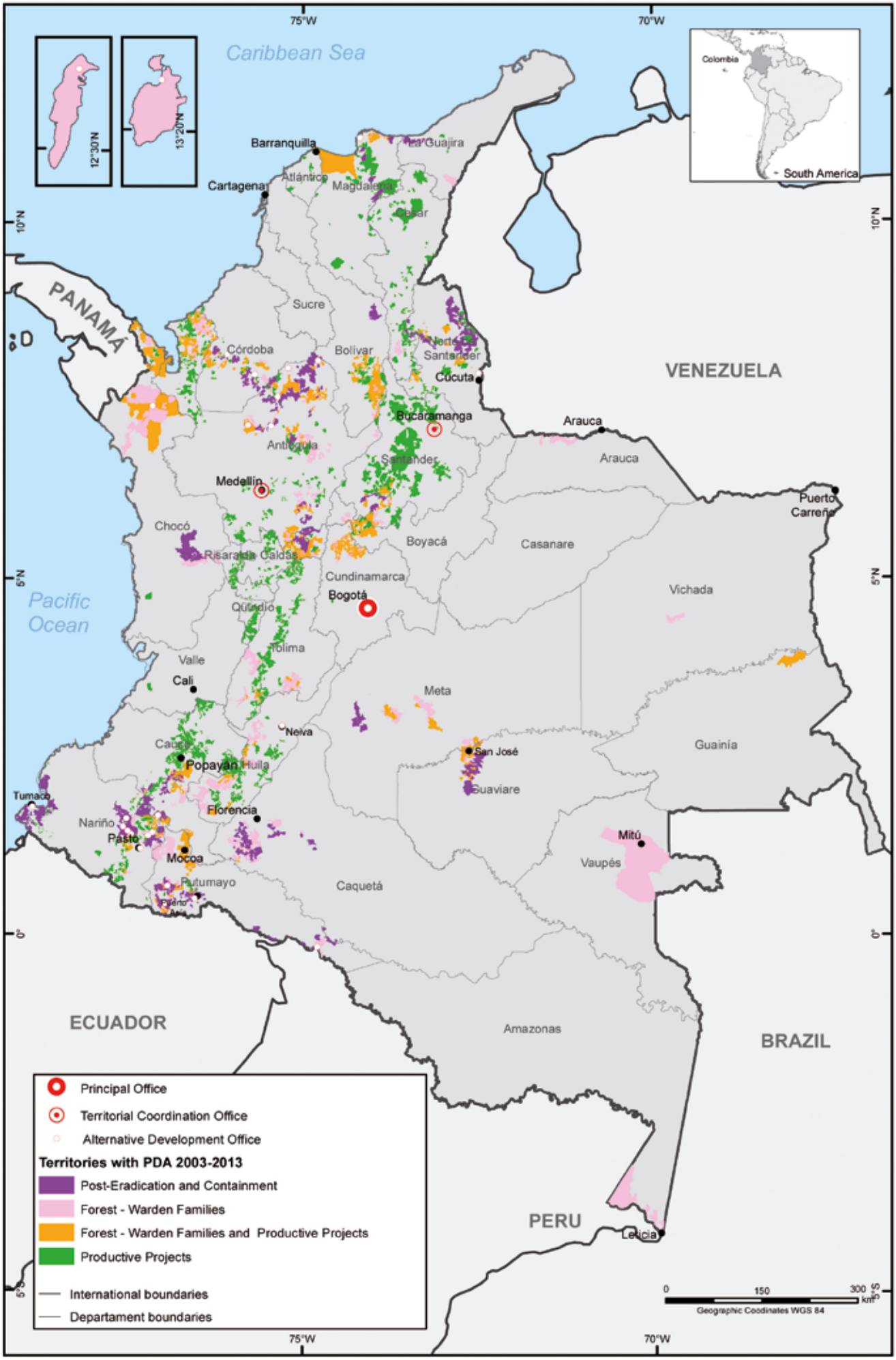
Table 32. Forest Ranger family programmes (2003 - 2013)

Phase	Implementation period	Duration	Conditioned incentive value bimonthly (COP $)	Number of beneficiary families
I - II	2003 - 2007	3 years	$ 833,000	36,222
III	2006 - 2009	3 years	$ 600,000	17,408
IV	2007 - 2009	1 ½ years	$ 408,000	33,546
V	2008 - 2010	1 ½ years	$ 408,000	19,743
VI	2009 - 2012	2 ½ years	$ 408,000	7,401
VII	2010 - 2013	2 ½ years	$204,000[63]	7,759

Source: Presidential Management against Illicit Crops

61 Internal monitoring precedes the collection of information during three moments; base line, follow up and end line. It contains a historical series over ten years, during which information about alternative development was compiled.
62 During phases IV, V, VI and VII saving is obligatory. This is invested during the final phase of intervention during projects promoted by the PFGB. During previous phases saving is voluntary
63 In Phase VII the conditional incentive is distributed every four months at a value of $408.000. The relation to resources in other phases is distributed to families, in this phase it is aimed at starting family associated projects.

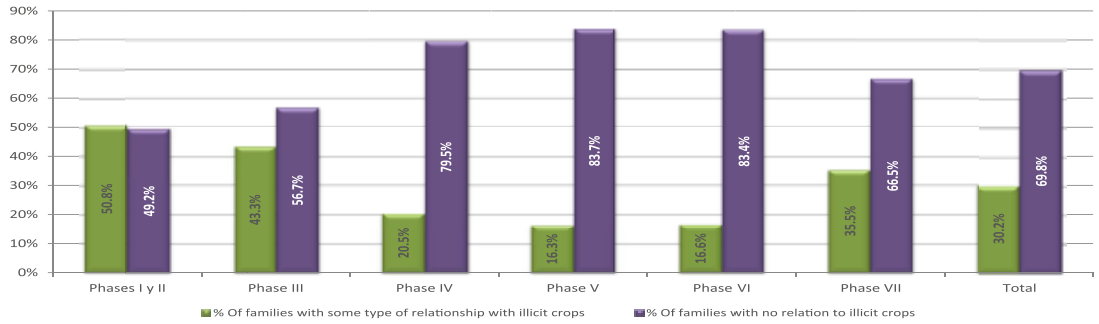
Map 17. Alternative Development Intervention in Colombia 2003 - 2013



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

During the seven phases of the programme, a link is established between the population that have worked with illicit crops or have owned crops, and families that have had no relation with this type of crop. During the first three phases, when the conditional grant is higher, it can be observed that the proportion of people who had some sort of relation to illicit crops was at around 50% of the beneficiaries.

Figure 25. Percentage of families with some sort of relation to illicit crops



Source: UNODC, project COL/K53 - Component 5

The conditional economic incentive and savings (voluntary during the first few phases and compulsory during the last few) allows the beneficiary families to acquire land. As a result of the Forest Ranger family programme survey, it is estimated that 30,148 families acquired 101,213 hectares, although it is not possible to attribute the purchasing of this land to the programme. The data shows in a significant proportion of the cases, the beneficiaries used economic incentives from grants for land purchase; this was highlighted during a pilot study in Antioquia and Cordoba for the formalisation and titration of 1,714 small producer farms within the framework of the programme. The promotion of access to rural property forms a fundamental part of the alternative development programmes, as the rooting of the land contributes to the farmers remaining removed from illicit crop cultivation and enables them to develop productive projects in the long term.

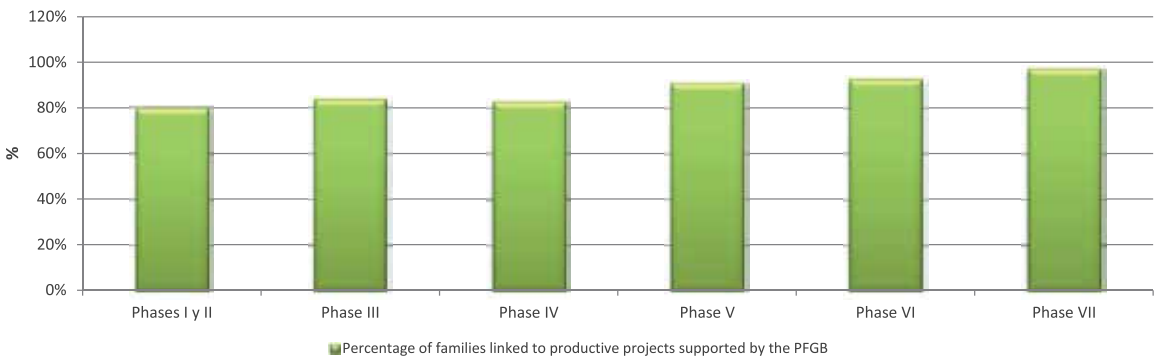
Table 33. Land acquisition for Forest Ranger families

Phases	Time of data collection	Hectares acquired	Number of families acquired land	Percentage of families who acquired land	Average hectares purchased by family
I y II	Final	41,698	11,036	54.80%	3.8
III	Final	24,454	7,281	38.00%	3.4
IV	Final	17,796	7,109	21.80%	2.5
V	Final	11,776	3,005	17.20%	3.9
VI	Final	4,067	1,038	15.10%	3.9
VII	Final	1,422	679	11.50%	2.1
TOTAL		**101,213**	**30,148**	**25.60%**	**3.4**

Source: UNODC, project COL/K53 - Component 5

To finalise each one of these seven phases, the majority of families surveyed express having a project supported by the PFGB. As outlined in the following graph, the high percentage of families that end each phase of the programme relying on legal income options, outlining their efficiency in relation to the sustainable elimination of illicit crops in Colombia.

Figure 26. Percentage of families linked to productive projects supported by PFGB



Source: UNODC, project COL/K53 - Component 5

Productive Projects Programme

Thee Productive Projects programme –PPP- aims to improve productivity, employment and income opportunities for families that were dependent on prone to links with illicit crops for their livelihood. This programme is enforced through base organisations, aiming to promote the economic advantages of the cooperation and contribute to strengthening social capital in the communities it is involved in.

Within the programme framework, the Colombian government contributes the resources for productive projects, providing technical assistance, strengthening entrepreneurial capacity, identifying marketing channels and supporting the procurement of quality certificates for access to fair trade markets, organic products and other niche markets. The productive projects also rely on the support of international organisations, members of national unions for each of the production lines, governments and mayor´s offices.

This programme has benefited around 59 thousand families through 644 projects that the 613 producer organisations have implemented, created or strengthened by alternative development programmes. During 2012 and 2013, this programme has benefited 60,716 families through productive organisations and has invested $19,906 million of pesos[64].

More than half of today's organisations are marketing their products. Some of these organisations have been able to manage credit and resources totalling more than 21 billion pesos. Others have achieved a level of development which enables them to be certified as provides of technical assistance, accompanying other producer organisations. These organisations have also achieved socio-environmental certification, permitting them to access new markets offering better sales prices.

Post-Eradication and Containment strategies

In 2012, within the national police framework for Territorial Consolidation and Reconstruction – PNCRT, in accordance with the three pillars of which the project consists: effective governance and citizen participation[65], territorial institutionalization[66] and regional integration[67], beginning with illicit crop post-eradication and containment strategies. The PNCRT operates containment strategies within 48 municipalities' and post-eradication and containment strategies within 41 municipalities (see Map No.17).

The post-eradication strategy aims to offer communities the opportunity to establish or strengthen initiatives for sustainable production after the forced or voluntary[68] eradication of illicit crops. The objective of this strategy is to guarantee family livelihoods whilst the supported projects generated income. To prevent the expansion of illicit crops, the containment strategy is active in: "territories which currently do not have this type of crop, but are vulnerable to the harmful effects posed by this activity or in risk of developing illegal activities associated with drug trafficking, possessing the sufficient conditions for the proliferation of illicit crops"[69].

For both the post-eradication and containment strategies, the total amount of income received by families, be it for food security or productive initiatives, is $1,570,000. These resources should be executed within a one year period, an interval during which the beneficiary families can count on technical productive and socio-business assistance. During 2012 and 2013, the DPCI pre-registered 44,957 families[70] located in 1,117 territories[71] in 70 municipalities of the

64 Source: UACT, Planning and Information Management Office

65 Understood as the generation and strengthening of citizen capacity and the community to influence the management of local development and exercise democratic control of public management within the territory. Good local governance, refers to the institutional capacities of municipalities to guarantee the efficiency and transparency of local management for the development of resources providing services to the population Consult http://www.consolidacion.gov.co/?q=content/pol%C3%ADtica-nacional-de-consolidaci%C3%B3n-y-reconstrucci%C3%B3n-territorial

66 Establishment of institutional capacities necessary to correct illegal territorial control, as in the Constitution and the law. Consult http://www.consolidacion.gov.co/?q=content/pol%C3%ADtica-nacional-de-consolidaci%C3%B3n-y-reconstrucci%C3%B3n-territorial

67 Understood as the establishment of base conditions within infrastructure connectivity, and social services supporting productive development, amongst other factors. These are essential to guarantee equal opportunities for development within recovered territories, inhabited by the national population average. Consult http://www.consolidacion.gov.co/?q=content/pol%C3%ADtica-nacional-de-consolidaci%C3%B3n-y-reconstrucci%C3%B3n-territorial.

68 Eradication is determined by community validation, considering the territory security conditions, these can be: voluntary or forced within manual eradication mobile groups GME. DIRECCIÓN DE PROGRAMAS CONTRA CULTIVOS ILÍCITOS-DPCI. New focus of programmes preventing illicit crop cultivation, Version 1 2012, p. 21. Available at:: <http://www.consolidacion.gov.co/themes/danland/descargas/DPCI/DOC_ESTRATEGICO_NUEVO_ENFOQUE_PROGRAMAS_CONTRA_CULTIVOS_ILICITOS.pdf>

69 Ibíd.

70 Source: UACT, Planning and Information Management Office

71 During UNODC internal monitoring, the territories correspond to areas, indigenous reserves and collective territories of black communities where programmes preventing illicit crop cultivation are enforced.

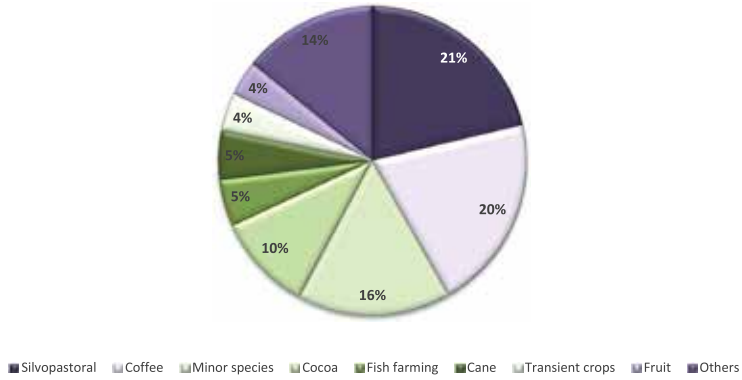
15 departments[72]. The investment during 2012 and 2013, provided for the families within this incentive, was $97,410 million pesos[73].

Through surveys carried out with community boards[74], the internal monitoring completed by the UNODC found that 36% of the territories had illicit crops when the programmes were first initiated. There was an evident decline in the number of territories with crops present; however 22% still have illicit crops. The monitoring also revealed that 50% of the beneficiaries were linked to illicit crops before programme intervention and that the majority of these crops belonged to the beneficiaries themselves.

Territory access is a fundamental condition for productive initiatives to be completed, boosting post-eradication and containment strategies. More than half of the beneficiary families are not title or deed holders, a situation representing the weakness of this group of beneficiaries for the implementation of these actions within programmes against illicit crop cultivation. Farming families with formal titles guarantee land availability as a production factor, mainly for the sustainability of projects in which it is implemented. During post-eradication and containment strategy follow-up, 42% f families confirmed that they were registered providers[75], 33% confirmed that they were owners[76], whilst 13%were tenants.

In relation to productive initiatives, the community gave preference to the development of silvopastoral systems, coffee cultivation and minor species breeding programmes, as alternative projects to generate income. During follow-up, it was found that 49% of families were linked to projects sustaining productive activities, founded prior to the programme. 42% of beneficiaries established projects in new cultivation areas. There was an active renewal of crops, indicated by 5% of the beneficiaries, just as 4% indicated having focused their productive project at post-harvest activities.

Figure 27. Production lines promoting post-eradication and containment activities



Source: UNODC, project COL/K53 - Component 5

In order to offer an alternative contributing to the mitigation of immediate effects from illicit crop eradication, the Project has promoted the implementation of food security activities (vegetable patches) and/or food assistance. As a result of the cooperation agreement, 6,392 beneficiary families opted to follow food security projects, the remaining preferred to invest these resources in the strengthening of productive projects as previously mentioned.

The different productive initiatives implemented by alternative development programmes have acted as a sustainable source for families who have decided to abandon illicit crop cultivation. For example, coffee is recognized as one of the products for major investment as part of alternative development and has contributed within direct annual sales from productive organisations. One success story is that of Asprotimaná within the department of Huila, where annual sales were close to 30 million pesos per family.

72 The number of families and territories corresponds with the focus of the 2012 and 2013 interventions. The other data presented in this paragraph relates uniquely to the 2012 intervention.

73 Source: UACT, Planning and Information Management Office

74 The Community councils for verification and social monitoring – CCVCS - are groups consisting of area leaders, advocating on behalf of their communities. They are subjected to the área survey, investigating economic, social, environmental and institutional topics. Surveys are carried out within all programme areas.

75 Owner "This refers to the person in possession of the holding for a particular object, acting as holder and owner. For this type of possession, the law demands that two factors are present: corpus, or the material or objective element, in this case land and the animus, international element or subject, consistent in owner behavior (for each case and individual), whilst another person is not acting as owner. [Within this category are persons in unique possession of a purchasing sales letter for the farm]". UNITED NATIONS OFFICE ON DRUGS AND CRIME (UNODC). MONITORING AND EVALUATION SYSTEM (SS/E). Service manual. National Forest Ranger survey. Municipal beneficiaries form phase VI. Bogotá: Monitoring and Evaluation system. 2010., p. 56-57.

76 Owner: "The natural or legal person exercising ownership rights or the facility to use, govern and provide goods for personal use, under the limitations imposed law for common good (Colombian Civil Code, 2000). For example: public deeds registered by notary of a representative de INCODER". Ibíd.

In the same vein, cacao and its derivative products, is another of the production lines that has had a marked effect within product framework. In En San Calixto, Teorama and El Carmen (Norte de Santander), for each three hectares of cocoa a family receives more than 15 million pesos per year.

Another option to eliminate illicit crop cultivation has been rubber plantation. With the Guaviare department, the ASOPROCAUCHO association reported that the beneficiaries with crops in the manufacturing process receive approximately 15 million pesos during the last year. Other productive initiatives, such as non-industrial fishing, offer an alternative for income generation within areas located in strategic corridors for illicit drug trafficking. These generate annual earnings of more than 9 million pesos for each of the associates.

To complement and generate a level of trust between the communities and the state, to promote social participation and create conditions for institutional action in vulnerable territories, the Colombian government, with the Special Administrative Unit for Territorial Consolidation –UACT, has advanced the construction of small and medium scale social works for collective interest, in response to communities' basic needs.

During 2012 and 2013 this programme was present in 10 departments and 31 municipalities for a total of 134 projects, and an approximate investment of seven million, two hundred thousand dollars (USD 7,200,000).

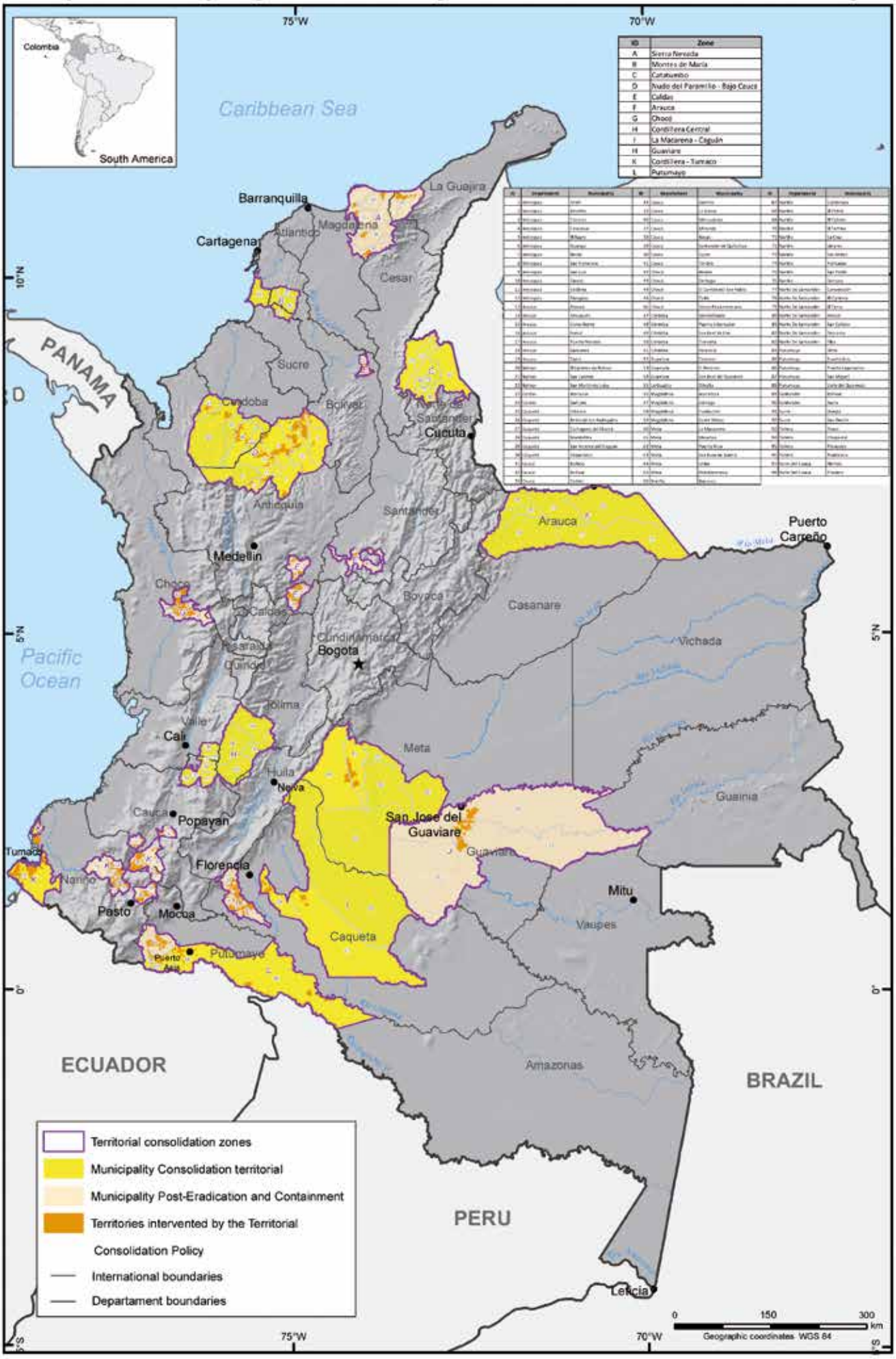
Alternative development in Colombia has contributed to a sustainable reduction in illicit crops, by implementing sustainable options to replace income from illicit economies. As a consequence, the state has been able to act within vulnerable areas, with a low level of connectivity and problems with violence, improving the quality of life for communities within various regions of the country. This has strengthened the rural economy in vulnerable areas, and in some cases new innovative strategies have been implemented, enabling the certification of products and the identification of niche markets.

