



UNDCP

Illicit Crop  
Monitoring  
System  
Peru

Country Office  
Peru

PERU

# Annual Coca Cultivation Survey 2001



March 2002

## **I. SUMMARY**

Illegal coca cultivation in Peru has registered significant changes in its dynamic and area covered during the last 15 years, in response to factors such as the variations in international demand and interdiction measures implemented in the areas of illicit cultivation.

Until the first half of 1995 the growth of the area occupied and the expansion of coca crops in Peru was constant. Until then, 60 to 70 % of international coca trafficking requirements were supplied by Peru. The remaining percentage was provided by Colombia and Bolivia.

Between 1995 and 1998, Colombia recorded a rapid growth in the area cultivated with coca, which displaced the Peruvian supply to second place. This situation, combined with the action against drug trafficking carried out by the Peruvian Government, resulted in turn in an overproduction of coca leaf and derivatives in the Peruvian production centers and a fall in farmgate prices. The result was an abandonment of about 60 % of the total cultivated area of coca.

Since 1999, however, prices of coca leaf and derivatives have been recovering. At the end of 2000 the prices averaged US\$ 2.0 per kg of dry leaf. In 2001, sustained market demand continued to push the prices of leaf, with averages varying between US\$ 2.2 and US\$ 2.5. This situation, combined with a parallel fall of prices for legal products such as coffee, has been stimulating the rehabilitation of the coca plantations previously abandoned, as well as the use of chemical fertilizers to increase the yields.

Results of the coca cultivation survey for 2001 show that coca cultivation covered 46,232 hectares in 2001, against 43,405 hectares in 2000. This represents a increase of 2,827 hectares, or 6.5 %. The potential production of coca leaf was estimated at 49,260 metric tons in 2001.

The area occupied by poppy appears to be still insignificant. Nevertheless, there are indications that it is an increasing illegal activity.

In this context, the continuous monitoring of the areas under illicit cultivation constitutes a matter of priority for the Peruvian government represented by CONTRADROGAS, and a prerequisite for the definition of adequate control and development policies.

## **II. BACKGROUND**

The United Nations International Drug Control Program was requested by Member States to provide assistance for the establishment of national monitoring systems in the countries where illicit cultivation takes place and to compile and report estimates at the global level (resolutions of the Special Session of the UN General Assembly on drugs in June 1998, and CND Resolution 42/3 on "Monitoring and Verification of Illicit Cultivation").

In this framework, UNDCP launched the project AD/PER/98/DO2 “Monitoring of coca leaf production” in Peru in 1998. A “year zero” map was established by the project to locate and identify the spatial dimensions of coca crops in their state of production or abandonment. This enabled the creation, for the first time in Peru, of a Cartographic Data Base and a System of Geographic Information (GIS) containing detailed information on all the basins where coca crops are found. With these tools, it is possible to implement a systematic and periodic follow up of the evolution of the cultivation and to update the figures annually or bi-annually.

The project also validated a method of processing multispectral information (using SPOT and LANDSAT satellite images) to detect and estimate the size of coca fields in production.

In order to monitor coca markets changes, the system also compiles reports the prices of coca leaf and its derivatives on a monthly basis.

Yield surveys on a network of plots located in the main coca basins (Apurímac, Monzón, Aguaytía, Tocache, Uchiza, Inambari-Tambopata) enable the project to estimate the productivity of dry leaf per hectare every year. The annual supply of coca leaf is calculated based on those yield estimates combined with the area estimates. For 2000, the total supply amounted to 41,787 mt of dry leaf..

### **III. METHODOLOGY APPLIED TO MEASURE THE AREA OF COCA CULTIVATION 2001**

The methodology to determine the area under coca cultivation in Peru in 2001 included three basic steps:

1. Comparison of the information, which is contained in the Cartographic Data Base of coca cultivation at “year zero” level for each basin (determined area) with the information contained in the SPOT multispectral registration of 2001.
2. Definition of spectral features and spectral classification of coca cultivation in the different stages of production and abandonment.
3. Land control and verification.