During the last decade, Colombia has created an institutional framework, playing a leading role in the implementation of alternative development politics as an effective strategy for the reduction of illicit crop cultivation. This institutional framework is not only reflected in the formulation and application of public politics but also in the strengthening of organizational capacities to promote alternative development with a social, entrepreneurial and business vision. In this sense, the UNODC has contributed to boost state capacity and that of civil society in the fight against illicit drugs.

Colombia finds itself at a historic moment during which alternative development is a valuable addition during peace construction. In this juncture, these programmes should continue these efforts to create a possible post-conflict phase, this could be an option for rural communities in order to disconnect from illicit economies and improve their quality of life.

Beneficiaries from Alternative Development projects.

Map 18. Municipality intervention by the Territorial Consolidation Policy



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

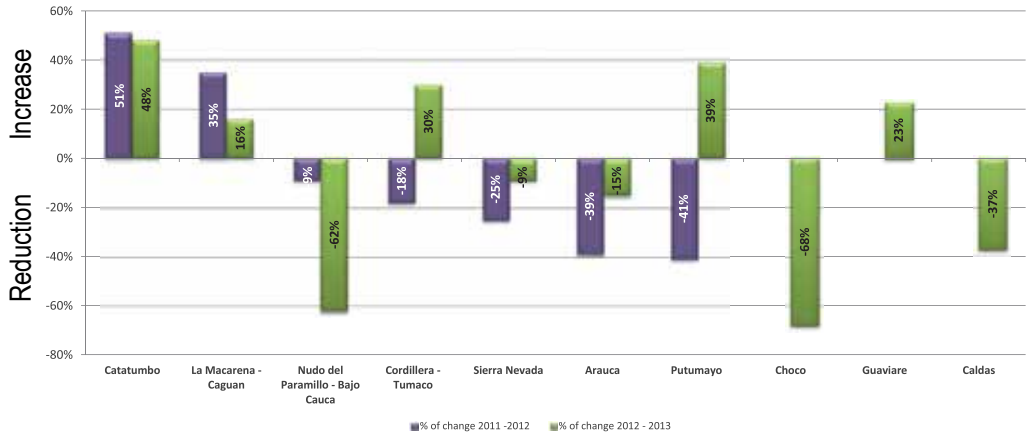
Coca crop dynamics in areas of national police intervention in relation to national politics and territorial consolidation and reconstruction

For 2013, in the 98 municipalities of PNCRT intervention (58 municipalities were within nine consolidation areas and 40 municipalities were outside of consolidation areas. (See Map 18), 56% of the national area total of coca crop cultivation. The municipalities most affected are: Tumaco, Puerto Asis, Tibu and San Jose del Guaviare.

The analysis of coca crop dynamics between the years 2012 and 2013 was carried out based on a grid analysis framework, with grids of 1Km^2 provided by SIMCI. Data indicates that 63% of the territory affected by coca crop cultivations remains stable, whilst 21% show an increase, principally within the Norte de Santander, Putumayo and Cordillera-Tumaco and 16% showed a reduction in coca area cultivation, particularly in Choco, Nudo de Paramillo and Magdalena Medio. See Map No.18.

In relation to 2012, five of the zones evaluated during both periods have preserved a similar dynamic: Nudo de Paramillo, Sierra Nevada and Arauca continue to show decreases in coca crop cultivation. Catatumbo and La Macarena- Caguán have shown an increase, although this is less than during 2012. For Putumayo and Cordillera-Tumaco these zones have shown an increase of 39% and 30% respectively. (See Map No.18; Figure No.28). Institutional intervention began in 2013 within the Choco, Guaviare and Caldas; a marked reduction in coca cultivations can be noted in relation to 2012.

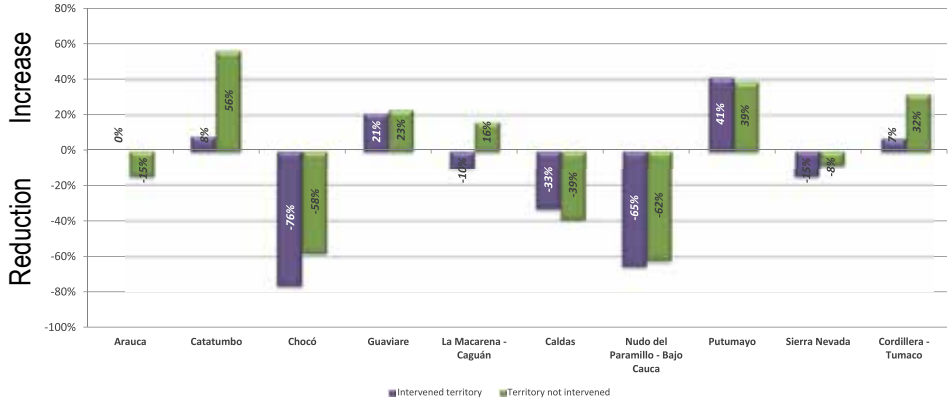
Figure 28. Coca crop cultivation trends within areas of PNCRT intervention 2012 - 2013



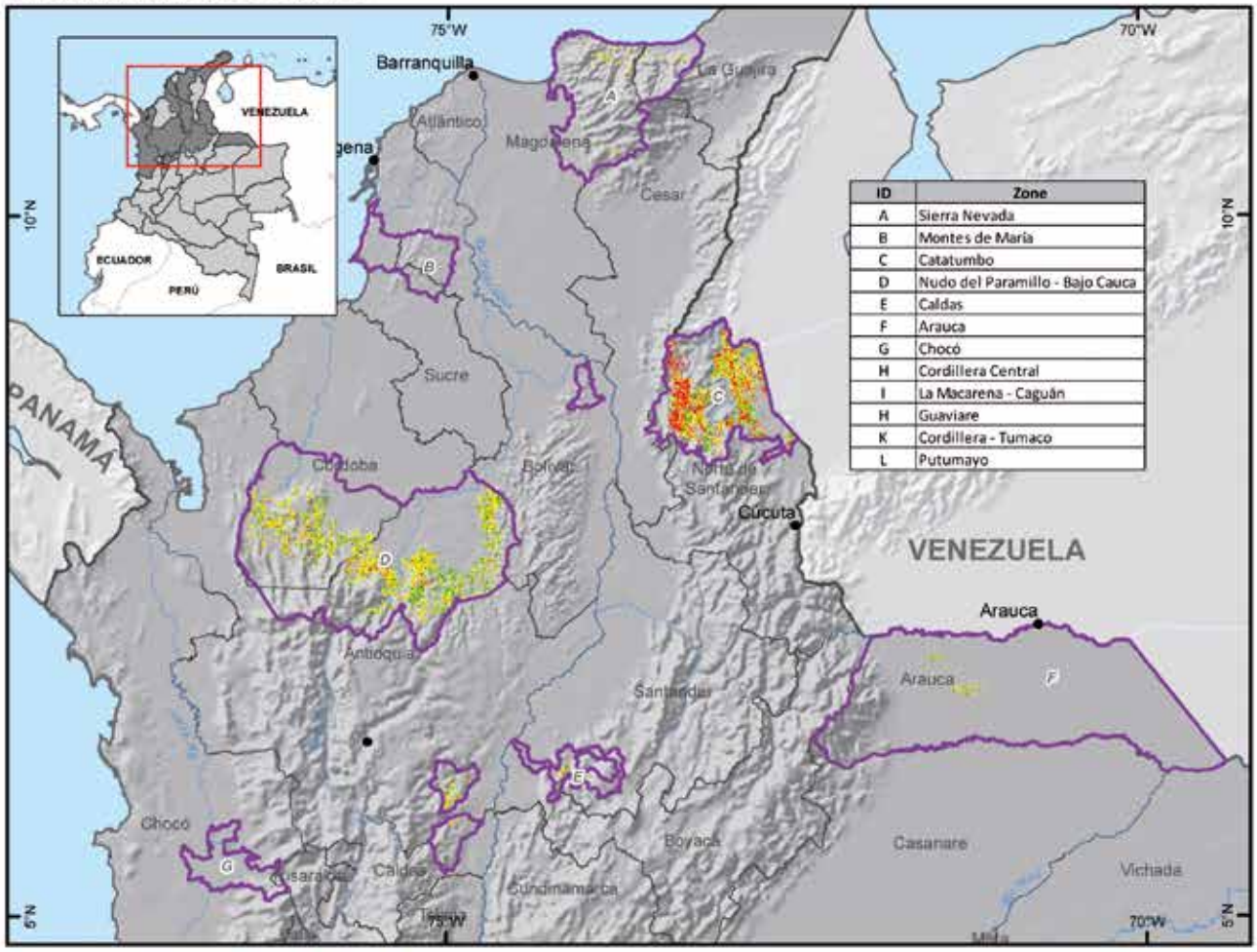
Note: During 2013, intervention began in the Choco, Guaviare and Caldas

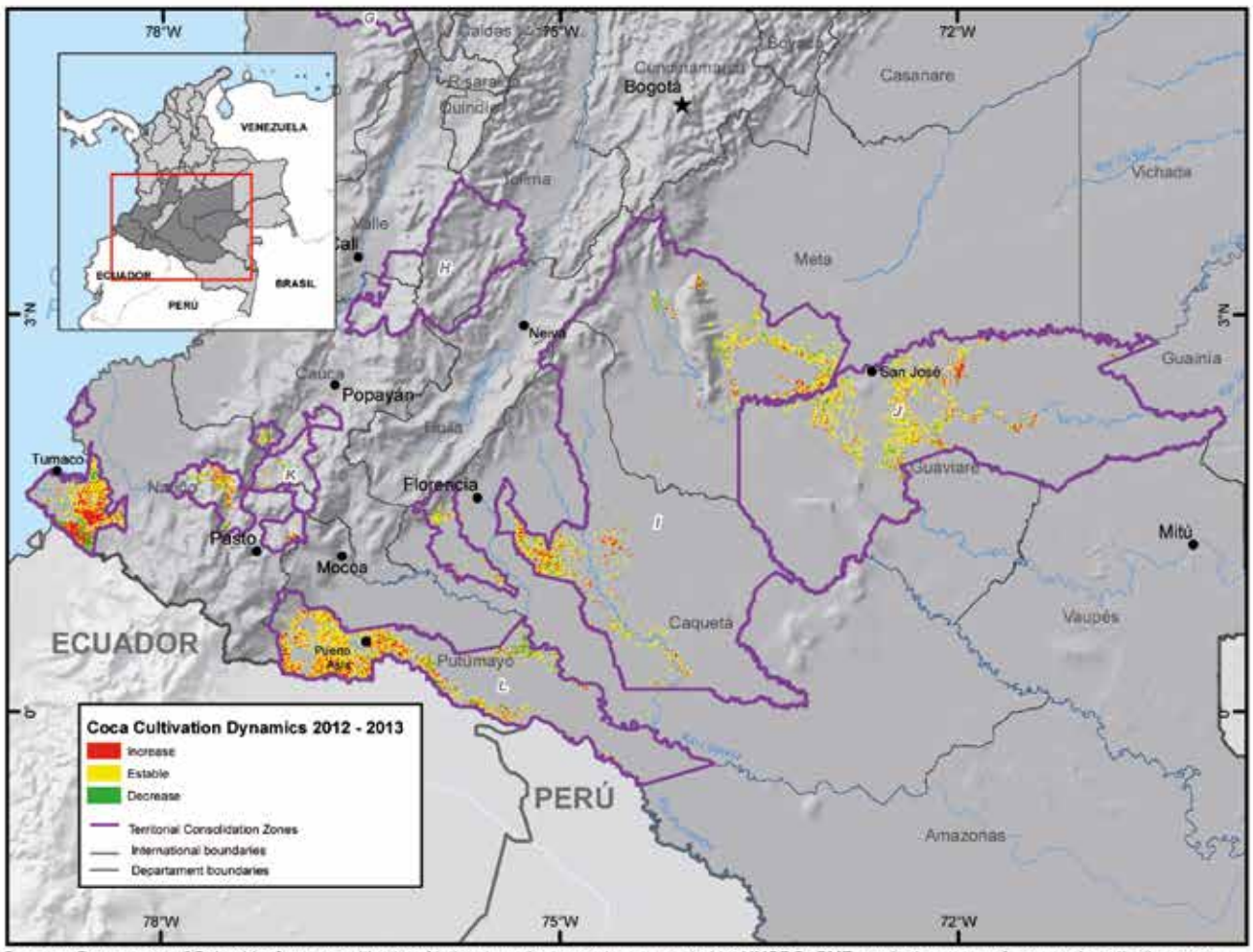
If coca crop trends are investigated in each zone, compared the zones of intervention with zones in which no intervention has occurred as a result of Territorial Consolidation programmes, in Figure 29. Similar general trends are displayed within and outside of zones of intervention. In particular within Catatumbo and Cordillera-Tumaco the increase is less within the zone of intervention than within the zone in which no intervention has occurred (See Figure 29 and Map 19.) In Macarena-Caguán there is a reduction in the coca crop area (-10%) within a zone of intervention, whilst an increase can be observed within a zone in which no intervention has (16%).

Figure 29. 2012-2013, Coca crop area trends. Comparison between zones in which intervention has occurred and zones free from intervention as part of the Programme against illicit crop cultivation.



Map 19. Dynamic of the illicit crops in intervention zones of national territorial consolidation 2012 - 2013





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

Map 20. Forced manual eradication and coca cultivation in Colombia, 2013

Sources: Colombian Government; National coca cultivation 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

Supply Reduction

Colombia´s strategy in relation to illicit drug supply is framed within the development of a series of programmes that aim, amongst other objectives, for the following: i) identification and elimination of crops for illicit use, through spraying, enforced manual eradication and the National Consolidation Programme ii) Dismantling manufacturing infrastructures; iii) control of chemical substances used during extraction and alkaloid refinement processes and chemical precursors used during the production of synthetic drugs; iv) national and international drug trafficking control and dismantling of drug trafficking networks

Manual eradication

The manual eradication strategy within Colombia is divided into three modalities: i) voluntary manual eradication, ii) forced manual eradication supporting Mobile Eradication groups and, iii) manual forced eradication carried out by the National Police of Colombia and military patrols across the country.

Manual voluntary eradication is carried out in agreement with communities; those who have eradicated their illicit crops can be linked to alternative development programmes. This modality does not have a unique registration code which enables the total eradicated area, by community voluntary input, to be known.

Forced manual eradication is part of the DPCI Special Administrative Unit for Territorial Consolidation, and is carried out by Mobile Eradication Groups–GME, accompanied by public forces to guarantee the integrity of the GME members, who are exposed to risks posed by anti-personnel landmines (MAP), improvised explosive devices (AEI) and unexploded devices (MUSE) during the execution of their work, as part of overall civil security. This means of eradication has been certified by UNODC since 2007.

The third means of eradication is carried out using public forces, when illicit crops are discovered during surveillance and the course of work. It is important to highlight that the data reported in this modality does not meet with the reliability and veracity parameters which enable it to be certified by UNODC.

Forced Manual eradication

In 2013 22,056 hectares of coca crops were eradicated, 27% less than the previous year. Manual eradication activities are principally concentrated within Nariño (41%), Norte de Santander (18%), Antioquia (9%) and Guaviare (9%). In 2013 UNODC verified the manual eradication of 9,827 hectares, 44.4% of the total manual eradication area reported. The National Police of Colombia and the military carried out forced manual eradication activities of coca across the whole country to complement this, in 2013 12,229 ha were eradicated manually by this means.

Manual eradication has a marked effect on coca cultivation as the plants are totally removed. Re-planting implies additional costs for the farmer, and a period of approximately 8 months between sowing the crop and the first harvest, presenting a low level of productivity during the initial phase.

Through the overlapping of coordinates reported GME, and considering the date on the image and the date of eradication, UNODC evaluated the behaviour of resowal activities within forced eradication areas. The following table outlines yield areas that were manually eradicated during 2013 and were Re-planting with coca crops when the census was carried out. The analysis only includes forced manual eradication data certified by the UNODC.

Table 34. Manual eradication of coca crops as verified per department by UNODC. 2013

Department	Coca crops		Poppy crops		Marijuana	
	Eradicated areas (ha)	% of the total	Eradicated areas (ha)	% of the total	Eradicated areas (ha)	% of the total
Nariño	4,026	41.0	450	92		
Norte de Santander	1,894	19.3			2	7
Antioquia	891	9.1			1	4
Guaviare	870	8.9				
Putumayo	610	6.2	40	8		
Choco	341	3.5				
Valle del Cauca	229	2.3				
Santander	186	1.9				
Cordoba	167	1.7				
Vichada	129	1.3				
Bolivar	124	1.3				
Meta	119	1.2				
Caqueta	98	1.0				
Boyaca	60	0.6				
Caldas	37	0.4				
Cesar	26	0.3				
Magdalena	19	0.2			14	52
La Guajira	1	0.01				
Cauca					10	37
Total	**9,827**	**100.0**	**490**	**100.0**	**27**	**100.0**

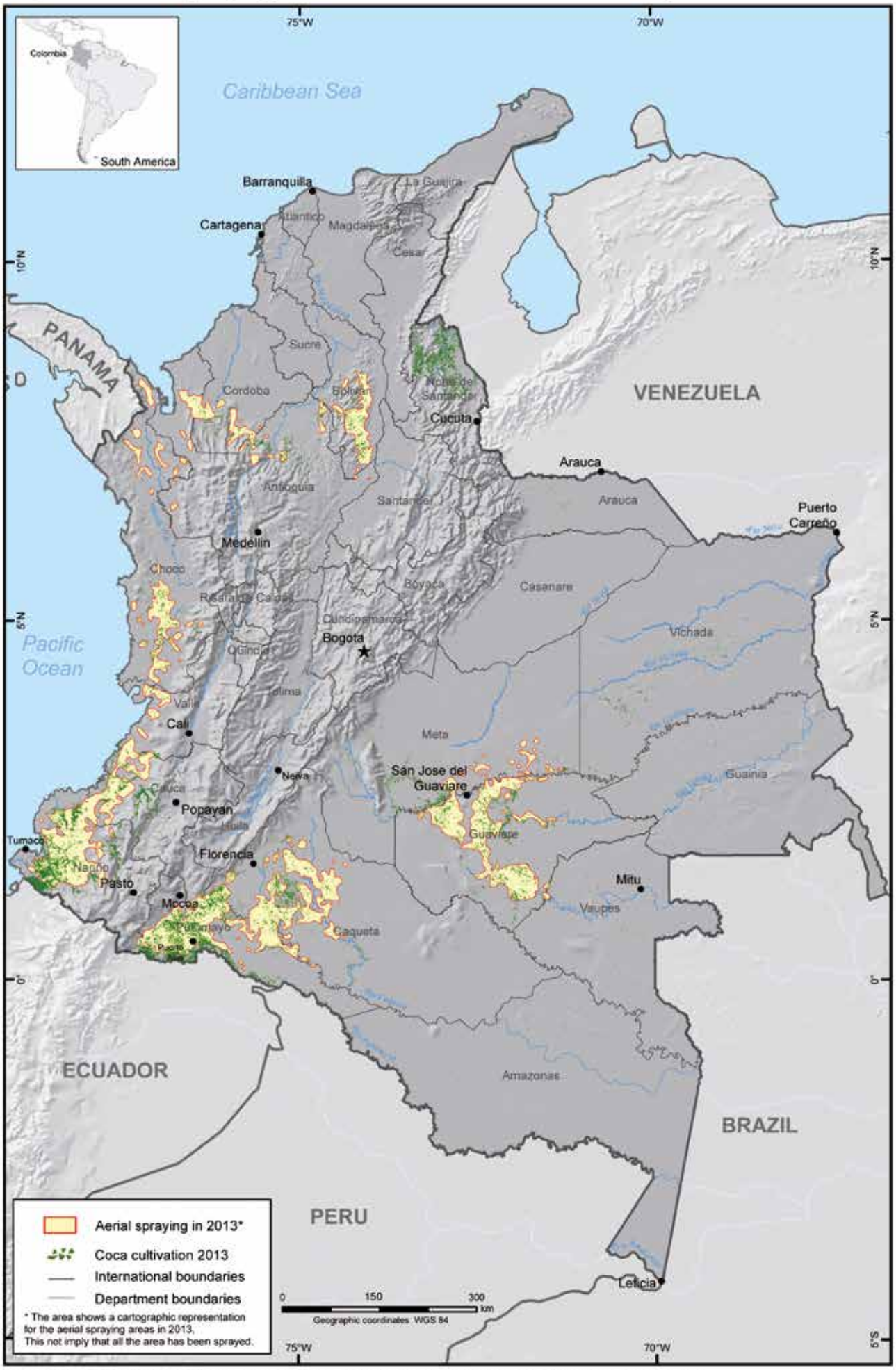
Table 35. Re-planting analysis within manual forced eradication coca crop areas GME, 2013

Region	Eradication			Re - planted with coca		No re -planting	
	Hectares	Study area	% of the total area	Hectares	%	Hectares	%
Amazon							
Central	3,385	3,139	93	184	6	2,954	94
Meta - Guaviare	989	986	100	81	8	906	92
Orinoco	129	129	100	0	0	129	100
Pacific	4,595	3,768	82	970	26	2,797	74
Putumayo - Caqueta	709	668	94	126	19	542	81
Sierra Nevada	20	17	82	0	0	17	100
Total	9,827	8,707	89	1,361	16	7,345	84

This comparison shows that 89% of the total eradicated area has sufficient information to evaluate the resowing[77] and 11% is covered by clouds. Within areas with information, 16% show evidence of resowing, 617 hectares less than the previous year. Within national coordinates, the regions that report the highest resowal of coca crops are Pacific (26%) and Putumayo – Caqueta (19%)[78].