The first step is a visual and digital (computer-based photo interpretation) process. Firstly, it allows to update the data contained in the Data Base “year zero”, i.e. to detect objectively the changes in the stages of coca cultivation that occurred in the two periods under registration.

The second step is applied to classify the presence of new coca crops within and outside of the coverage area of the “year zero” Data Base. The spectral features of coca cultivation classification in production and abandonment have been determined using aerial photographs with a scale of 1:20,000 and field information.

The third step serves to establish the definition of spectral features of coca cultivation and to make corrections; to determine the types and levels of

confusion in the classification and to determine the levels of confidence of the final classification.

For 2002, the programme plans to use SPOT images of 10x10m resolution (multispectral) and 5x5m (panchromatic). This type of resolution should improve the level of confidence of the results.

## CARD

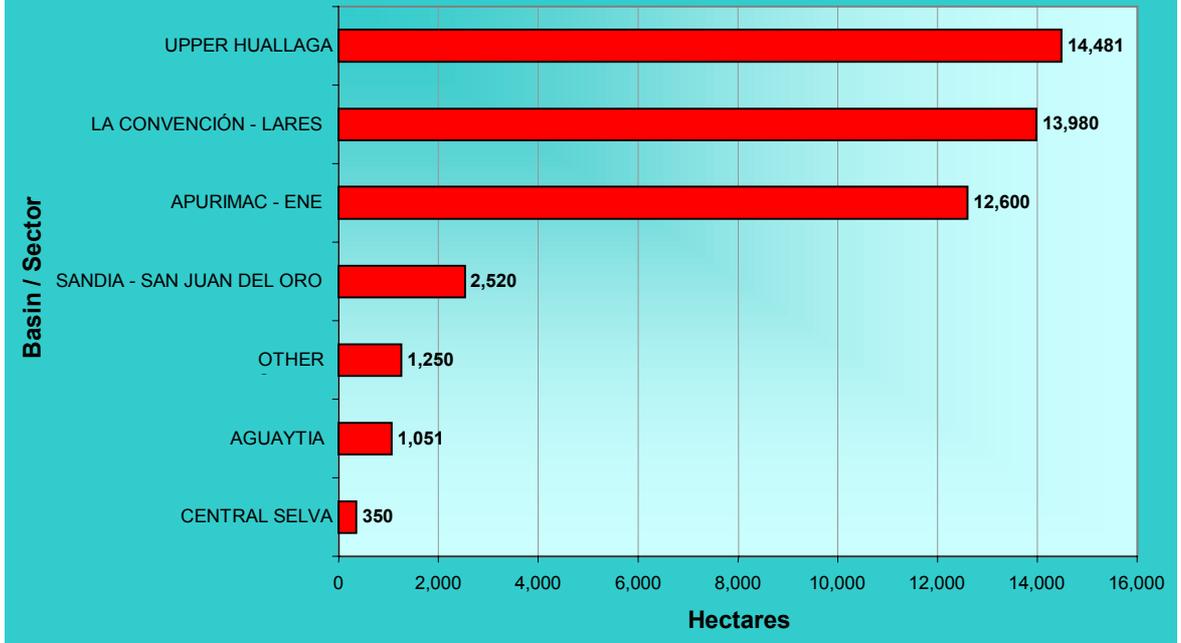
<b>1 INPUTS USED</b>	<ul style="list-style-type: none"><li>* Data of coca cultivation "year zero"</li><li>* Spectral information 2001</li></ul>
<b>2 CHARACTERISTICS OF MULTISPECTRAL RECORDS</b>	<ul style="list-style-type: none"><li>* Spot XS</li><li>* Color corrected</li><li>* 3 Visible Bands</li><li>* 1 Infrared band</li><li>* Resolution 20x20 m</li></ul>
<b>3 PROCESSING METHOD</b>	<ul style="list-style-type: none"><li>* Visual and digital correlation of data "year zero" with Multispectral Records for 2001</li><li>* Spectral classification</li><li>* Terrestrial Control / G.P.S</li></ul>
<b>4 RESULTS 2001</b>	<ul style="list-style-type: none"><li>* <b>46,232 Hectares</b></li></ul>
<b>5 LEVELS OF ERROR</b>	<ul style="list-style-type: none"><li>* <math>\pm 9.2 \%</math></li></ul>
<b>6 COMPLEMENTARY INFORMATION</b>	<ul style="list-style-type: none"><li>* Spot Records 1999 and 2000</li><li>* Landsat registrations of 2000</li><li>* Colored and infrared aerial photographs 1:20,000 1996 - 97 - 98 - 99 - 2000</li></ul>