77 For an approximate evaluation of the resowal area, data must be periodically reviewed and spraying must be referred to. Within the figure calculated, the data is calculated with 31st December as a cutoff date, and is uniquely from eradication certified by the UNODC.
78 For the Pacific region, eradication is spread over the course of the year in the following manner: phase 1(27%), phase 2 (20%), phase 3 (21%) and phase 4 (31%); and for the Putumayo-Caqueta region: phase 1 (27%), phase 2 (44%), phase 3 (21%) and phase 4 (8%). Each phase lasts approximately 3 months.

Map 21. Aerial spraying and coca cultivation in Colombia, 2013



Sources: Colombian Government; National coca cultivation 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

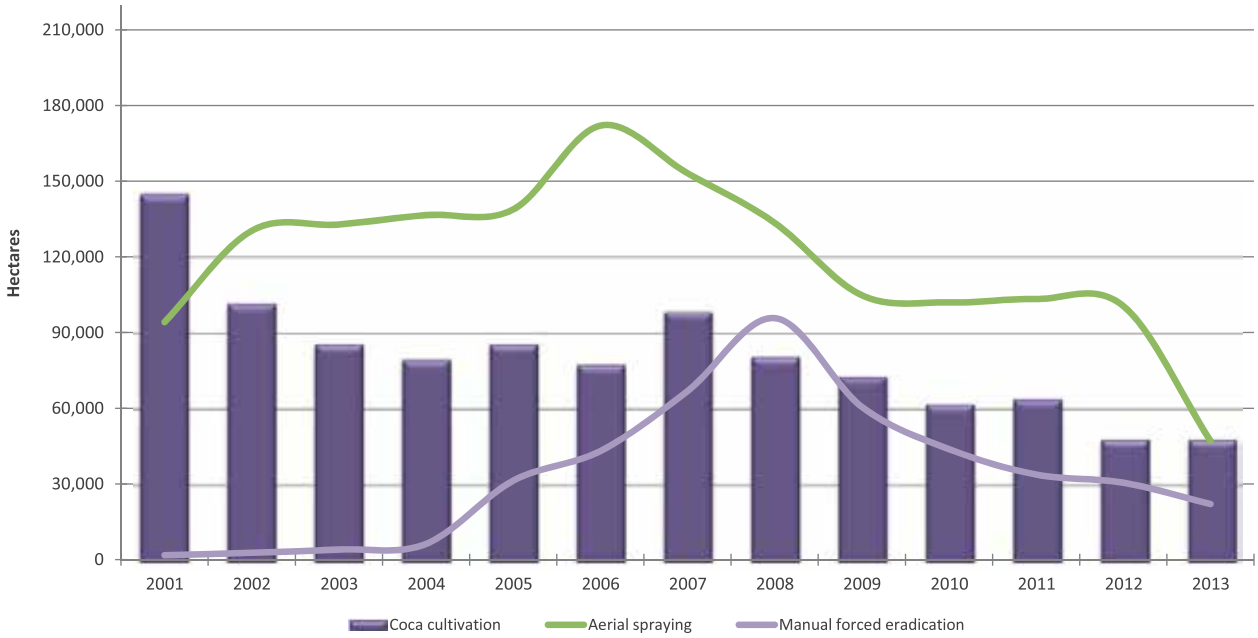
Aerial spraying

In response to the National Narcotics Council, the aerial spraying programme will be carried out by the National Police of Colombia – Narcotics Division. Spraying is carried out using a mixture of herbicide with glysophate as an active ingredient, a coadjutant and water. The chemical mix has a systematic effect (it is absorbed by the leaves and transported towards the roots). In 2013, the National Committee for the Verification of Spraying activities estimated a 91.2 % effective death rate of plants per yield. UNODC did not participate or supervise the aerial spraying activities. The information presented above is directly reported by the National Police of Colombia – DIRAN

During 2013, the DIRAN sprayed a total of 47,053 hectares of coca crops, 53% less than the previous year. 19% of the activities were carried out within the department of Putumayo, 17% in Nariño, 16% in Choco, 14% in Guaviare and an additional 24% within the departments of 24% Caqueta, Cauca and Valle del Cauca.

The decrease in spraying in relation to 2012 should be highlighted within the departments of Meta (86% reduction), Antioquia (86% decrease), Nariño (78%) and Cauca (68%). Within the department of Caqueta, the spraying effort was maintained, and within the Valle del Cauca and Putumayo departments, important increases were noted (130% and 35% respectively).

Figure 30. Comparison of coca crops within sprayed areas and areas using manual eradication 2001-2013



The accumulated sprayed area corresponds with the total amount of intervention during one calendar year, calculated by multiplying the longitude of flight lines by their width of passage, without considering the overlap between adjacent bands and the number of chemical applications applied to the same yield during the same year: this is different to the effective area sprayed.

The producers develop strategic behaviours to decrease the effect of spraying on coca crops, such as: interspersed or mixed crops, the application of substances to isolate the leaf area from the glysophate effects, washing the leaves, increasing the amount of yields so that not all are affected, rotate the plots within a productive unit and decrease the size of the yield, amongst others. Spraying, according to its level of effectiveness, can result in the loss of one or more harvests, decrease in production or total loss. These effects significally vary between one region and another, highlighting that spraying is not the only cause for the reduction or loss of harvests.

The aforementioned reasons, united with losses due to climate, pests or diseases, enable the understanding as to why the crop area within Colombia is not constant during the year due to various actions or factors which result in the upturn (crop resowing and protection from spraying) or the drop (aerial spraying, manual eradication, problems within the market or factors such as violence).

Table 36. Aerial spryaing within coca crops per department and year (hectares) 2002-2013

Department	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Putumayo	71,891	8,343	17,524	11,763	26,491	26,766	11,898	3,777	11,434	9,480	6,504	8,755
Nariño	17,962	36,911	31,307	57,630	59,865	36,275	54,050	39,992	25,940	34,988	37,831	8,101
Choco	-	-	-	425	-	-	-	-	-	4,287	13,259	7,464
Guaviare	7,207	37,493	30,892	11,865	14,714	10,950	13,061	12,584	17,633	8,917	11,088	6,796
Caqueta	18,567	1,060	16,276	5,452	4,575	5,084	11,085	6,652	16,947	12,888	5,638	5,784
Cauca	-	1,308	1,811	3,292	1,536	3,557	6,891	11,136	14,450	11,834	10,697	3,409
Valle del cauca	-	-	-	5	-	-	-	-	-	719	986	2,269
Bolivar	-	4,783	6,456	6,443	2,662	7,050	2,214	8,715	4,412	3,564	2,740	1,925
Cordoba	734	550	-	1,767	5,588	6,259	3,561	742	546	3,128	1,632	1,183
Antioquia	3,321	9,835	11,048	16,799	18,022	27,058	10,028	9,281	3,026	9,847	6,971	944
Meta	1,496	6,974	3,888	14,453	25,915	15,527	9,057	6,756	5,825	2,545	3,152	423
Vichada	-	-	1,446	-	5,485	7,193	5,901	1,699	1,425	1,014	51	-
Santander	-	5	1,855	2,042	2,146	1,754	422	1,269	153	92	-	-
Norte de Santander	9,186	13,822	5,686	899	1,687	2,683	2,864	1,883	149	-	-	-
Caldas	-	-	190	1,090	1,068	284	-	169	-	-	-	-
Boyaca	-	-	-	925	831	-	166	117	-	-	-	-
Arauca	-	11,734	5,336	2,584	1,400	2,695	2,296	-	-	-	-	-
Cundinamarca	-	-	-	43	41	-	-	-	-	-	-	-
La Guajira	-	-	449	572	-	-	-	-	-	-	-	-
Magdalena	-	-	1,632	383	-	-	-	-	-	-	-	-
Vaupes	-	-	756	340	-	-	-	-	-	-	-	-
Total spraying	130,364	132,817	136,551	138,775	172,025	153,134	133,496	104,772	101,940	103,302	100,549	47,053

Source: UNODC - SIMCI, National police of Colombia, DIRAN

Drug infrastructure and drug manufacturing seizures

In Colombia, drug seizures, just as the detection and dismantling of the infrastructure destined for drug production, are carried out by the government through interventions by the control institutions: these being The Colombia Drug Observatory – ODC, administered by the Ministry of Law and Justice[79] in charge of compiling and reporting official information.

UNODC does not take part in these operations, nor in the information capture, consolidation and validation processes. Nevertheless, given the relevance of the analysis on drug trade dynamics, this information is included in the current report.

Infrastructure

During 2013, the Colombian authorities destroyed a total of 2,344 infrastructures destined for drug extraction and production and chemical substances distributed within the following manner: 2,128 laboratories for the extraction of coca paste or cocaine base, 208 cocaine hydrochloride laboratories, 1 heroine laboratory, 4 marijuana greenhouses and 3 potassium permanganate laboratories.

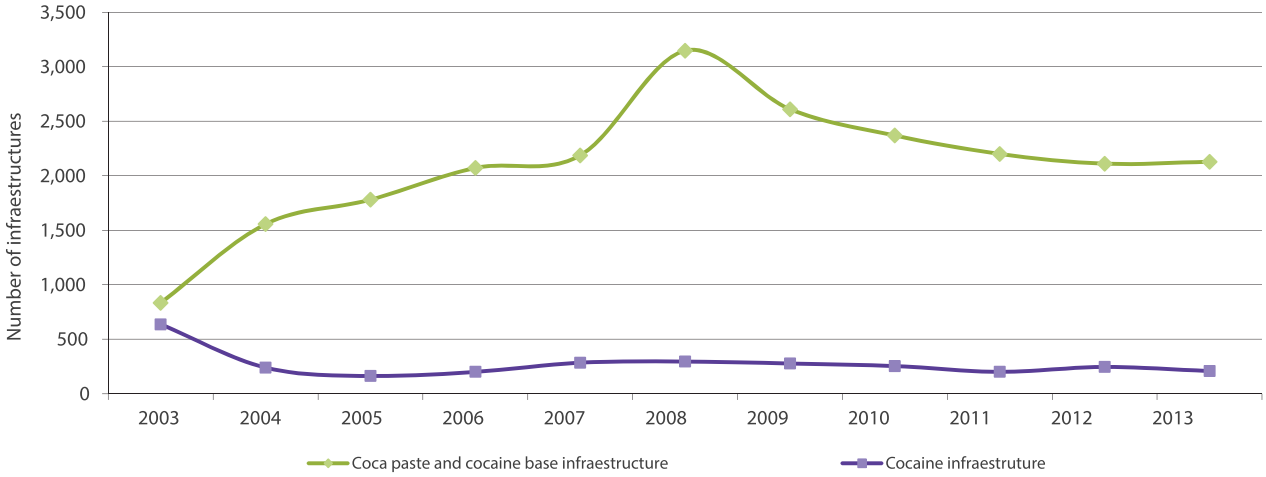
In 2013, the dismantling of coca paste and cocaine base laboratories was at 73% within the departments of Nariño (17%), Norte de Santander (15%), Cauca (10%), Choco (9%), Antioquia (8%), Caqueta (7%) and Putumayo (6%).

79 Statistical information in relation to seizures and dismantled infrastructures can be consulted in greater detail on the Colombia Drug Observatory web page www.odc.gov.co. The information outlined within the current chapter was updated on the 5th May 2014 and corresponds with the variables available up to this date.

If the historical behaviour in relation to the dismantling of these infrastructures is observed, their location tends to be associated with areas of cultivation and the production of coca leaves, enabling a direct geographic relation to be established directly with the reduction of risks connected to these activities (as in the case of transport) as the Agricultural Production Unit with Coca-PAC sells the leaf.

In relation to the cocaine hydrochloride laboratories, the majority of the "cristalizaderos" dismantled were found within the departments of Norte de Santander (29%), Antioquia (13%), Cauca (11%), Nariño (10%), Cundinamarca (8%), Meta (7%) and Valle del Cauca (6%). The establishment of these infrastructures is not directly geographically related to the presence of coca crop cultivations, their installation and location is a result of a strategy related to secure conditions. Due to the clandestine nature of the manufacture and trafficking of products deriving from the coca manufacturing chain, it is difficult to obtain the precise location of places of installation and infrastructure which are not associated with the Agricultural Production Unit and Coca-Pac.

Figure 31. Manufacture infrastructure destroyed by Public Forces within Colombia, for the extracation and refinement of cocaine from 2003-2013(p)



Source: Colombia drugs observatory
Technical notes:

(p) Preliminary figures. It is worth mentioning that during the compilation of this chapter, the Colombia Drug Observatory is carrying out a methodological update, including the implementation of purification processes, standardisation, consistency and validation of the source generated within the historical series. In relation to the aforementioned, the figures presented can be adjusted and updated.

On average, over the last few years, the number of infrastructures dedicated to the extraction of coca paste and cocaine base that have been dismantled, is more than those used for the crystallization of cocaine hydrochloride or any other type of substances. These types of infrastructures imply significant financial costs for the implementation, coordination with armed groups guaranteeing security and supporting the operations, amongst other reasons. In these studies carried out by UNODC[80], it has been identified that the laboratories for the transformation of cocaine hydrochloride have had to reduce their production capacity by between 50% and 75%, characterised as structures that are easy to assemble in isolated areas. These laboratories have been detected in sites near to urban zones or cities.

Seizures

Drug seizures are an effort by institutions within the Colombian government to reduce the market supply. In accordance with figures reported by the Colombia Drug Observatory, in 2013 322 mt of coca leaf, 14 mt of coca paste, 45 mt of cocaine base and 167 mt of cocaine hydrochloride were seized[81].

80 Within the framework of the coca leaf transformation process to cocaine hydrochloride within Colombia, the studies are led by UNODC, SIMCI and PRELAC projects with the support of the European Union and the Colombian Government.
81 The purities and chemical characteristics of seized drugs are unknown.

Table 37. Illicit drug seizures 2003-2013

Drugs	U	2003	2004	2005	2006	2007	2008	2009	2010	2011	20121	2013[2(p)]
Coca leaf	kg	688,691	567,638	682,010	818,544	1,064,503	644,353	826,793	871,249	1,022,532	718,992	321,669
Coca paste	kg	2,368	1,218	2,651	5,451	922	5,001	11,400	3,685	3,892	5,312	14,401
Cocaine base	kg	27,103	37,046	106,491	42,708	33,882	49,663	41,634	46,405	50,401	49,698	45,090
Cocaine hydrochloride	kg	113,142	149,297	173,265	127,326	126,641	198,366	203,166	164,808	155,832	188,021	166,732
Opium latex	kg	27	57	1,632	118	125	172	49	2	193	0	1
Heroine	kg	629	763	745	442	537	646	728	337	299	464	403
Marijuana	kg	108,942	151,163	150,795	93,745	142,684	254,685	206,811	254,991	348,082	348,472	410,281
Synthetic drugs	Tablets	5,042	19,494	148,724	7,888	1,968,857	5,597	132,987	26,299	22,809	56,961	121,151

Source: Colombia Drugs Observatory, Ministry of Law and Justice,

[1] The cocaine hydrochloride seizure data from 2012 includes 34.7 mt related to international operations in collaboration with the Colombian Public forces

[2] Cocaine hydrochloride seizure data from 2013 includes 35.8mt related to international operations in collaboration with the Colombian Public Forces

Technical notes:

[(p)] Preliminary figures. From the date which this chapter was complied, the Colombia Drug Observatory is executing a methodological study which includes the implementation of purification processes, standardisation, consistency and validation of the source generated within the historical series. In relation to the aforementioned, the figures presented can be updated and adjusted.

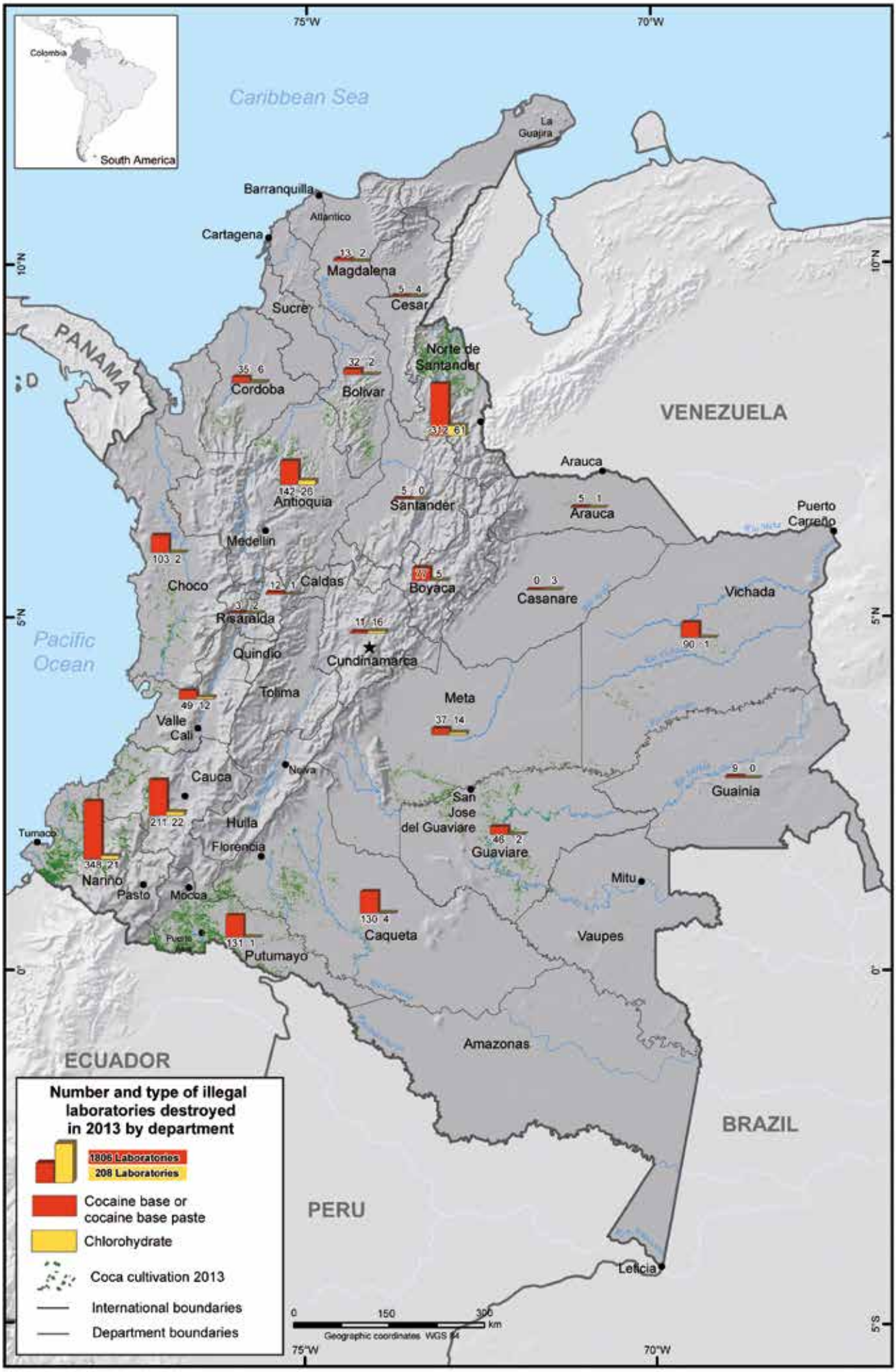
In 2013, coca leaf seizures reduced by 55.3% in relation to the previous year, reaching the lowest value during the last ten years. These seizures were principally conducted within the departments of Cauca (26%), Norte de Santander (17%), Nariño (12%), Vichada (7%), Antioquia (6%), Valle del Cauca (6%) and Caqueta (5%).

Coca paste seizures tripled during 2013 in comparison with those registered in 2012: of the 14mt confiscated, the majority was seized within the departments of Caqueta (50%), Cauca (23%), Putumayo (11%) and Nariño (10%).

Cocaine base seizures decreased by 9.3%, from 50 mt in 2012 to 45 mt during 2013, these seizures were principally conducted within the departments of Norte de Santander (13%), Antioquia (10%), Nariño (9%), Cauca (8%), Caqueta (8%), Cesar (7%), Choco (7%), Putumayo (6%), Caldas (5%) and Valle del Cauca (5%).

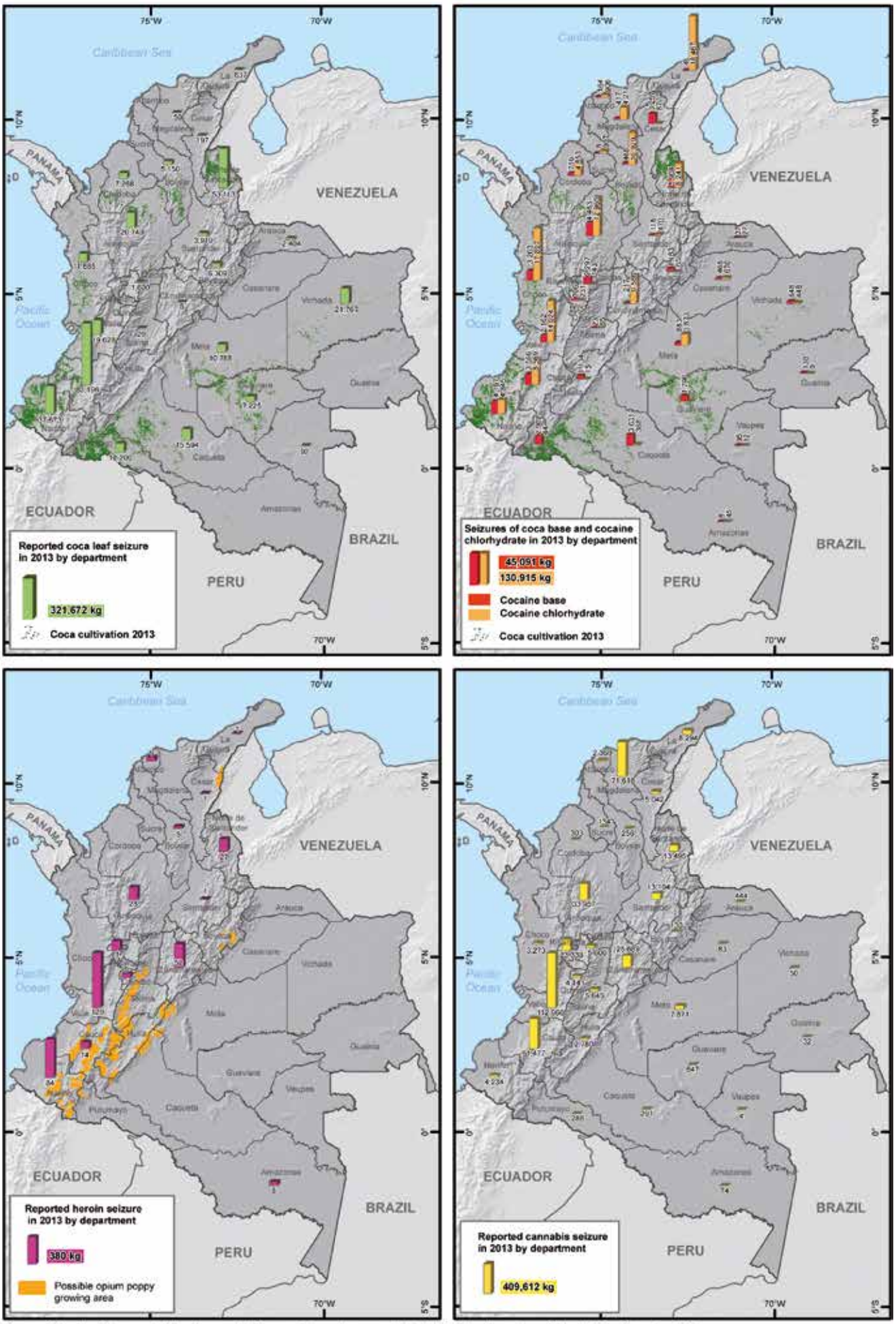
Cocaine hydrochloride seizures decreased from 153 mt in 2012 to 131 mt in 2013, presenting a reduction of 146%. Cocaine hydrochloride seizures were concentrated in the departments of Choco (14%), La Guajira (14%), Valle del Cauca (11%), Antioquia (10%), Bolivar (8%), Cauca (7%), Norte de Santander (6%), and San Andrés (6%). The purity of seizures carried out within Colombia is unknown.

Map 22. Destruction of clandestine laboratories and coca cultivation in Colombia, 2013



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

Map 23. Drug seizures by department and by drug type, Colombia 2013



Sources: Colombian Government; National coca cultivation 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 38. Illicit drug seizures as per type and department 2013(p)

	Coca leaf	Coca paste	Cocaine base	Cocaine hydrochloride
Department	**Kilograms**	**Kilograms**	**Kilograms**	**Kilograms**
Amazonas		88	8	45
Antioquia	20,749	28	4,463	12,965
Arauca	2,404		37	27
Archipielago de San Andres, Providencia y Santa Catalina				7,859
Atlantico			164	906
Bogota, D.C.			55	6,570
Bolivar	5,150	8	468	10,929
Boyaca	6,309		1,163	65
Caldas	1,600		2,297	143
Caqueta	15,594	7,257	3,631	388
Casanare		320	465	670
Cauca	83,196	3,245	3,556	8,569
Cesar	197	53	3,257	87
Choco	11,885	134	3,263	17,897
Cordoba	7,268		716	4,853
Cundinamarca	8		161	3,010
Guainia			138	0
Guaviare	7,225	97	1,796	0
Huila		4	1,134	15
La Guajira	837	0	4	18,467
Magdalena	50	11	417	4,218
Meta	10,788	21	883	3,873
Nariño	37,673	1,413	4,167	4,845
Norte de Santander	53,113	161	5,904	8,241
Putumayo	12,200	1,531	2,902	44
Quindio			82	72
Risaralda			706	231
Santander	3,919	12	118	470
Sucre			8	907
Tolima	20		23	65
Valle del cauca	19,628	8	2,162	14,024
Vaupes	92		95	12
Vichada	21,767	10	848	448
Total national	**321,672**	**14,401**	**45,091**	**130,915**
Others[1]				35,816
Total	**321,672**	**14,401**	**45,091**	**166,731**

Source: Colombia Drugs Observatory, Ministry of Law and Justice

[1] Corresponds with seizures carried out during international operations in collaboration with the Colombia Public Forces

Technical notes:

(p) Preliminary figures. It is worth mentioning that at the date of consolidation for this chapter, the Colombian Centre for Drugs is completing a methodological study which includes the processes for purification, standardisation, consistency and validation of sources generated within historical series. In relation to the aforementioned, the figures presented can be adjusted and updated.

During international operations, 36 mt of cocaine hydrochloride was seized, representing 21% of the total amount. These seizures are carried out in collaboration with the Colombian Public Forces, 50% were carried out in Panama, followed by 22% of seizures within international waters.

In 2013, there was an important increase in coca paste seizures (171%), differing from coca leaf, cocaine base and cocaine hydrochloride which decreased by 55.3%, 9.3% and 14.6% respectively.

Table 39. Seizures of other illicit drugs within Colombia according to type and department 2013(p)

	Basuco	Pressed marijuana	Heroine	LSD[1]	Amphetamines[1]	Ecstasy[1]
Departamento	**Kilograms**	**Kilograms**	**Kilograms**	**Unit**	**Unit**	**Unit**
Amazonas	19	74	8			
Antioquia	570	33,957	28	1,790	56	27,279
Arauca	3	444	0		15	
Archipielago de San Andres, Providencia y Santa Catalina	4	2,002				
Atlantico	92	2,360	9	1,654		773
Bogota, D.C.	414	19,980	47		44	141
Bolivar	25	256	5			371
Boyaca	8	130	0		11	487
Caldas	65	5,600	-		1,421	259
Caqueta	39	291				161
Casanare	8	83				73
Cauca	1,162	61,477	14			236
Cesar	23	5,042	1			51
Choco	30	3,273				55
Cordoba	28	303				5,146
Cundinamarca	161	5,709	5			1,100
Guainia	16	32				
Guaviare	1	647		46		392
Huila	16	2,780	0	400		46
La Guajira	6	8,294	1			
Magdalena	37	71,616				33
Meta	21	7,871			40	83
Nariño	89	4,234	84			2,144
Norte de Santander	213	13,495	27		56,910	49
Putumayo	15	286				
Quindío	41	4,141	9			
Risaralda	111	23,338	21		743	1,094
Santander	100	13,104	1	160		280
Sucre	1	134				159
Tolima	26	5,645			100	28
Valle del cauca	363	112,960	120		13,537	3,778
Vaupes	1	4				
Vichada	3	50				6
Total National	**3,711**	**409,612**	**380**	**4,050**	**72,877**	**44,224**
Others[2]		670	24			
Total	**3,711**	**410,282**	**404**	**4,050**	**72,877**	**44,224**

Source: Colombia Drugs Observatory, Ministry of Law and Justice

[1] The data refers to the name under which the substance is marketed, no laboratory tests exist to prove its nature.

[2] Corresponds with the seizures carried out during international operations in collaboration with the Colombian Public Forces

Technical notes:

(p) Preliminary figures. It is worth mentioning that at the date of consolidation for this chapter, the Colombian Centre for Drugs is completing a methodological study which includes the processes for purification, standardisation, consistency and validation of sources generated within historical series. In relation to the aforementioned, the figures presented can be adjusted and updated.

METHODOLOGY

COCA CULTIVATION CENSUS

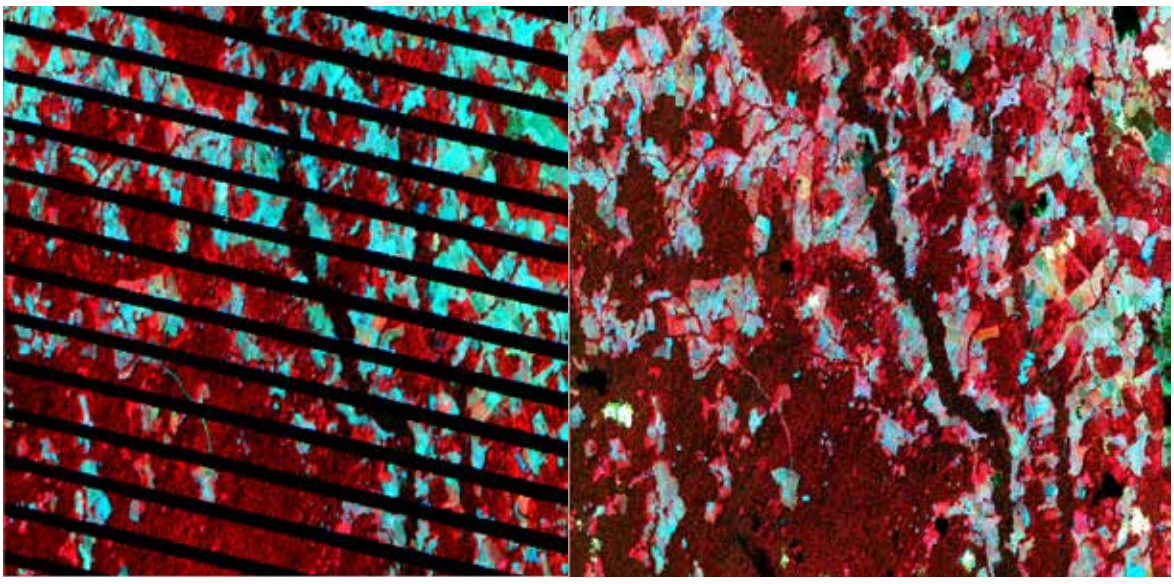
The monitoring of coca cultivations within Colombia is based on the interpretation of satellite images. For the 2013 census, the project downloaded and georeferenced a total of 124 images, of which 73 (70 Landsat 8 and 3 Landsat 7) were effective. The remainder were used as a support to analyse the trace of coca cultivations. 64.3% of the study area was covered using satellite images obtained between November 2013 and February 2014. The cloudy conditions which prevailed in Colombia during the end of 2013 required the use of 3 images taken by Landsat 8 between May and July of 2013. The acquired images covered all the national territory (1,142,000 km^2) except the San Andres and Providencia islands.

To monitor coca cultivations, a new satellite Landsat 8 was introduced in 2013. This was launched on the 11th February 2013, enabling the continuity of the capture, archival, processing and data distribution, for at least 5 years, in a manner consistent with the Landsat 7 system.

The mission brought two sensors on board, the first "Operational Land Imager (OLI)" captures images within 9 bands in short succession using spatial resolution of 30 metres for all images apart from the panchromatic band of 15 metres. The other sensor, "Thermal Infrared Sensor (TIRS)" obtains images in two thermal bands using a spatial resolution of 100 metres, useful during the collection of data in relation to the heat emitted by the planet´s surface and the monitoring of water consumption, amongst other applications.

In relation to its predecessor, Landsat 7, the most important changes occur in OLI once in band 5, excluding a water vapour absorption band to reduce atmospheric interference. In addition, this sensor has two more bands, band 1 for colour and ocean quality observations within coastal regions and band 9 to detect cirrus type clouds, unnoticed in previous platforms. The panchromatic band is wider in relation to Landsat 7, allowing a greater contrast between areas with and without vegetation. To make the most of this improved technology, by fusioning the 30 metre bands with the panchromatic band, for each image used in the census, a product known as pan sharpening is obtained with 15 metres of spatial, enabling an improved level of visual discrimination for the interpreter.

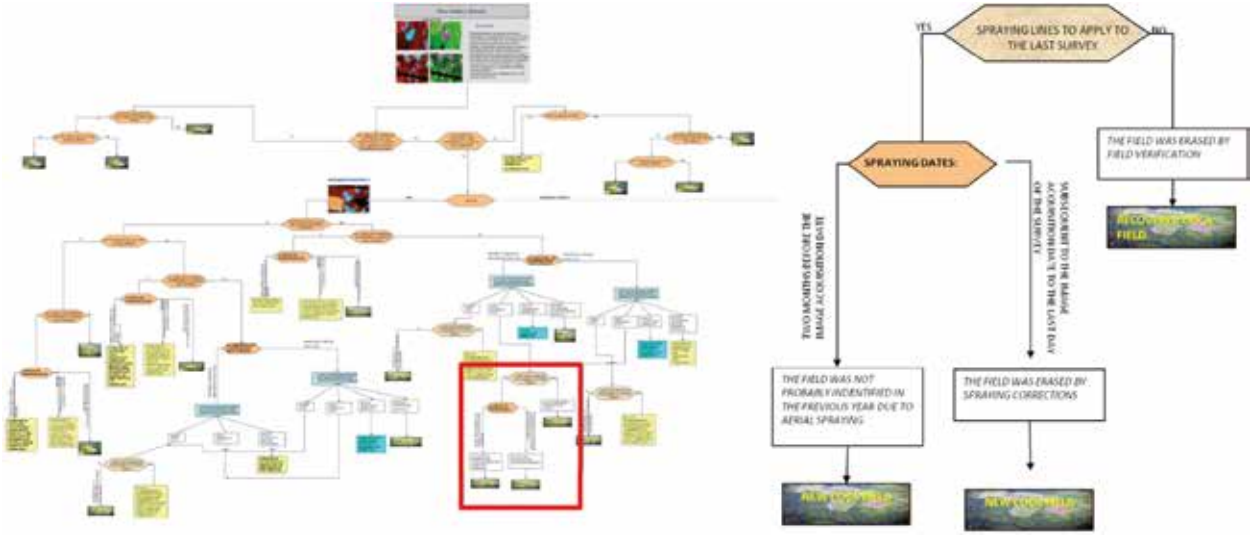
Figure 32. Examples of minimisation from areas in which no information is obtained



a b Landsat 7 with gaps (a) Landsat 8 in pansharperning 15 mt (b)

The project was developed with the support of the Universidad de BOKU, physiotherapic decision trees for coca cultivation interpretation from satellite images within three regions: Meta-Guaviare, Putumayo-Caqueta and Cauca-Nariño. The objective is the documentation of the process carried out by the interpreter to qualify the yield of coca crop cultivation with all possible variations within the dynamics presented by each one of the regions.

Figure 33. Detail of an physiotherapic decision tree designed as a key aspect in the interpretation of coca crop cultivations.



The calculated total area of coca crop cultivations within Colombia during 2013 is a result of the following processes:

Identification and acquisition of satellite images. One of the main difficulties posed by the acquisition of satellite images is the frequent cloud coverage over Colombian territory. For this reason, permanent monitoring of the path of different satellites is used. The following satellites were used during the 2013 coca cultivation census.

Landsat 8 captures data in 8 spectral bands, with a spatial resolution of 30 metres, two thermal bands: one of 100 metres and an addition panchromatic band of 15 metres. The satellite has a 16 day repeat cycle, which enables the obtention of images with different cloud cover. The 185km bandwidth is appropriate for regional studies.

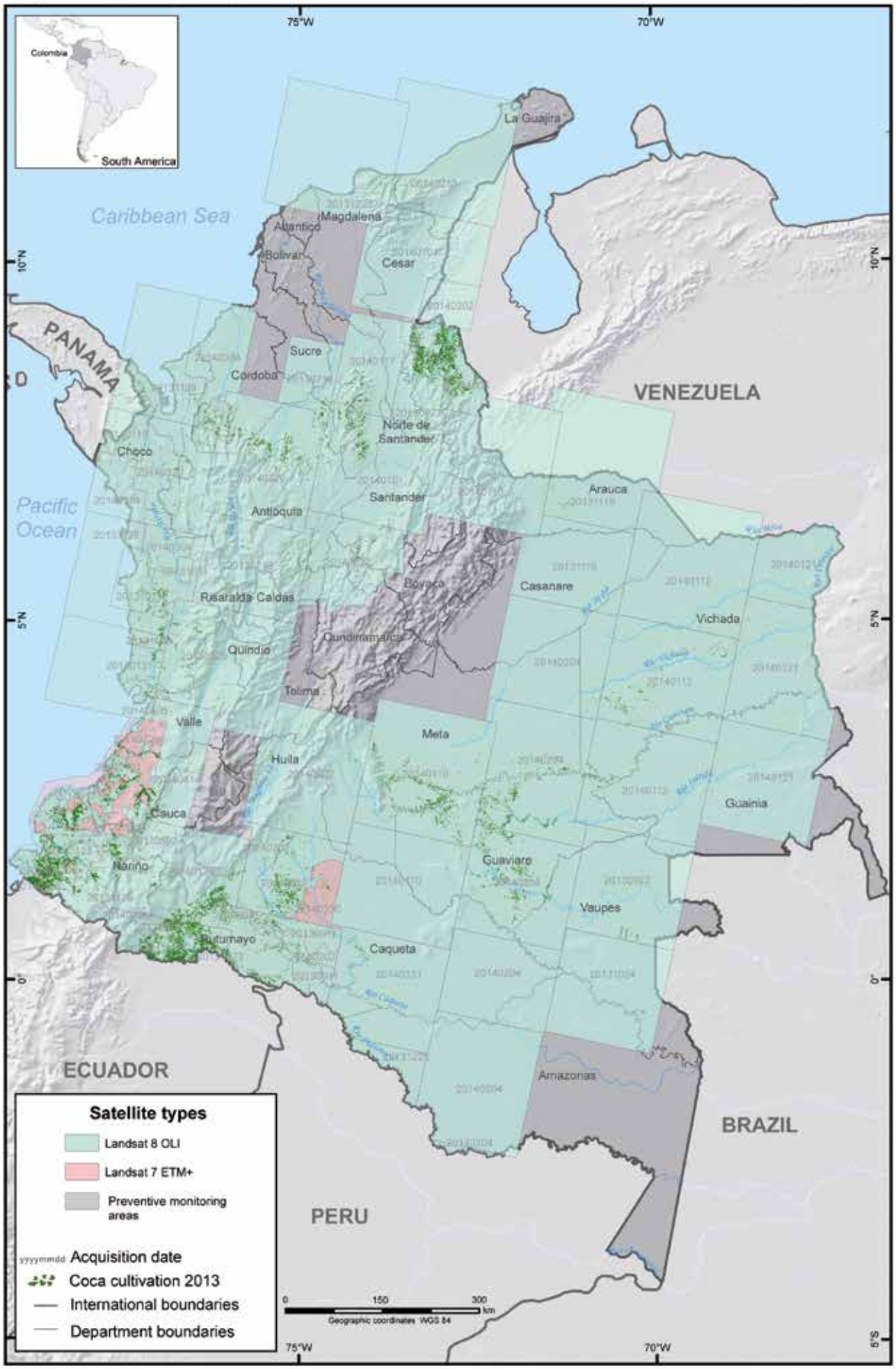
The LANDSAT 7 ETM+ data is obtained within 6 spectral bands with a 30 metre spatial resolution, two thermal bands of 60 metres and an additional panchromatic band of 15 metres. The satellite has a 16 day repeat cycle. The 185km bandwidth is appropriate for regional studies.

The figure relates to the different sensors that the Project permanently consults in accordance with the spectral and spatial characteristics, viable for the monitoring of coca cultivations. Nevertheless, Aster has only functioned using the first three bands since 2008 due to faults in the sensor, whilst Alos stopped capturing images as from 2011.

Table 40. Contribution of satellite images from 2005 to 2012 used in censuses in Colombia

Sensors	2005%	2006%	2007%	2008%	2009%	2010%	2011%	2012%	2013%
LandSat 7 ETM+	92	89	89	95	69	67	88	100	4
LandSat 5 TM	-	-	-	-	13	11	7	-	
SPOT 4 and 5	5	3	3	4	-	-	5	-	
ALOS	-	-	3	1	11	22	-		
ASTER	3	5	5	-	7	-	-		
IRS6 – LISS III	-	3	-	-	-	-	-		
Landsat 8									96
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Map 24. Satellite images used for the coca cultivation survey in Colombia, 2013



Source: Colombian Government - 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

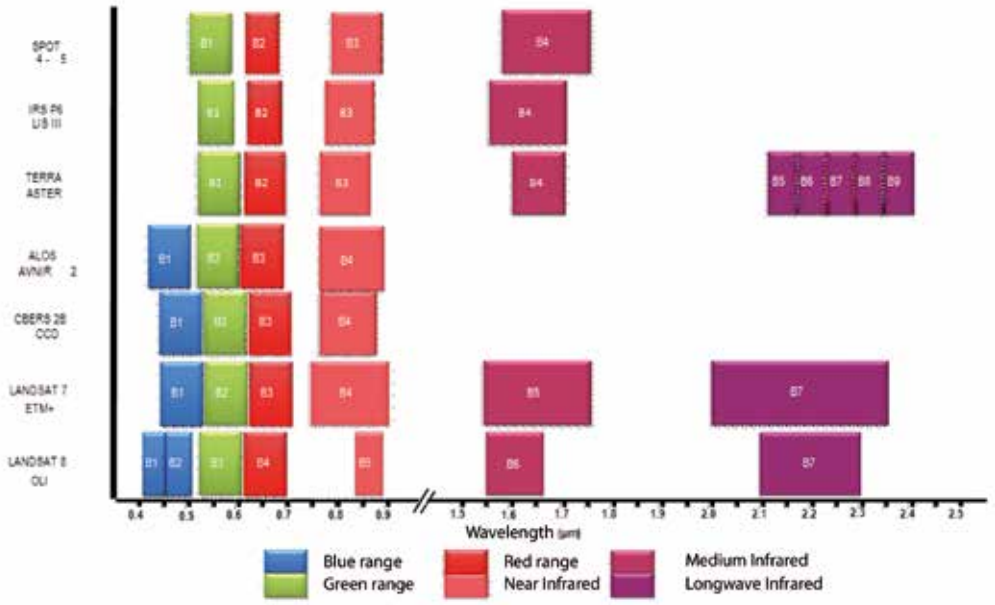


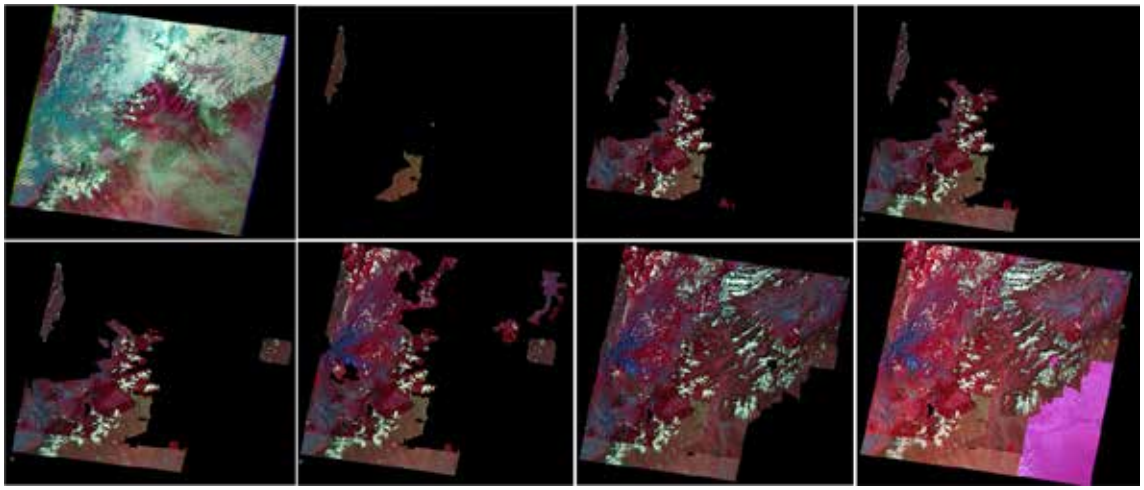
Image pre-processing

Georeferencing

To use spectral and spatial information in conjunction with other spatial data available (e.g. digital elevation models, spraying lines, eradication polygons amongst others) this requires that the data from the images is the same as that used for map coordinates. The satellite images are georeferenced based on mosaics constructed using images with the least amount of cloud cover from previous censuses.

Minimising areas without information

Constant cloud cover in Colombian territory produces losses in information and hinders the obtention of images free from clouds. To minimize the loss of information, permanent monitoring of the images captured by different satellites, from earlier dates, to replace areas covered by cloud with areas free from clouds in other images. Each segment of images that are used are analysed individually allowing for possible temporal updates. The permanent search for images guarantees optimum coverage within zones of interest.



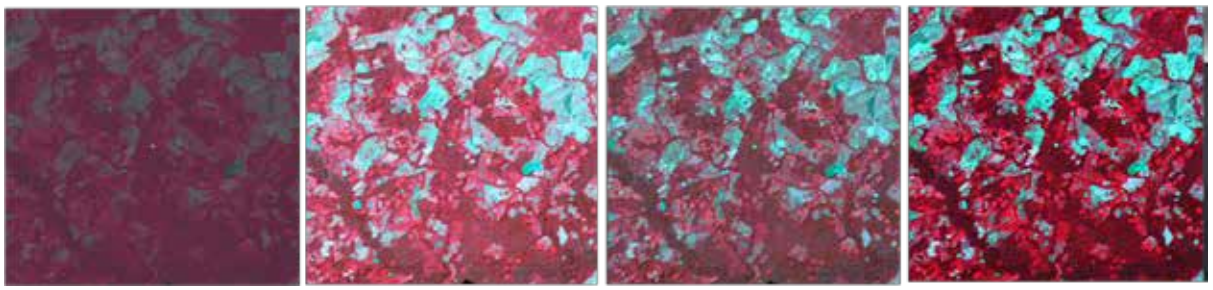
a	b	c	d
e	f	g	h

From a Landsat 7 ETM+ image (a) and by means of the selection and addition of information available in other 5 Landsat images (c, d, e, f and g), and 2 ASTER images (h), a built image is obtained (h).

Radiometric and spatial improvements

Radiometric improvement is aimed at improving the spectral contrast of data for optimum visual interpretation.

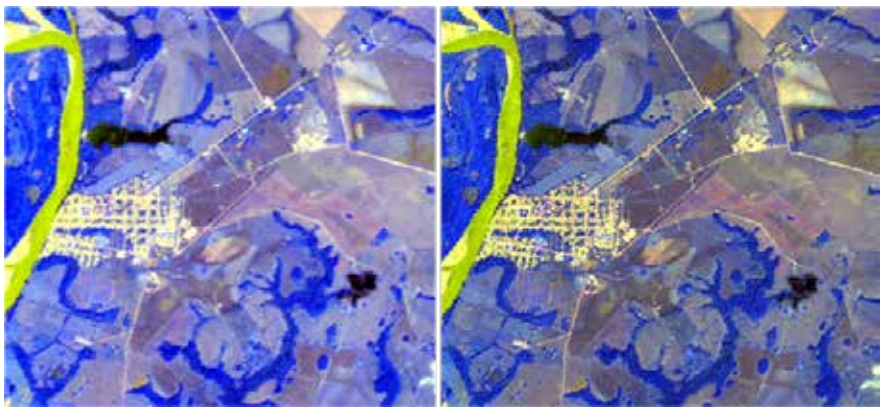
Figure 36. Example of radiometric enhancement.



a b c d The original data (a) is subject of different processes of shine and contrast highlight (b, c, and d)

To improve the spatial characteristics of an image, various filters are used which modify the pixel value, using neighbouring pixel values, whose function is to highlight lineal elements such as rivers and roads within the image.

Figure 37. Example of spatial enhancement.

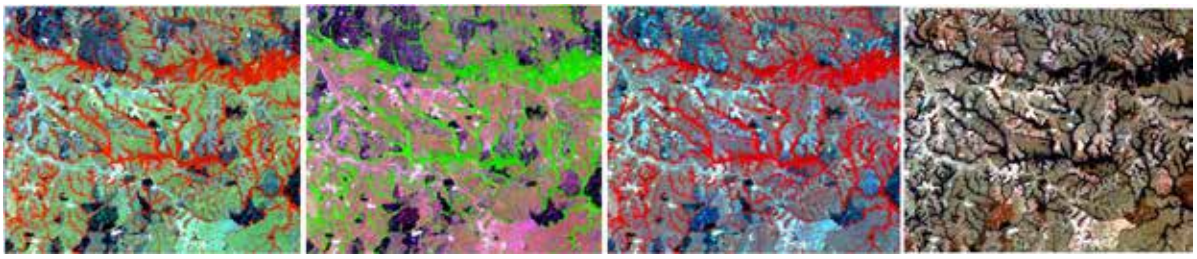


a b The original data (a) is subject of a spatial filtering process (b)

Colour compositions

The multispectral images capture information within various ranges of the electromagnetic spectrum, capturing different colour compositions enabling the visualization of different parts of the spectrum in order to enable the distinction of different coverages present in the image. Obtaining a colour composition depends on the interpretation objective; different compositions highlight different characteristics or image data.

Figure 38. Example of different colour compositions.



a b c d F rom a 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).

Visual interpretation of coca yields

The characteristics of Colombian territory mean that a clear timetable for coca harvests is not necessary, together with the spectral characteristics of coca crops during their differing phonological stages, these overlap with other vegetal coverage prevents the use of supervised classification for the obtention of coca fields. Coca yield obtention is based on the visual interpretation of satellite images based on: spectral behavior, interpretation elements (tone, form, texture, pattern), geographic environment and characteristics specific to the zone. The class of coca within all of its vegetal states, can be considered as a composition of areas in which high and mid-density foliage zones are mixed with low density foliage zones, characteristed by a high soil reflectance. This results in a wide spectral range within coca yields.

Coca yield interpretation consists of three phases:

1- Preliminary interpretation of coca cultivations

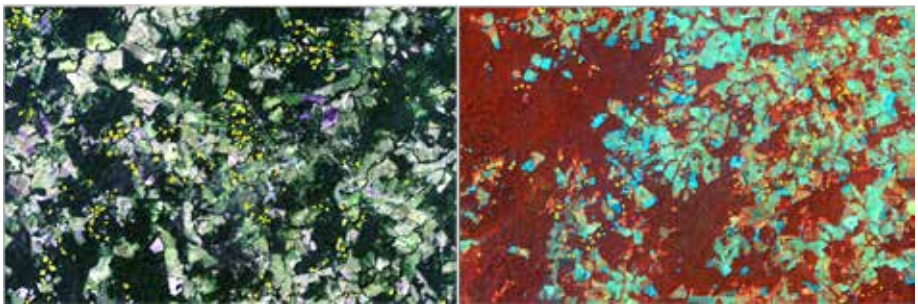
2- Flyover auditing

3- Edition

Preliminary interpretation of coca cultivations

The preliminary interpretation process is based on the aforementioned points; historical coca series analysis and secondary information consisting of aerial photography, aerial spraying and manual eradication information and information provided by different Government agents and the United Nations System.

Figure 39. 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).

Flyover auditing

Flyover auditing is necessary to adjust and subsequently validate coca interpretation. The auditing is based on visual inspection of the terrain within affected zones from an aircraft. For the 2013 census, a direct data capture system was implemented for information obtained during fieldwork satellite images, with the use of a tablet synchronized with a GPS wireless antenna. This mechanism enables the direct creation of a shapefile type folder, created by an expert within which the characteristics identified during fieldwork are assigned to a list of the following attributes: coca yield, high or low density zone, resowing, bare soil cover, other crops and other factors. This process enables improvements in the reduction of editing of information obtained during fieldwork and simultaneously enables the construction of a historic file georeferenced with verification missions.

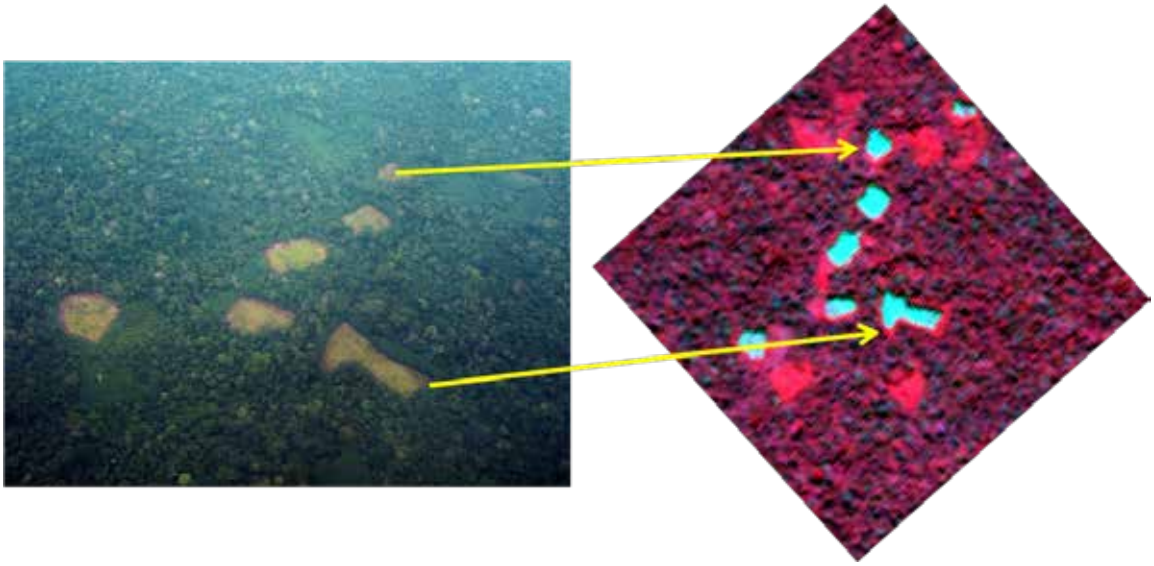
Flyover planning is based on four basis aspects: general monitoring, changes in crop density, open area monitoring from the previous census and expansion zones. These checks are carried out within 5 mile sweeps at an average of 3,000 feet.

In addition to the shape file created during the flyover, a digital camera is used in combination with the GPS to take photographs, a video camera captures additional information and the GPS is used to register the positions of zones with or without coca. All of these resources are used during the edition process of preliminary yields which are interpreted in the office. The flyovers are supported by DIRAN. During the 2013 coca cultivation census, 12 flyovers were carried out with a 136 hour flight time.

Edition

The information collected during flyover audits is used to adjust the preliminary interpretation keeping in mind the date of the images and spraying and manual eradication carried out within the image area. Once this change has been carried out, the coca yield interpretation file is obtained.

Figure 39. Photographic record of verification overflights and its equivalent in satellite image.

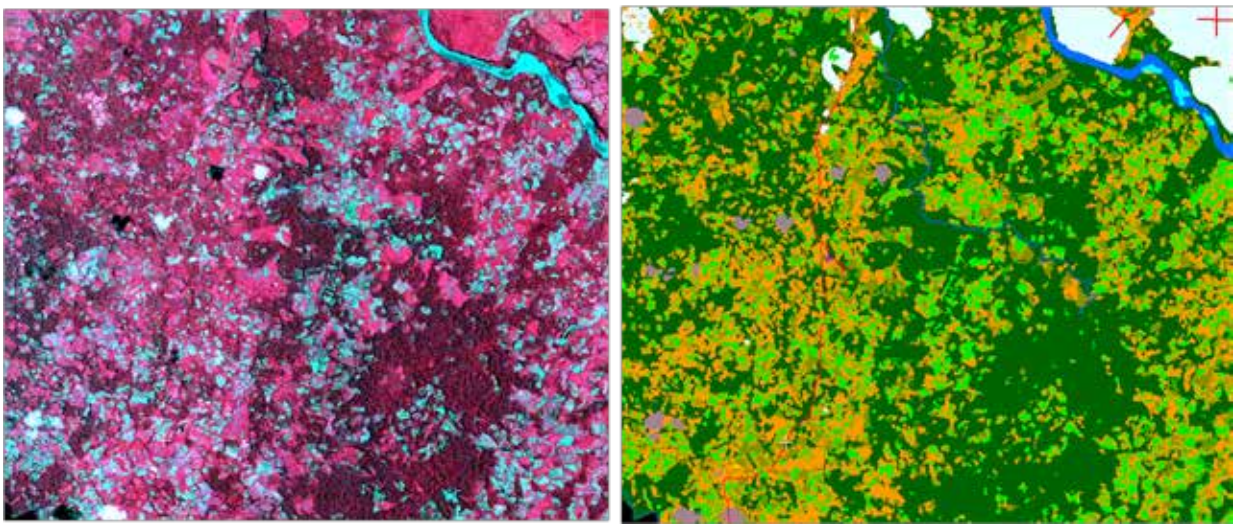


Digital imagery coverage classification and land usage

In addition to coca cultivations, other land coverage is interpreted within coca growing regions using the legend adapted for the Project. This coverage is used to carry out a multitemporal analysis, whose principal objective is to determine the coca yield dynamics in relation to other coverage.

This process is completed using supervised classification, within which known coverage pixels are used as training areas to classify the total amount of pixels within the image. The algorithm used is of maximum-likelihood and is applied to a probabilistic model for the formulation of pixel value allocation rules. During this process, 11 classification types are established: Primary woodland and forest, secondary woodland, low-lying grassland and stubble, other crops, rocky outcrops, sand banks, flood areas, clouds and gaps. This does not include: some bodies of water, roads or urban areas corresponding to lineal coverage, coca cultivations that can be visually analysed.

Figure 40. Digital classification of land covers.



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

Map 25. Study area distributed by region and coca cultivation in Colombia, 2013

Sources: Colombian Government; National coca cultivation 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

Estimations and Adjustments

Coca cultivation interpretation using satellite imagery is supported by the application of a series of adjustments which improve the data and reduce errors as a result of a lack of information (cloud coverage) or a difference between the date of the image and the date of census cut off.

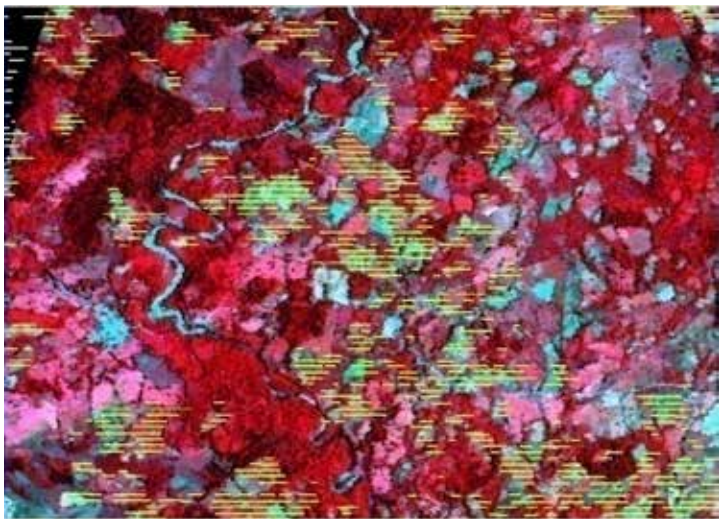
Adjustments due to forced manual eradication

As part of eradication activities, coca crops are manually uprooted and their coordinates, date of eradication and other crop related variables are registered. Using the aforementioned information, the corresponding adjustments can be made depending on the date of the image, eradication date and the census cutoff date. When eradication is carried out after the image date, the coca cultivation areas are interpreted. Nevertheless, if the eradication was carried out before the census cutoff, the coca yields that were interpreted are eliminated from the adjustment process.

Coca plots that were manually eradicated (after the date of the image) in white

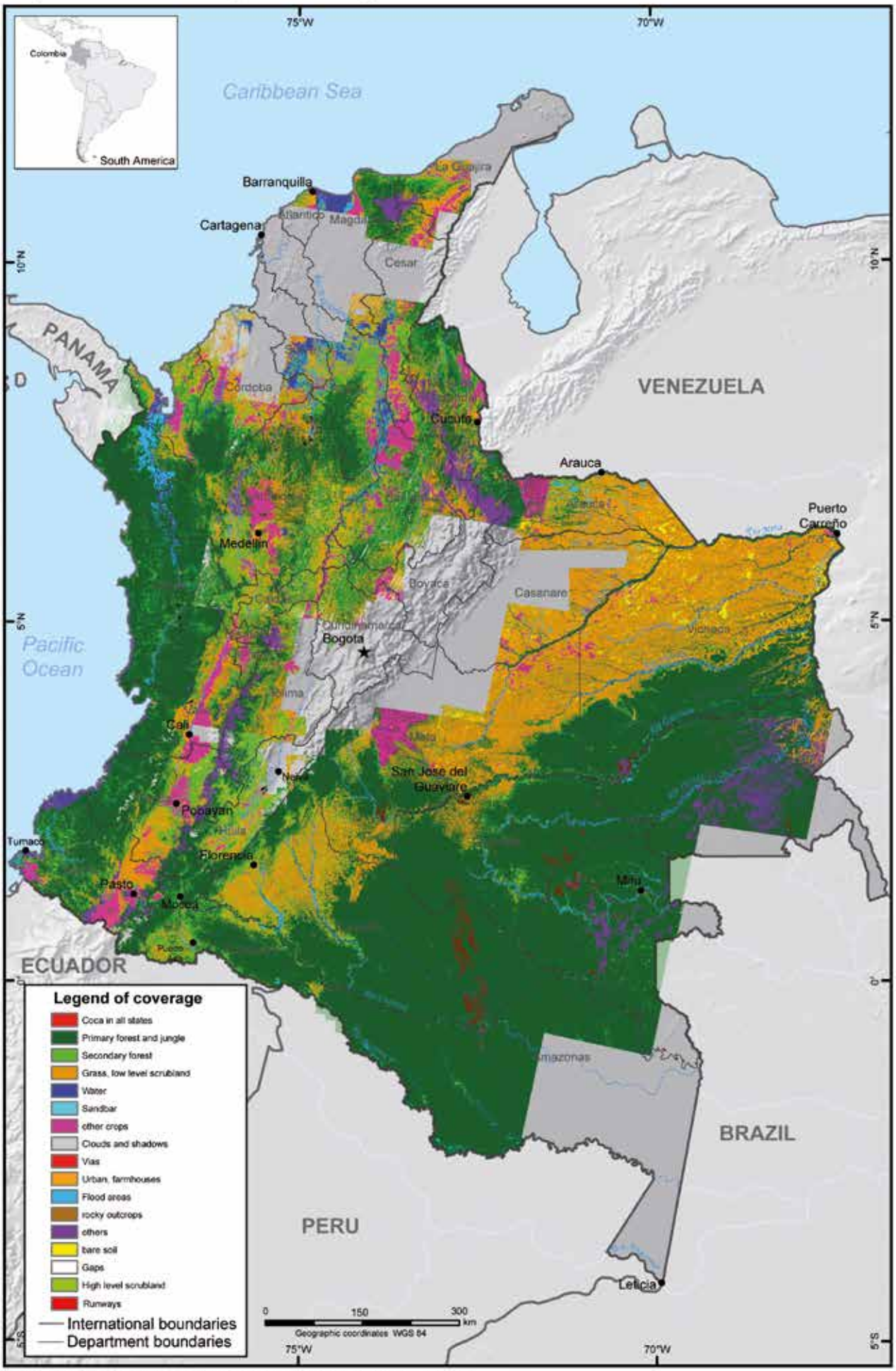
Adjustments due to aerial spraying

The coca yields are sprayed from aircraft as part of the illicit crop spraying programme. The spraying lines are automatically registered. After the system coordinates have been transformed to comply with the satellite image coordinates, a polygon (buffer) is drawn up according to the aircraft type around the registered the registered spraying line. The polygons, representing the sprayed area, are superimposed on the area of coca interpreted and the corrections are applied, keeping the image date, date of spraying and census cutoff date in mind. In this manner, all the coca cultivations interpreted within the images acquired before the spraying date and before the census cutoff date are eliminated. An estimated percentage of the survival rate of the sprayed crop is applied to the final statistics in accordance with DIRAN. For the year 2013, the survival rate was 8.8%.



Coca cultivation with aerial spraying lines in Yellow.

Map 26. General map of coverage 2012



Source: Colombian Government - 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

Adjustments in image collection dates

Within satellite imagery, crops can only be observed if they were present on the date that the image was taken. A correction factor should be applied to obtain estimates after the 31st December cutoff date. This factor is calculated in the form of a monthly rate of increase or decrease in relation to the coca cultivation trends within images of the same crop area used during consecutive censuses. This rate is applied after the initial interpretation in relation to the number of months that separate the date that the image was taken and the cutoff date on the 31st December, in order to calculate the coca area that should be added or subtracted from the final statistics.

Areas without information estimates

Clouds and shadows are reduced as much as possible using several images from the same zone and constructing mosaics to reduce the area without any information. During 2013, effective coverage of 86% was achieved. This means that from the entire area affected by coca cultivations, 14% had restrictions due to lack of information. This percentage is strongly concentrated in the Pacific and Cesar regions.

To adjust the effect within zones where clear images are not available as a result of cloud coverage, the areas are defined using information from within the last two consecutive years. The coca crops trends are then compared with the previous year. The results obtained from trends within areas with information are then applied to areas without information.

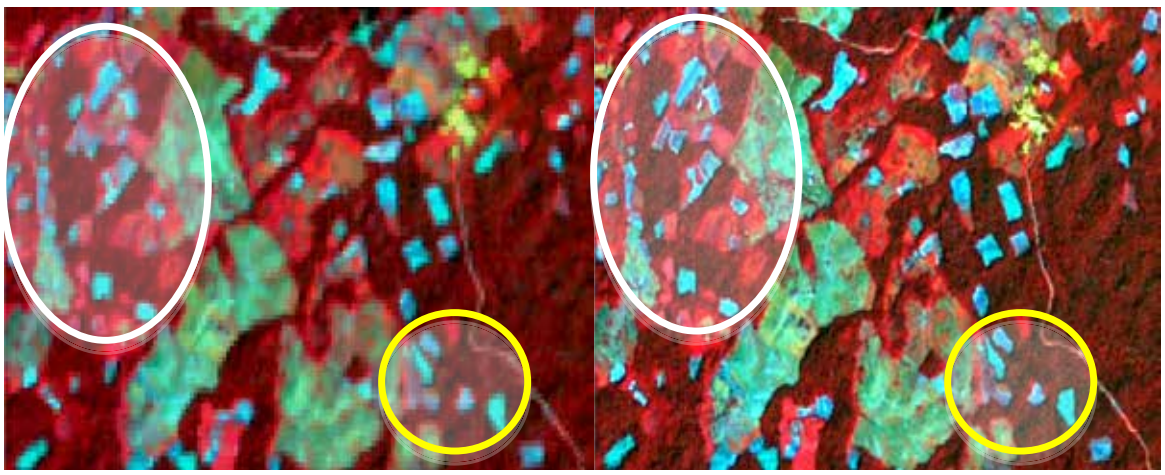
Small cultivation estimates

The SIMCI Project, has established a trend in the reduction of the average coca yield size within Colombia, based on the historical analysis of coca cultivations (decreasing from 2 hectares in 2000 to 0.58 hectares in 2013) as a result of a change in the crop type. Although the phenomenon is significant in relation to the proportion of the total number of cultivations detected (2.8% during the year 2000, increasing to 21.5% during 2009) this does not imply a proportionate increase within the total reported area (0.1% to 4.8% during the same period). The inclusion of this type of yields within the census data provides a valuable contribution to improve accuracy within the area.

During the 2013 census, the 15 metres spatial resolution was used, during which the following improvements were identified: the texture is increasingly relevant during the interpretation process to improve thematic precision (yellow polygon). The yield threshold borders are reduced, resulting in a more precise definition and at the same time, increasing the possibility of interpreting even smaller yields in comparison to Landsat 7 (white polygon).

Nevertheless, the images used in the coca cultivation census limit the detection of yields less than 0.1 hectares. Small yield estimations aim to include the proportion and significance of yields within the census, that are not detectable due to the limitations mentioned above. To enable this comparison, the historical series was adjusted, applying the estimation of small yields.

Figure 41. Comparison example of spatial resolution at 30 and 15 metres.



a b Imagen Landat 8 to 30 metres (4,3,7) (a),Imagen Landsat 8 to 15 metres (b).

A systematic monitoring framework was employed, within 20km^2 evaluation surface areas separated by 20km distances within zones with historical coca crop presence. The coca cultivations are interpreted from complementary images of high spatial resolution and compared with interpretation carried out during the 2009 census.

A conglomerate analysis was completed[82], within which the parameters for modelling is the proportion of small yields within each one of the conglomerates. The interpreted areas crossed with the 1km * 1km master framework to determine the number of elements within the conglomerate. To control the variability, the analysis is stratified by region. The real land cover of each of the grids within the conglomerate was verified, eliminating grids with coverage less than 50%.[83]

By verifying the variations between conglomerations within each region, homocedasticity was found. Or, the conglomerate variation behaviour is controlled for each one of the strata. Significant differences exist between the regions, and therefore this stratification factor is significant for information analysis (table 42).

Table 41. Means difference tests within Duncan grouping

Means with the same letter are not significantly different				
Duncan Grouping		**Media**	**N**	**Region**
	A	0.3744	117	Central
	B	0.2204	104	Pacific
	B	0.2087	88	Putumayo - Caqueta
C	B	0.1450	76	Guaviare - Meta
C		0.0958	42	Orinoco

The estimate is determined by the proportional weighting of the coca area found within a conglomerate, in relation to the total coca area within the region. This weighting affects the proportion parameter for coca areas of less than 0.25 hectares within the conglomerate; this is expressed by:

$$F_i = \sum_{i=0}^{n1} \sum_{j=0}^{n2} \frac{Aj}{Ai}$$

Aj= Coca yields less than or equal to 0.25 within the region. j=1,2,3,4,5,……,n.

Ai= Identified coca yields within the region. i= 1,2,3,4,5,6.

The aforementioned analysis shows that the simple sizes are acceptable and guarantees variety homogeneity per region, with which the average weighted behaviour is established as the regional parameter behaviour[84].

QUALITY CONTROL

The quality control process outlines that good quality processing improves the reliability of final data. It enables the detection and adjustment of potential inconsistencies, and improves the degree of reliability.

The quality control as part of the 2013 census has three basic lines: the first refers to the data adjustments that are not associated with the interpretation but reduce the errors as a result of missing information (clouds and gaps) and temporality; attainment of images with the least amount of clouds and proximity to the census cutoff date is an important factor within the total territory coverage, for this census the adjustment rate was 11% at national level due to lack of information, 5% less than the 2012 census. This reduction principally relies on the use of images from the Landsat 8 sensor, released at the beginning of the year 2013, within which there was no lack in information (gaps) due to a fault within SLC (scan line corrector).

The national value for areas without information was 14%, even through the Pacific region and Norte de Santander department within the central region surpassed the maximum percentage for this parameter.

82 The conglomerate analysis enables us to group individuals considering their characteristics of interest via distances, with the aim to evaluate the construction of homogenous groups from which to characterise the population.
83 Inclusion criteria for grid observation units. census 2010
84 The methodological details are found in: adjustment factor for small plots within the 2010 census.

The second line is based on the intensity and distribution of fieldwork enabling the validation and topic theme adjustment for the data. This activity consisted of 12 flyovers, a 136 hour flight time during the 2013 census, with a 20.500 kilometre route, covering 58% of the coca cultivation area and 95% coverage within the number of images used in the census. As a result of the climatic conditions, 5% of the images (two images) of those used in the census could not be flown over, within the Cauca and Choco departments.

Table 42. Quality control parameters, 2013

Line	Process	Reference Value	Value 2013
Processes not associated with the interpretation	Areas without information	Maximum 20%	14%
	Adjustments associated with areas without information	Maximum 15%	11%
Fieldwork	Fieldwork coverage	30% of the minimum affected area	58%
	Fieldwork image distribution	100% of the images used should relate to fieldwork	95%
Census data	Geo-referencing	RMS flat zones <1 RMS mountainous zones <3	RMS national X= 1.07 RMS national Y= 0.6
	Interpretation	Performer evaluation and interpretation, minimum 40% of the images	61%
		Validation based on atypical errors, 100% of the images	100%
		Confrontation dynamics and field trends, 100% of images	100%

As a final line, quality control is carried out on processes that are based on specific developments wtihin the different activities involved in the annual census crop data (georeferencing and interpretation).

Succesful georeferencing enables the satellite image distortions to be controlled, guaranteeing the correct geographical position, a good measurement of areas and the comparison of historical census material with other sources of information. To control this georeferencing, three factors had to be considered: number of points, distribution within the image and location stringency. The georeferencing evaluation was completed using the indicator “root mean square error”, RMS.

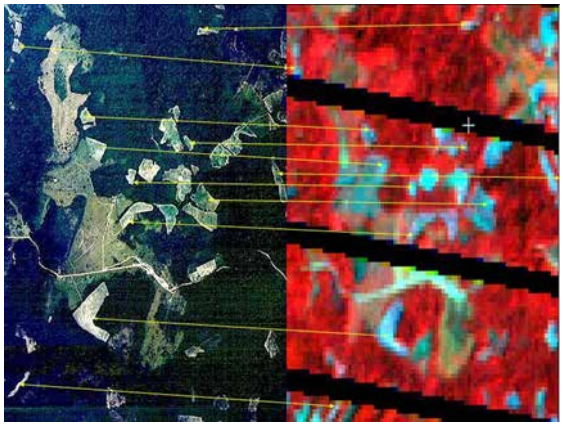
The RMS values established in the Project consider mountainous RMS zones <3 pixels and flat RMS zones <1 pixel. The national RMS value for the 2013 census is 1.07 pixels within the X coordinate and 0.6 pixels within the Y coordinate. The X coordinate average for flat zones is 0.8 and 0.6 for the Y coordinate. For mountainous areas, the average values are 1.1 and 0.8 respectively. Both the mountainous and flat zones meet the georeferencing parameters for the project.

The interpretation control process consists of three basic filters:

1. Evaluation and validation of the interpreter data. This enables the intepretation of zones to be verified by other interpreters.
2. Validation of atypical data. This process seeks to identify atypical spectral data.
3. Comparison of dynamics obtained from historic trends within information from activities generated within regional dynamics and fieldwork findings.

RELIABILITY

The data is submitted to an interpretation control quality system, including the precision estimation for two aspects: geometric precision, the precision of the limits interpreted and the thematic precision, measuring the reliability of the identification of differing types of coverage. The difficulty in obtaining precise reference data in relation to the terrain (accurate ground truth data) continues to be the main limiting factor for the quality of the interpretation. The precision studies were carried out at case level.



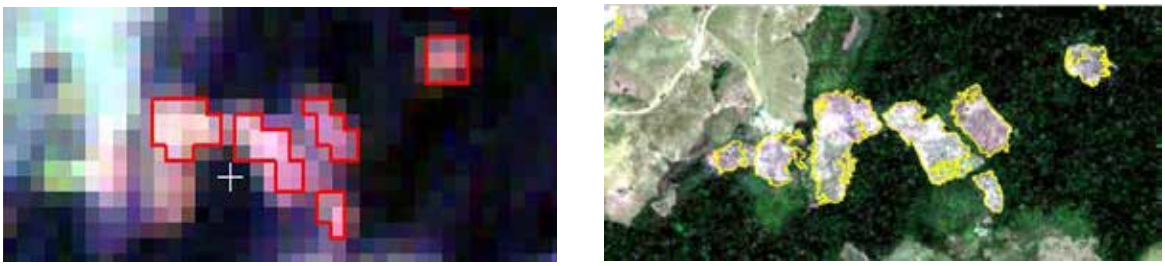
a b Comparison of coca yield identification (limits in yellow) within aerial photography (a) and satellite imagery- 2008.

Studies carried out during 2008, using aerial photos at a medium scale, faced with the interpretation results from the Landsat 7ETM+ satellite images and ALOS (Advanced Land Observation Satellite) taken during similar dates within the Vista Hermosa (Meta) and Cáceres (Antioquia) zones enable the conclusion that:

- Recognition of the field considerably improves the interpretation and interpreter experience within the region, their knowledge of the dynamics has a positive effect on the degree of reliability of the interpretation.
- The reliability obtained uniquely applies to the study area and is not applicable to the census due to the representative limitations.
- Difficulty in the lifting of information to obtain field truths and field truth confrontations, make the temporal consistency strictly necessary between the field validation and the images.

For the 2012 census, a case study was carried out within the Union Peneya (Caqueta) confirming the processes found within previous studies. This contributed new conclusions:

- Thematic identification of yields is generally good.
- The spatial resolution has particular incidence during the identification of small yields.
- Errors of omission are principally associated with alignment systems.
- User accuracy is greater than 89%, indicating a high level of general accuracy in the identification of coca cultivations.



Yields detected from flyovers in high resolution Pléiades imagery, outlined in yellow on the left. On the right, a Landsat image outlining coca cultivations identified during the census in red.

In accordance with the processes obtained during the case study carried out in the Union Peneya during 2012, and recommendations as a result of this, this census uses medium resolution images processed by pansharpening, improving the spatial resolution to 15 metres. Consequently, to evaluate the incidence of this improved spatial resolution, as part of the delimitation a fourth case study was carried out in the Miraflores (Guaviare) zone, aimed at the delimitation of yields (boundary marking). This characteristic is essential for the upscaling of the coca crop area.

The process for obtaining the highest degreee of boundary marking reliability consisted of three steps:

1. Field truths: obtained using a high resolution spatial image and area flyover to identify the different coverages present within the study area.

Climatic conditions affected the aerial flyovers for five months and marked a significant five month time difference between the field validation and high resolution image, and a three month difference in relation to the 2013 crop census image. This combined the regions dynamic characteristics, impeding the construction of field truths.

The detection flyover covered a 75% area of interest. During the flyover, fiscal evidence was found presenting the coca yields in different phenological states and associated coverage was transferred to high resolution imagery.

2. Data comparison: the interpretation obtained from the image resolution, partly modified during the census for each of the four Project interpreters (the area expert and the three remaining interpreters), was compared with the yields identified during flyovers, transferred to high resolution image.

3. Evaluation and analysis: For the evaluation of boundary marking reliability, image interpretation employed during the 2013 census (Landsat 8), is used within the area. The dates for the flyover images are:

- Censo 2013 image 2nd February 2014
- Pléiades image 23rd December 2013
- Flyover field detection 15th May 2014

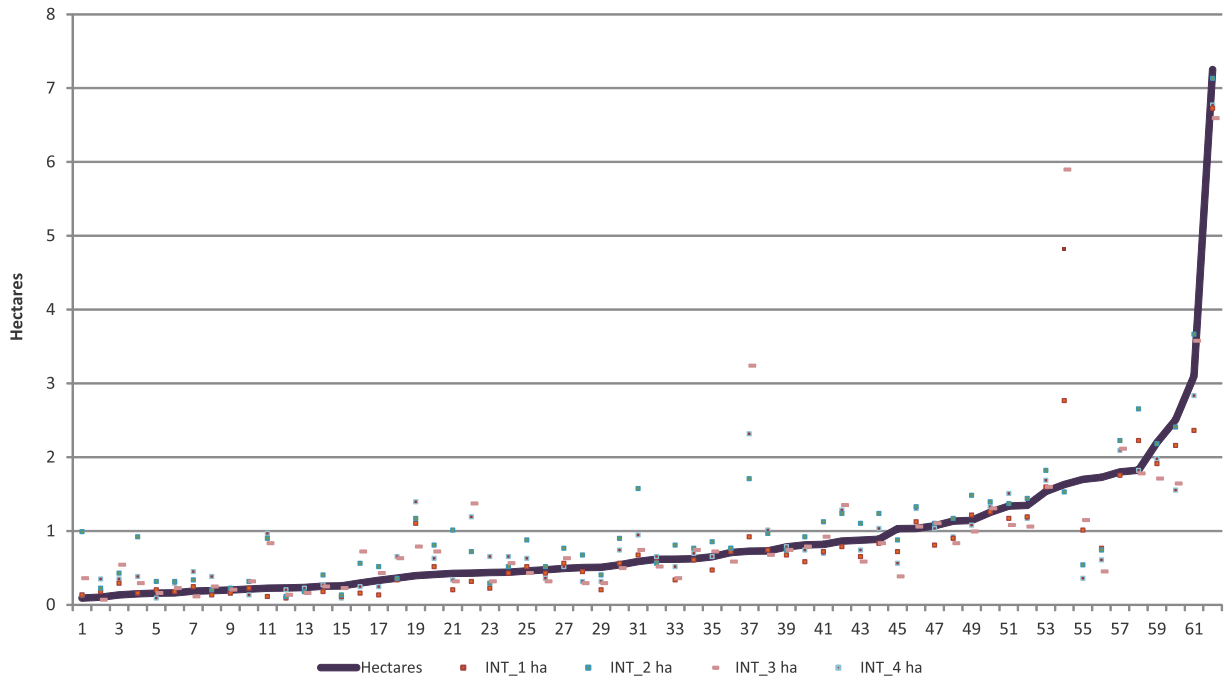
Table 43. Areas obtained during yield boundary marking, for interpretation during field truths

Interpreter	Area in ha	% respect of field truth
Field Truth	54.23	100%
Interpreter #1	49.73	91.7
Interpreter #2	65.57	120.91
Interpreter #3	59.54	109.79
Interpreter #4	59.65	110

The result shows that:

- Pansharperning improves the general delimitation of yields obtained from areas close to those found within fieldwork.
- Despite absolute differences being observed between the four interpreters, three of them show an oversizing trend within the figure that can be observed. This does not represent a systematic bias and is principally due to specific yields. .
- In general, a high coincidence can be observed within small yields and large yields detected within the field, with yields in which the boundary is marked by interpreters.

Figure 43. Distribution of delimited areas interpreted versus field area.



Annex 1: 2013 Estimate for areas without information, aerial spraying and outdated images

For the 2013 census, the satellite coca cultivation coverage census was 89%, 4 percentage points greater than the 2012 coverage. Coverage improvement represented a larger area available for interpretation. This was reflected in a greater area of coca interpretation during 2013 and a general decrease within the area adjusted. The Pacific region and the department of Cesar are the areas with the least satellite coverage, as the data within these areas needs to be analysed with caution.

The Exchange rate between 2012 and 2013 within areas containing information from the last two years is 1.14, adjusting the ratio to include corrections of 1.0.

The figure demonstrates the area with coca crops interpreted from satellite images and trends without estimates applied to calculate the national figure.

Figure 44. Coca cultivation interpretation without adjustments, 2005 -2013

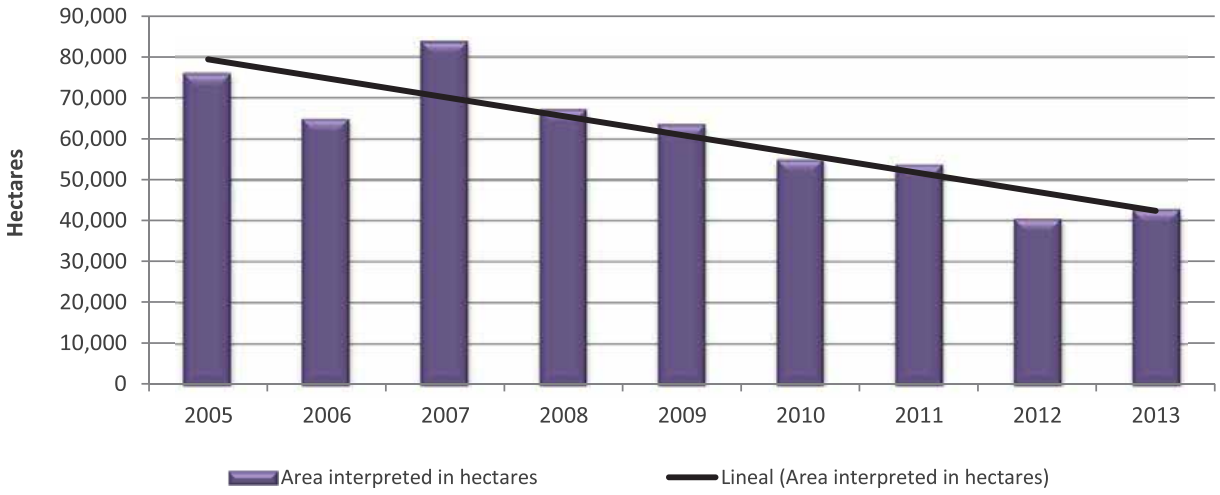


Table 44. Historical adjustment series, 2005-2013

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013
Area estimation without information	6,362	8,418	8,357	9,962	6,177	5,492	8,843	5,328	5,377
Correction of age of the image	1,020	1,135	-917	391	371	-119	936	1834	-119
Correction of aerial spraying	2,315	3,349	7,625	3,266	2,843	1,378	159	30	95
Total	**9,697**	**12,902**	**15,065**	**13,619**	**9,391**	**6,752**	**9,938**	**7,192**	**5,353**
Percentage/census	11	17	15	17	14	11	15	15	11
Area interpreted in hectares	76,053	64,968	83,888	67,334	63,634	55,061	53,826	40,597	42,836
Area reported in hectares	86,000	78,000	99,000	81,000	73,000	62,000	64,000	48,000	48,000

The weight of the estimates applied during the different censuses over the course of the historical series varies between 11% in 2005 and 17% in 2004, 2006 and 2008. For 2013, despite the adjustments, this was 11%. Nevertheless, it should be highlighted that 60% of these adjustments are concentrated in Nariño, where 46.5% of the areas without information and 27% of the coca cultivations are located. It should also be highlighted that 18% of the adjustments are within the Norte de Santander, with 13% of the areas without information and 13% of the coca cultivations.

Table 45. Estimation by zones without, aerial spraying and date when the image was taken in 2013

Department	Interpretation ha	Corrections			Census 2013 Ha.
		Aerial spraying ha	Areas without information ha	Temporality ha	
Amazonas	108	0	4	-2	110
Antioquia	950	1	67	-27	991
Arauca	64	0	1	4	69
Bolivar	911	1	6	7	925
Boyaca	16	0	0	1	17
Caldas	6	0	0	2	8
Caqueta	4,401	11	85	-175	4,322
Cauca	2,916	0	437	-27	3,326
Cesar	10	0	2	1	13
Choco	1,214	71	317	59	1,661
Cordoba	392	0	55	-8	439
Guainia	81	0	0	0	81
Guaviare	4,767	0	89	-131	4,725
La Guajira	6	0	1	-1	6
Magdalena	31	0	7	-1	37
Meta	2,922	0	19	-43	2,898
Nariño	9,956	0	3,268	-47	13,177
Norte de Santander	5,399	0	712	234	6,345
Putumayo	7,418	5	222	22	7,667
Santander	62	0	6	9	77
Valle del Cauca	305	6	79	8	398
Vaupes	179	0	0	5	184
Vichada	722	0	0	-9	713
Total	**42,836**	**95**	**5,377**	**-119**	**48,189**

Appendix 2: List of satelite images used in the 2013 coca census

LANDSAT 8 OLI		
PATH	ROW	Acquisition date day (dd/mm/yyyy)
3	58	10/10/2013
3	59	15/02/2014 – 19/03/2014
4	56	20/12/2013 – 21/01/2014
4	57	20/12/2013 – 21/01/2014
4	58	20/12/2013 – 21/01/2014
4	59	20/12/2013 – 21/01/2014
4	60	20/12/2013 – 21/01/2014
4	61	21/01/2014
4	62	21/02/2014
4	63	21/02/2014
5	56	12/01/2014
5	57	12/01/2014 – 28/01/2014
5	58	12/01/2014
5	59	22/09/2013 – 12/01/2014 – 28/01/2014
5	60	22/09/2013 – 24/10/2013
5	61	09/11/2013 – 25/11/2013
5	62	09/11/2013 – 25/11/2013
6	55	16/11/2013 – 08/03/2014
6	56	16/11/2013 – 08/03/2014
6	57	04/02/2014
6	58	04/02/2014
6	59	04/02/2014
6	60	04/02/2014
6	61	04/02/2014
6	62	04/02/2014
7	52	10/01/2014
7	54	06/10/2013
7	55	10/01/2014
7	56	10/01/2014
7	57	10/01/2014
7	58	10 /01/2014 – 16/01/2014
7	59	10 /01/2014 – 16/01/2014
7	60	31/03/2014
7	61	25/12/2013
8	52	18/02/2014
8	53	01/01/2014 – 02/02/2014
8	54	27/09/2013 – 17/01/2014 – 18/02/2014
8	55	01/01/2014 – 18/02/2014
8	56	25/07/2013 – 22/03/2014
8	57	27/09/2013 – 01/01/2014
8	58	02/02/2014
8	59	02/02/2014 – 18/02/2014
8	60	11/09/2013 – 02/02/2014
9	52	23/12/2013
9	53	23/12/2013
9	54	16/07/2013 – 23/12/2013
9	55	20/10/2013 – 29/03/2014
9	56	16/07/2013
9	57	29/05/2013 – 08/01/2014
9	58	29/05/2013 – 14/04/2014
9	59	02/09/2013 – 24/01/2014
9	60	23/12/2013 – 24/01/2014
10	54	28/11/2013 – 04/03/2014 – 20/03/2014
10	55	28/11/2013 – 15/01/2014 – 04/03/2014 – 20/03/2014
10	56	11/10/2013 – 28/11/2013 – 04/03/2014
10	57	28/11/2013 – 31/01/2014 – 05/04/2014
10	58	15/01/2014 – 31/01/2014 – 04/03/2014
10	59	11/10/2013 – 28/11/2013 31/01/2014
TOTAL	101	

LANDSAT 7 ETM		
PATH	ROW	Acquisition date day (dd/mm/yyyy)
6	56	11/01/2014
6	59	29/01/2014
7	58	02/01/2014
8	52	09/01/2014
8	59	30/03/2014
10	58	23/01/2014
10	59	23/01/2014
TOTAL	7	

Annex 3: Changes in estimation methodology for the production of coca leaves, coca paste and cocaine hydrochloride

The methodology for the estimation of annual cocaine hydrochloride production, recourses the existing information on hectares, yields per hectare, conversion factors during the extraction and refinement process and purity, amongst others. The convergence of information related to the cocaine hydrochloride transformation processes; contribute to the production calculations within the following procedures:

Table 46. Synthesis of procedures for cocaine hydrochloride production estimates

1.	Fresh coca leaf production (PHC)	=	Yearly productive area$_n$ (AP)[85] x annual coca leaf yield$_n$ (RAH)
2.	Cocaine base production(PBC)	=	$PB_1+PB_2+PB_3$
	where,		
	Production of coca paste carried out in UPAC (PB_1)	=	(PHC) x % coca paste producers x coca paste yield per mt of coca leaf UPAC (RPB) x paste/base coefficient (RB/RPB)[1]
	Cocaine base production carried out within UPAC (PB_2)	=	(PHC) x % growers that produce cocaine base x cocaine base yield per mt of coca leaf within UPAC (RB_1)
	Cocaine base production carried out outside of UPAC (PB_3)	=	(PHC) x % growers that sell coca leaf x cocaine base yield per mt of coca leaf outside of UPAC (RB_e)
3	Pure cocaine hydrochloride production	=	(PBC) x cocaine base purity (P) x base conversion factor kg/ hydrochloride kg (RHCL)

[1] A coefficient is estimated for the yields of coca paste and cocaine base, obtained from manufacturing studies, with the aim to express the quantities of coca paste in reference to cocaine base. Nevertheless, within cases in which no cocaine base yields are registered, it is assumed that the coefficient equals 1.

The SIMCI Project, in strict alliance with national and international public and private institutions, has carried out studies which enable the strengthening of cocaine production estimates, creating an indicator reflecting these dynamics intervening in the transformation process, such as:

i) establishment of coca production area; ii) obtention of fresh coca leaves per hectare iii) extraction of coca paste alkaloid; iv) oxidation of coca paste; and v) crystallization to obtain cocaine hydrochloride. As a result of this, adjustments have been made to the traditional calculation methodology, focused on the strengthening of two strategic variables: yearly productive area$_n$ (AP) and Cocaine base yield per mt of coca outside of (RB_e).

Firstly, the Yearly productive area (AP) aims to estimate the hectares that have remained productive during the entire year. In traditional methodology, the productive area is calculated using the averages from the last two censuses, based on the assumption that the new crops and crops within the abandonment phase during the year referenced are only productive for half of the year.. It should be highlighted that, if this indicator constitutes a proxy for the establishment of productive hectares, it does not incorporate the dynamics which affect the permanence of yields during the year. Nor does it consider the occurrence of other factors during production such as State interdiction, climate and plagues amongst others. As a result of this, a spatial analysis has been developed, enabling the estimates of coca cultivation permanence by means of creating a factor which enables the modelling, yield by yield, of the cultivated area during the year, beginning with the incorporation and systemization of the available information in relation to the variables with a direct effect on crop stability, such as forced manual eradication, area spraying and vegetal coverage, amongst others.

The permanence factor methodology included spatial information (georeferencing) such as: i) polygons from manually eradicated areas by Mobile Eradication Groups GME, ii) polygons from areas sprayed as part of the National Government glyphosate aerial spraying programme, iii) data from the coca cultivation census for each cutoff date since 2001, iv) ground coverage interpreted from satellite images using the SIMCI legend since 2000, v) areas without information due to cloud coverage in the images used for each annual coca crop census. However, new variable can be included to strengthen this model, as long as this information is available.

85 The productive area differs from the affected area due to how the temporary condition of plots is reflected; this is calculated applying the permanence factor of the area by interpreting satellite imagery. The affected area is the geographical sum of the registered sprayed areas, manual eradication and detection.

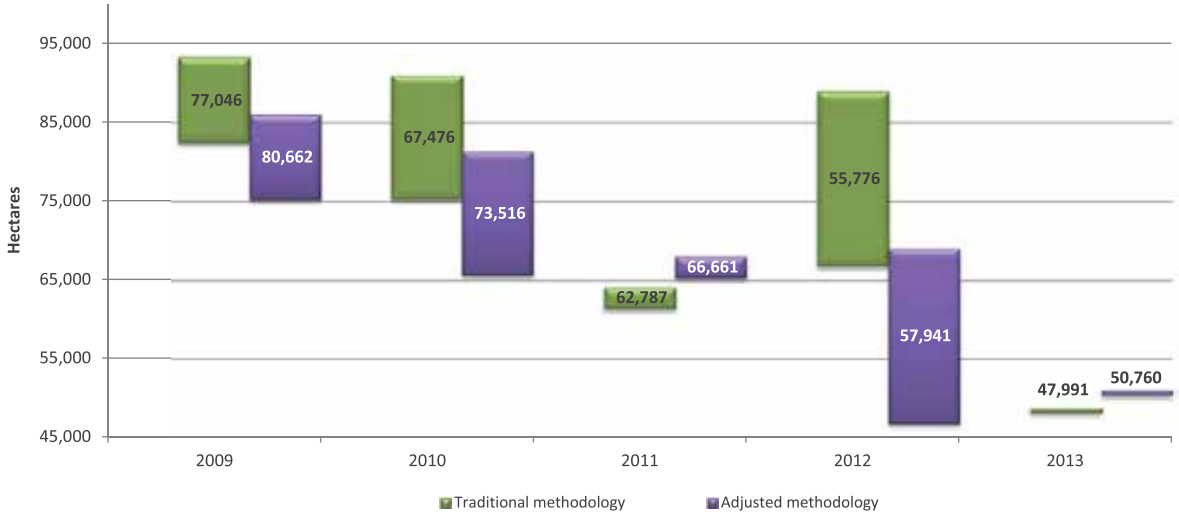
The permanence factor is calculated according to the three yield categories: stable, new and abandoned[86]; as long as this is included within the spatial analysis of the previously mentioned variables, each yield can be categorised and belongs to, in turn, a subcategory generated by definition from possible affective scenarios[87]. The factor varies between a zero (0) and one (1) and is directly applied within the area measured in hectares, within each yield. For example, a permanence factor of 1 means that a yield was produced during the whole year, whilst 0.5 means only for 6 months; if it is zero (0) this is understood as despite its detection in coca crop monitoring, it was not productive. This means that it could have been affected by interdiction activities during the entire year.[88]. As a result of the above, the Yearly productive area$_n$ (AP) is established from the permanence factor methodology presented below:

Table 47. Yearly productive area in hectares, estimated based on the permanence factor

Region	2009			2010			2011			2012			2013		
	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary
Amazon	1,810	1,322	2,299	1,503	1,370	1,636	1,396	850	1,942	759	714	803	617	372	862
Catatumbo	3,290	3,185	3,394	3,213	2,418	4,009	2,945	1,836	4,055	3,959	3,247	4,670	5,604	4,336	6,872
Central	17,491	16,913	18,069	15,785	14,682	16,889	10,237	5,893	14,580	6,643	5,767	7,518	4,543	2,175	6,912
Meta	14,173	13,497	14,848	12,534	9,471	15,597	10,628	9,817	11,439	9,360	7,053	11,666	8,072	7,273	8,870
Orinoco	3,898	3,872	3,924	3,932	3,470	4,395	3,201	2,790	3,613	2,089	1,346	2,833	1,278	904	1,651
Pacific	25,624	23,617	27,630	25,979	25,051	26,908	26,407	25,640	27,174	20,661	15,243	26,079	16,818	16,538	17,098
Putumayo	13,893	10,883	16,902	10,218	8,655	11,780	11,661	7,562	15,760	14,410	12,029	16,790	13,783	12,300	15,266
Sierra	484	345	622	351	285	418	185	51	319	61	51	72	45	42	48
Total	80,662	75,247	86,077	73,516	65,667	81,366	66,661	65,309	68,012	57,941	46,873	69,010	50,760	50,481	51,039

Note:
[1] The productive area limits are constructed throughout the year, based on the variety of cultivated hectares reported in the censuses.

Figure 45. Yearly productive area in hectares: traditional methodology vs adjusted methodology, 2009-2013



Using the yearly productive area as an estimate and keeping the yearly fresh coca leaf yields obtained during productive studies as a constant, a new production series of fresh coca leaves is projected, exceeding 376,629 mt in 2009 to 208,218 mt in 2013.

86 The stable area corresponds to the yields identified during the last two censuses in a consecutive manner (t) and (t-1). These yields are considered as new yields within the area detected during the current census (t) and were not found within the previous census (t-1). The abandoned yields refer to the area identified during the previous census (t-1) and were not present in the current census (t).
87 For example, the subcategories can be part of the following scenarios: i) aerial spraying ii) aerial spraying and eradication iii) aerial spraying, eradication and historic iv) aerial spraying and historic, v) manual eradication, vi) manual eradication and historic, vii) historic and vii) no intervention.
88 Once a yield has been sprayed it has an unproductivity period (of three months) which is estimated based on the survival percentage; if the yield was manually eradicated a unproductivity period of eight months can be estimated, as the plant needs to regenerate to obtain a new harvest.

Table 48. Fresh coca leaf production in metric tonnes, including the permanence factor, 2009-2013

Region	2009			2010			2011			2012			2013		
	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary
Amazon	7,423	5,420	9,426	6,161	5,615	6,706	5,725	3,486	7,964	2,808	2,643	2,973	2,283	1,376	3,190
Catatumbo	13,817	13,377	14,256	13,496	10,155	16,838	16,200	10,098	22,302	21,772	17,861	25,684	30,823	23,848	37,797
Central	99,701	96,406	102,995	89,977	83,688	96,265	40,946	23,572	58,320	26,571	23,070	30,072	18,173	8,698	27,647
Meta	72,280	68,834	75,726	63,924	48,303	79,544	54,203	50,068	58,338	47,734	35,971	59,498	35,515	32,003	39,027
Orinoco	27,677	27,495	27,859	19,662	17,348	21,977	16,007	13,949	18,065	10,447	6,730	14,164	6,388	4,520	8,257
Pacific	97,369	89,746	104,993	98,722	95,193	102,251	100,347	97,432	103,262	78,511	57,922	99,101	63,909	62,845	64,974
Putumayo	56,960	44,621	69,299	41,892	35,485	48,299	47,809	31,004	64,614	53,316	44,508	62,124	50,997	45,509	56,484
Sierra	1,403	1,001	1,805	1,019	826	1,212	537	149	924	178	147	209	131	123	139
Total	376,629	346,900	406,358	334,852	296,614	373,091	281,774	229,758	333,790	241,338	188,851	293,824	208,218	178,921	237,515

Note:

[1] The potential production estimates are calculated based on 95% trusted intervals within the annual coca cultivation area. Based on these intervals and the maintaining the coca leaf, coca paste and cocaine base yield parameters, the market structure determined by the survey and the conversion rate of coca leaf to cocaine base, obtained from efficiency studies into transformation, the production potentials can be estimated using the top and bottom limits of confidence intervals. The aforementioned outlines the minimum and maximum production potential estimates during the different links in the chain associated with the variety of cultivated hectares reported during the coca censuses.

Figure 46. Fresh coca leaf production in metric tonnes: traditional methodology vs adjusted methodology, 2009-2013

Secondly, considering that the sale of coca leaves is processed outside of the Agricultural Production Unit-UPAC, within traditional methodology it can be assumed that if the extraction process is carried out by an external agent, Cocaine base yield per mt of coca leaf outside of the UPAC (RB_e) associated with the transformation process due to leaf sales, are equal to those registered by the cocaine base grower[89]; the previous reason only considers leaf to base conversion factors that are reported during productivity studies[90].

In light of the increased coca leaf sales, on behalf of the producer and the stockpiling carried out by other agents, it has been necessary to incorporate traditional methodology as a conversion factor during the transformation of cocaine base. Assuming that the efficiency of extraction processes is superior to those registered by the coca Agricultural Unit producer as a result of scaled production, and better use of input products. This conversion factor (1.80 kg of cocaine base per mt of fresh coca leaf) was estimated based on the results obtained during the 33 cocaine base processes, under controlled conditions, within the framework of the Cocaine Hydrochloride Efficiency study carried out by UNODC and the Colombian Government[91], which will only be updated using the addition of new information.

89 It should be highlighted that if the extraction processes were carried out outside of UPAC by agents differing to the grower, these would continue in the same region based on the high risks posed by interdiction actions in relation to the transport of the product, just as the leaf manufacture and transformation are directly associated to crop areas.

90 Insofar as the information relates to interviews carried out with coca agricultural producers, characterising the manufacturing processes within UPAC.

91 By carrying out these experimental exercises this enables the simulation, under controlled conditions, of coca leaf manufacture and extraction

As a result of the inclusion of these previous adjustments, raised and maintained during the methodological processes implemented within the other variables, a new cocaine base production series is estimated, increasing manufacture from 603 mt in 2009 to 358 mt in 2013 and cocaine hydrochloride from 488 mt in 2009 to 290 mt in 2013.

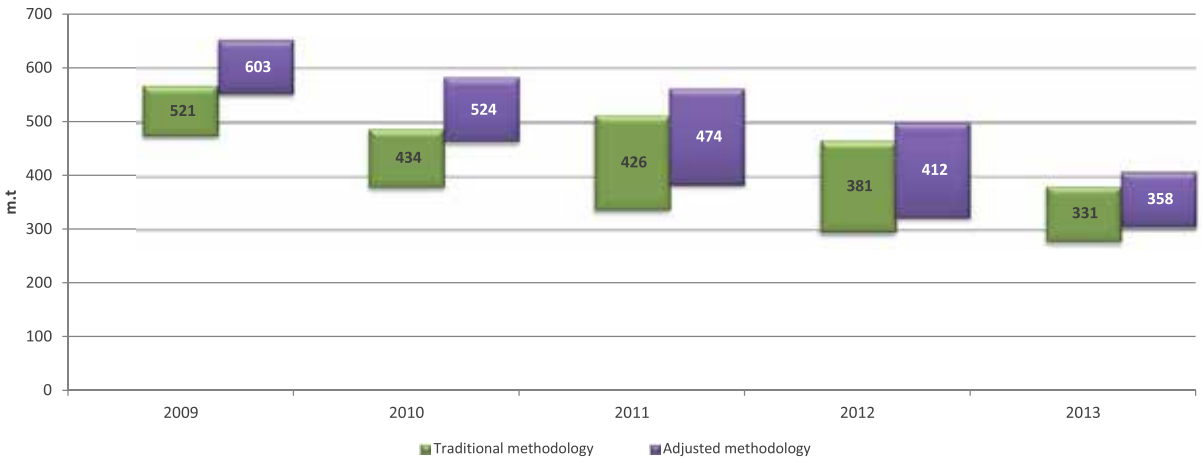
Table 49. Adjusted Cocaine base production in metric tonnes, 2009-2013

Region	2009			2010			2011			2012			2013		
	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary	Average	Lower boundary	Upper boundary
Amazon	13	9	16	11	10	12	10	6	14	5	5	5	4	2	6
Catatumbo	23	23	24	23	17	28	30	19	42	41	33	48	58	45	71
Central	134	130	138	121	113	129	71	41	102	46	40	52	32	15	48
Meta	113	108	119	100	76	125	85	78	91	75	56	93	52	47	57
Orinoco	48	48	48	22	19	25	18	16	20	12	8	16	9	6	12
Pacific	171	158	184	173	167	180	176	171	181	138	102	174	112	110	114
Putumayo	98	77	119	72	61	83	82	53	111	95	79	110	91	81	100
Sierra	2	2	3	2	1	2	1	0	2	0	0	0	0	0	0
Total	603	553	653	524	464	583	474	385	563	412	323	500	358	307	408

Note:

[1] The potential production estimates are calculated based on 95% trusted intervals within the annual coca cultivation area. Based on these intervals and the maintaining the coca leaf, coca paste and cocaine base yield parameters, the market structure determined by the survey and the conversion rate of coca leaf to cocaine base, obtained from efficiency studies into transformation, the production potentials can be estimated using the top and bottom limits of confidence intervals. The aforementioned outlines the minimum and maximum production potential estimates during the different links in the chain associated with the variety of cultivated hectares reported during the coca censuses.

Figure 47. Cocaine base production in metric tonnes: traditional methodology vs adjusted methodology, 2009-2013



Note:

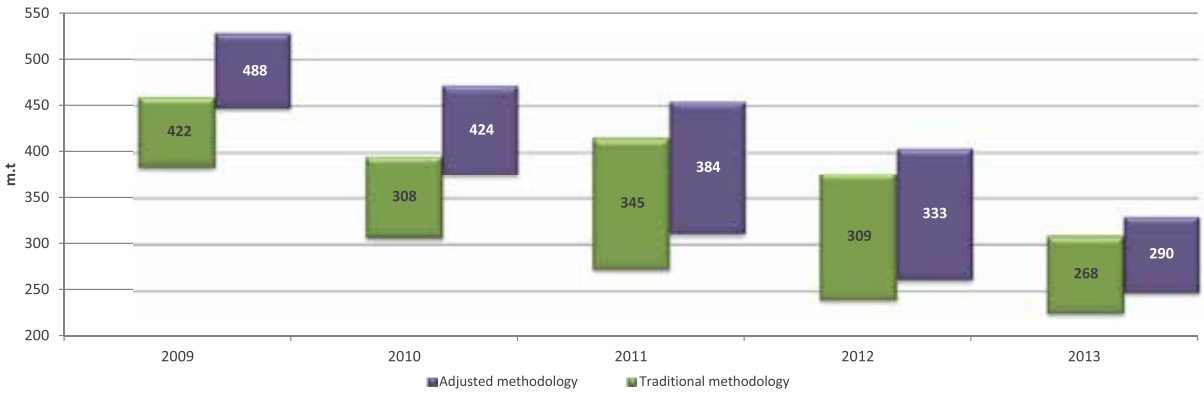
[1] Productivity studies are not carried out based on the information from the Amazon region, for which the production estimates are carried out considering the results from the Putumayo-Caqueta region.

[2] Cocaine base production estimates are carried out based on the estimated annual production area in relation to permanence factor, labour distribution during the sales process and coca leaf transformation and the crop yields and extraction process for each one of the regions studied under controlled conditions.

[3] The potential production estimates are calculated based on 95% trusted intervals within the annual coca cultivation area. Based on these intervals and the maintaining the coca leaf, coca paste and cocaine base yield parameters, the market structure determined by the survey and the conversion rate of coca leaf to cocaine base, obtained from efficiency studies into transformation, the production potentials can be estimated using the top and bottom limits of confidence intervals. The aforementioned outlines the minimum and maximum production potential estimates during the different links in the chain associated with the variety of cultivated hectares reported during the coca censuses.

processes, cocaine hydrochloride oxidation and crystallization. In addition, this enables the inputs and chemical substances used during coca leaf transformation to be characterized. From the results obtained during these exercises carried out to date, a 1.8kg cocaine base factor per mt of coca leaf is constructed, associated to scaled extraction processes. The aforementioned constitutes an approach during transformation efficiency, carried out within a laboratory. UNODC/SIMCI and the Colombia Government are developing and strengthening experimental studies on alkaloid content within coca leaves and laboratory efficiency.

Figure 48. Cocaine hydrochloride production in metric tonnes: traditional methodology vs adjusted methodology, 2009-2013



Note:

[1] Productivity studies are not carried out based on the information from the Amazon region, for which the production estimates are carried out considering the results from the Putumayo-Caqueta region.

[2] Cocaine base production estimates are carried out based on the estimated annual production area in relation to permanence factor, labour distribution during the sales process and coca leaf transformation and the crop yields and extraction process for each one of the regions studied under controlled conditions.

[3] The potential production estimates are calculated based on 95% trusted intervals within the annual coca cultivation area. Based on these intervals and the maintaining the coca leaf, coca paste and cocaine base yield parameters, the market structure determined by the survey and the conversion rate of coca leaf to cocaine base, obtained from efficiency studies into transformation, the production potentials can be estimated using the top and bottom limits of confidence intervals. The aforementioned outlines the minimum and maximum production potential estimates during the different links in the chain associated with the variety of cultivated hectares reported during the coca censuses.

[4] Potential cocaine base production is calculated using an 81% purity rate.

[5] To estimate cocaine production, data is used obtained from the marketing and performance studies within primary transformation (leaf to cocaine base) and data obtained by the United States Government, in relation to the efficiency of secondary transformation (base to cocaine hydrochloride at 1:1) and base purity (81%). These estimates correspond with the national scenario in which all crops are extracted within coca paste and refined to produce cocaine hydrochloride.

Appendix 4: Coca cultivation in indegenous territories 2013

Region	Indigenous territories	Hectares en 2012	Hectares en 2013
Amazon	ALMIDÓN LA CEIBA	8,2	0,0
	ARARA, BACATÍ, CARURU Y MIRAFLORES	83,1	34,7
	ARRECIFAL	4,8	0,0
	BACHACO BUENAVISTA	7,5	6,4
	CARANACOA YURI-LAGUNA MOROCOTO	3,5	6,7
	CARPINTERO PALOMAS	10,6	0,0
	CHIGUIRO	12,0	0,0
	CUENCA MEDIA Y ALTA DEL RÍO INIRÍDA	108,8	12,2
	CUMARAL-GUAMUCO	5,2	1,9
	EL VENADO	0,8	0,0
	LAGUNA NIÑAL,COCUY, LOMA BAJA Y LOMA ALTA DEL CAÑO GUARIBEN	4,6	5,9
	LAGUNA-CURVINA SAPUARA	0,0	0,6
	MINITAS-MIRALINDO	6,1	7,8
	MURCIÉLAGO ALTAMIRA	10,4	2,7
	PARTE ALTA DEL RÍO GUAINÍA	5,0	0,0
	PREDIO PUTUMAYO	90,2	113,0
	PUEBLO NUEVO-LAGUNA COLORADA	13,8	6,5
	PUERTO ZÁBALO Y LOS MONOS	0,2	0,0
	REMANSO - CHORRO BOCON	19,0	3,0
	RÍOS CUIARI E ISANA	18,0	2,3
	TONINA, SEJAL, SAN JOSÉ Y OTRAS	4,8	0,0
	VAUPÉS	148,8	60,6
	YAIGOJÉ-RÍO APAPORIS	9,1	0,0
Central	ALTO SINU, ESMERALDA CRUZ GRANDE E IWAGADO	142,3	114,8
	ANDABÚ	2,1	1,0
	CAIMÁN NUEVO	0,0	1,6
	CHONTADURAL CAÑERO	2,7	1,4
	GABARRA-CATALAURA	13,8	11,6
	JAIDEZAVÍ	6,2	5,6
	JAI-DUKAMA	1,3	0,7
	JAIKERAZAVI	4,4	1,7
	MAJORÉ-AMBURÁ	0,0	3,5
	MOTILÓN - BARÍ	42,7	89,1
	PABLO MUERA	6,8	0,0
	POLINES	1,1	0,0
	QUEBRADA CAÑAVERAL	0,7	0,0
	RÍO CHAJERADÓ	0,0	1,0
	YABERARADÓ	5,7	2,9

Region	Indigenous territories	Hectares en 2012	Hectares en 2013
Meta-Guaviare	ALTO UNUMA	42,1	1,4
	ARARA, BACATÍ, CARURU Y MIRAFLORES	10,0	9,8
	BARRANCO CEIBA Y LAGUNA ARAGUATO	16,4	29,2
	BARRANCO COLORADO	9,2	12,7
	BARRANCÓN	3,2	0,0
	BARRANQUILLITA	13,8	21,3
	CAÑO JABÓN	2,5	6,8
	CAÑO NEGRO	0,0	0,0
	CENTRO DE MIRAFLORES	2,2	0,0
	CHARCO CAIMÁN	4,6	0,6
	COROCORO	6,9	11,4
	EGUA-GUARIACANA	0,0	53,2
	EL REFUGIO	0,6	285,1
	EL TIGRE	27,0	0,0
	LA ASUNCIÓN	4,1	0,6
	LA FUGA	17,8	11,4
	LA YUQUERA	58,3	53,2
	LAGOS DEL DORADO, LAGOS DEL PASO Y EL REMANSO	179,1	285,1
	MACUARE	7,0	11,7
	MORICHAL VIEJO, SANTA ROSA, CERRO CUCUY, SANTA CRUZ, CAÑO DANTA- OTROS	127,5	155,8
	NUKAK - MAKU	217,3	454,2
	PUERTO NARE	22,7	21,4
	PUERTO VIEJO Y PUERTO ESPERANZA	9,6	4,6
	SIKUANI DE DOMO PLANAS	7,3	0,9
	TUCÁN DE CAÑO GIRIZA Y PUERTO LA PALMA	23,3	23,3
	VUELTA DEL ALIVIO	16,8	19,2
	YAVILLA II	64,9	78,7
Orinoco	ALTO UNUMA	106,1	87,1
	CALI-BARRANQUILLA	4,4	0,0
	CARPINTERO PALOMAS	2,5	1,4
	CHOCON	0,0	1,6
	CIBARIZA	0,0	0,0
	CONCORDIA	0,0	1,5
	COROCORO	0,0	0,0
	FLORES SOMBRERO	3,3	0,0
	GUACAMAYAS MAMIYARE	3,3	1,0
	GUACO BAJO Y GUACO ALTO	17,5	3,2
	KAWÁNERUBA	1,1	0,0
	LA LLANURA	4,6	3,0
	LA PASCUA	1,1	0,0
	LAGUNA TRANQUILA	0,0	0,0
	LOS IGUANITOS	0,0	0,0
	MEREY, LA VERAITA	0,0	0,0
	PUNTA BANDERA	1,5	0,0
	RÍO SIARE	4,5	3,9
	RÍOS MUCO Y GUARROJO	3,8	1,0
	RÍOS TOMO Y WEBERI	6,4	0,7
	SAN JOSÉ DE LIPA O CAÑO COLORADO	1,0	0,8
	SAN LUIS DEL TOMO	0,0	0,3
	SANTA TERESITA DEL TUPARRO	62,4	26,7
	SARACURE-CADÁ	68,1	45,7
	SELVA DE MATAVÉN	93,2	22,9
	SIKUANI DE IWIWI	2,2	0,0
	VALDIVIA	0,0	1,5

Region	Indigenous territories	Hectares en 2012	Hectares en 2013
Pacific	AGUACLARA Y BELLA LUZ DEL RÍO AMPORÁ	11,5	2,5
	ALMORZADERO, SAN ISIDRO Y LA NUEVA UNIÓN	7,9	7,6
	ALTO BONITO VIRA VIRA	8,2	0,8
	ALTO DEL RÍO MUNGUIDÓ	6,0	1,0
	BAJO GRANDE	10,2	2,3
	BELLAVISTA-UNIÓN PITALITO	19,7	4,5
	CALLE SANTA ROSA RÍO SAIJA	84,3	101,1
	CAÑÓN DEL RÍO SANQUININI	2,6	2,2
	CHAGPIEN	6,5	0,7
	CHAGUI CHIMBUZA VEGAS Y OTROS	14,7	40,3
	CHIDIMA TOLO	0,0	0,0
	CHIGORODO MEMBA	0,0	1,0
	CHINGUIRITO MIRA	98,1	90,9
	CHONARA HUENA	0,4	0,0
	CHONTADURAL CAÑERO	1,2	1,3
	CUAIQUER INTEGRADO LA MILAGROSA	25,3	34,0
	CUAMBI-YASLAMBI	0,5	0,0
	CUASBIL-LA FALDADA	5,7	10,8
	CUASCUABI-PALDUBI	1,4	0,4
	CUAYQUER DEL ALTO ALBI	228,3	169,6
	CUCHILLA-PALMAR	7,1	3,1
	DEARADE BIAKIRUDE	2,7	1,4
	DOMINICO, LONDOÑO Y APARTADÓ	13,6	2,3
	EL CEDRO, LAS PEÑAS, LA BRAVA, PILVÍ Y LA PINTADA	64,0	151,8
	EL GRAN SABALO	543,8	319,9
	EL SANDE	98,5	133,2
	GEGORÁ, QUIPARÁ, MURANDÓ, TIRAVENADO Y JIGUADÓ	0,0	0,0
	GRAN ROSARIO	229,1	534,0
	GUADUAL, CUMBAS, MAGÜI, INVINA Y ARRAYÁN	0,0	0,0
	GUALCALA	11,5	9,6
	GUAYACAN-SANTA ROSA	0,0	0,0
	GUELNAMBI-CARAÑO	13,7	22,7
	HONDA RÍO GUIZA	4,2	7,3
	INDA ZABALETA	148,3	794,6
	INFI	13,0	25,3
	INGA DE APONTE	0,0	1,3
	INTEGRADO EL CHARCO	50,7	42,4
	ISLA DEL MONO	0,7	3,0
	JAGUAL RÍO CHINTADO	0,0	1,4
	JURADÓ	6,7	7,0
	LA FLORESTA - LA ESPAÑOLA	5,7	8,6
	LA FLORESTA, SANTA ROSA Y SAN FRANCISCO	156,9	140,4
	LA IGUANA	13,5	14,5
	LA RAYA	0,0	5,5
	LA TURBIA	598,9	399,4
	LA UNIÓN CHOCO - SAN CRISTOBAL	13,2	2,2
	MAIZ BLANCO	0,0	0,3
	NUNALBÍ ALTO ULBÍ	7,1	11,1
	NUSSI PURRU	2,1	0,7
	PAINA	0,7	0,0
	PATIO BONITO	2,4	0,8
	PERANCHITO	1,5	0,0
	PERANCHO	1,5	0,0
	PIALAPI-PUEBLO VIEJO-SAN MIGUEL-YARE	0,6	0,0
	PICHICORA, CHICUE, PUERTO ALEGRE	1,7	0,0
	PIEDRA SELLADA-QUEBRADA TRONQUERIA	14,6	17,9
	PIGUAMBI PALANGALA	2,4	15,0

Region	Indigenous territories	Hectares en 2012	Hectares en 2013
Pacific	PIPALTA-PALBI-YAGUAPI	9,1	13,1
	PLANADAS TELEMBÍ	18,5	21,6
	PLAYA BENDITA	2,3	14,7
	PLAYITA SAN FRANCISCO	1,8	1,2
	PUADÓ, LA LERMA, MATARÉ, Y TERDO	19,1	10,4
	PUERTO ALEGRE Y LA DIVISA	14,5	1,9
	PUERTO LIBIA TRIPICAY	6,6	1,9
	PULGANDE CAMPOALEGRE	3,4	54,2
	QUEBRADA GRANDE	2,1	1,8
	QUEBRADA QUERA	18,4	6,8
	RAMOS-MONGON-MANCHURIA	0,0	1,3
	RÍO GARRAPATAS	6,4	9,0
	RÍO GUANGÜI	23,7	48,2
	RÍO NAYA	1,1	1,9
	RÍO NUQUÍ	3,0	0,5
	RÍO PAVASA Y QUEBRADA JELLA	12,1	0,1
	RÍO PURRICHA	50,6	10,7
	RÍO SATINGA	20,1	13,6
	RÍO TAPARAL	0,0	0,0
	RÍOS CATRU-DUBASA Y ANCOSO	139,0	33,7
	RÍOS JURUBIDA-CHORI Y ALTO BAUDÓ	27,7	12,6
	RÍOS PATO Y JENGADÓ	1,1	1,0
	RÍOS TORREIDÓ Y CHIMANI	37,4	26,2
	RÍOS UVA Y POGUE-QUEBRADA TAPARAL	0,0	0,0
	SALAQUI Y PAVARANDÓ	0,0	2,7
	SAN ANTONIO DEL FRAGUA	1,8	2,7
	SAN JOSÉ AMIA DE PATO	0,0	0,7
	SAN MIGUEL	4,8	3,5
	SANANDOCITO	8,8	9,6
	SANQUIANGUITA	3,0	1,3
	SANTA CECILIA DE LA QUEBRADA ORO CHOCÓ	9,8	2,5
	SANTA MARÍA DE PANGALA	25,6	1,4
	SANTA ROSA SUCUMBIOS EL DIVISO	6,4	11,0
	SAUNDE GUIGUAY	55,9	87,8
	SIRENA BERRECUY	3,7	0,1
	TOGOROMA	0,1	0,1
	TOKOLLORO	1,9	0,3
	TORTUGAÑA, TELEMBI, PUNDE, PITADERO, BRAVO, TRONQUERIA Y ZABALETA	38,1	51,6
	TRONQUERIA, PULGANDE-PALICITO	4,0	1,4
	URADÁ JIGUAMIANDÓ	8,3	4,4
	WASIPANGA	2,3	1,9
	YU YIC KWE	0,0	2,1

Region	Indigenous territories	Hectares en 2012	Hectares en 2013
Putumayo - Caqueta	AGUA NEGRA	7,9	10,0
	AGUANEGRA	36,9	52,2
	AGUAS NEGRAS	1,1	0,0
	ALBANIA	0,0	0,0
	ALTO LORENZO	11,1	14,7
	ALTO ORITO	3,5	7,5
	BELLA VISTA	6,9	11,9
	BUENAVISTA	27,9	50,9
	CAICEDONIA	12,7	22,9
	CALARCA	23,8	33,4
	CALENTURAS	3,4	3,6
	CAMPO ALEGRE DEL AFILADOR	8,3	8,0
	CAÑAVERAL	15,3	24,7
	CECILIA COCHA	0,0	0,0
	CHALUAYACO	2,1	1,0
	CONSARA-MECAYA	10,8	1,7
	COROPOYA	3,3	2,2
	CUSUMBE-AGUA BLANCA	0,0	0,6
	DAMASCO VIDES	24,0	37,0
	EL CEDRITO	0,7	9,1
	EL DESCANSO	0,0	0,0
	EL ESPINGO	21,6	29,9
	EL GUAYABAL	2,4	14,9
	EL HACHA	32,2	36,7
	EL PORTAL	0,6	0,4
	EL PORVENIR - LA BARRIALOSA	3,7	4,1
	EL QUINCE	0,0	0,0
	EL TABLERO	0,0	0,8
	EL TRIUNFO	1,0	0,4
	GETUCHÁ	0,0	0,0
	HERICHA	0,9	6,9
	HONDURAS	1,0	0,0
	JACOME	1,1	2,8
	JERICÓ-CONSAYA	11,8	1,4
	JERUSALÉN-SAN LUIS ALTO PICUDITO	36,5	32,7
	JIRIJIRI	0,0	0,0
	LA AGUADITA	13,2	17,5
	LA CRISTALINA	0,0	0,0
	LA ESPERANZA	0,0	0,0
	LA ITALIA	6,3	10,8
	LA PAYA	3,7	4,7
	LA SIBERIA	3,3	3,8
	LA TEÓFILA	1,1	1,8
	LOS GUADUALES	1,8	4,3
	MATICURÚ	0,0	13,1
	NIÑERAS	9,3	10,8
	PLAYA LARGA	13,3	8,2

Region	Indigenous territories	Hectares en 2012	Hectares en 2013
	PREDIO PUTUMAYO	15,1	14,8
	PUERTO NARANJO, PEÑAS ROJAS, CUERAZO Y EL DIAMANTE	2,2	5,4
	PUERTO ZÁBALO Y LOS MONOS	8,6	1,1
	SAN ANDRES - LAS VEGAS - VILLA UNION	20,5	34,3
	SAN ANTONIO DEL FRAGUA	2,6	2,3
	SAN LUIS	5,4	10,0
	SAN MIGUEL	2,4	0,7
	SAN MIGUEL DE LA CASTELLANA	2,3	0,8
	SANTA CRUZ DE PIÑUÑA BLANCO	1,0	1,2
	SANTA ROSA DE JUANAMBÙ, CAMPO ALEGRE, ALPES ORIENTALES Y LA FLORESTA	12,2	20,3
	SANTA ROSA DEL GUAMUÉZ	1,0	3,3
	SELVA VERDE	5,0	14,8
	SIMORNA	2,2	2,5
	VEGAS DE SANTANA	0,0	2,2
	VILLA CATALINA-DE PUERTO ROSARIO	49,2	67,3
	WASIPUNGO	0,0	1,5
	YARINAL (SAN MARCELINO)	3,9	13,8
	YURAYACO	1,8	1,2
	ZIT-SET DEL QUECAL	0,0	0,7
Sierra Nevada	ARHUACO DE LA SIERRA NEVADA	4,1	1,9
	KOGUI-MALAYO ARHUACO	11,5	26,0

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