**PERU: AREA OF COCA CULTIVATION, 2001**  
(Expressed in Hectares)

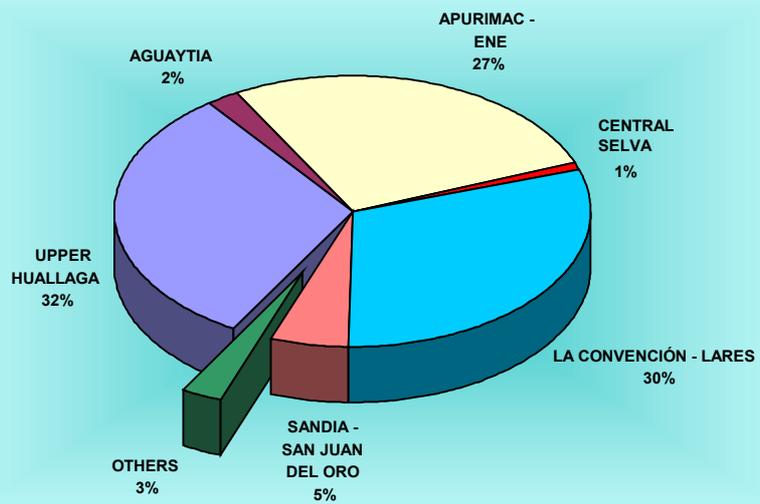
<b>BASIN/SECTOR</b>	<b>AREA (Ha)</b>	<b>PERCENTAGE (%)</b>
<b>I. UPPER HUALLAGA</b>	<b>14,481</b>	<b>31.3%</b>
Monzón	8,847	19.1%
Tulumayo	2,192	4.7%
Pendencia - Aucayacu	791	1.7%
Azpuzana	471	1.0%
Cuchara - Magdalena- Sta. Marta - Camote/Frijol	1,173	2.5%
Tocache - Chontayacu	624	1.3%
Ongon	383	0.8%
<b>II. AGUAYTIA</b>	<b>1,051</b>	<b>2.3%</b>
Aguaytia - Yurac	1,051	2.3%
<b>III. APURIMAC</b>	<b>12,600</b>	<b>27.3%</b>
Apurímac - Ene	12,600	27.3%
<b>IV. LA CONVENCION - LARES</b>	<b>13,980</b>	<b>30.2%</b>
Urubamba - Yanatile	13,980	30.2%
<b>V. CENTRAL SELVA</b>	<b>350</b>	<b>0.8%</b>
Palcazu - Pichis - Pachitea	350	0.8%
<b>VI. SANDIA - SAN JUAN DEL ORO</b>	<b>2,520</b>	<b>5.5%</b>
Inambari - Tambopata	2,520	5.5%
<b>VII. OTHERS (*)</b>	<b>1,250</b>	<b>2.7%</b>
<b>TOTAL</b>	<b>46,232</b>	<b>100.0%</b>
<b>AVERAGE ERROR</b>		<b>± 9.2%</b>

(\*) includes  
 Central Huallaga Basin (Saposoá, Sisa, Sauce, Ponaza)  
 Lower Huallaga Basin (Shanusi, Caynarachi)  
 Upper and Lower Mayo Basins (Lamas, Pamashto, San Antonio de Cumbaza)  
 Marañón Basin

**PERU: EXTENSION OF COCA CULTIVATION**  
(Expressed in Hectares)



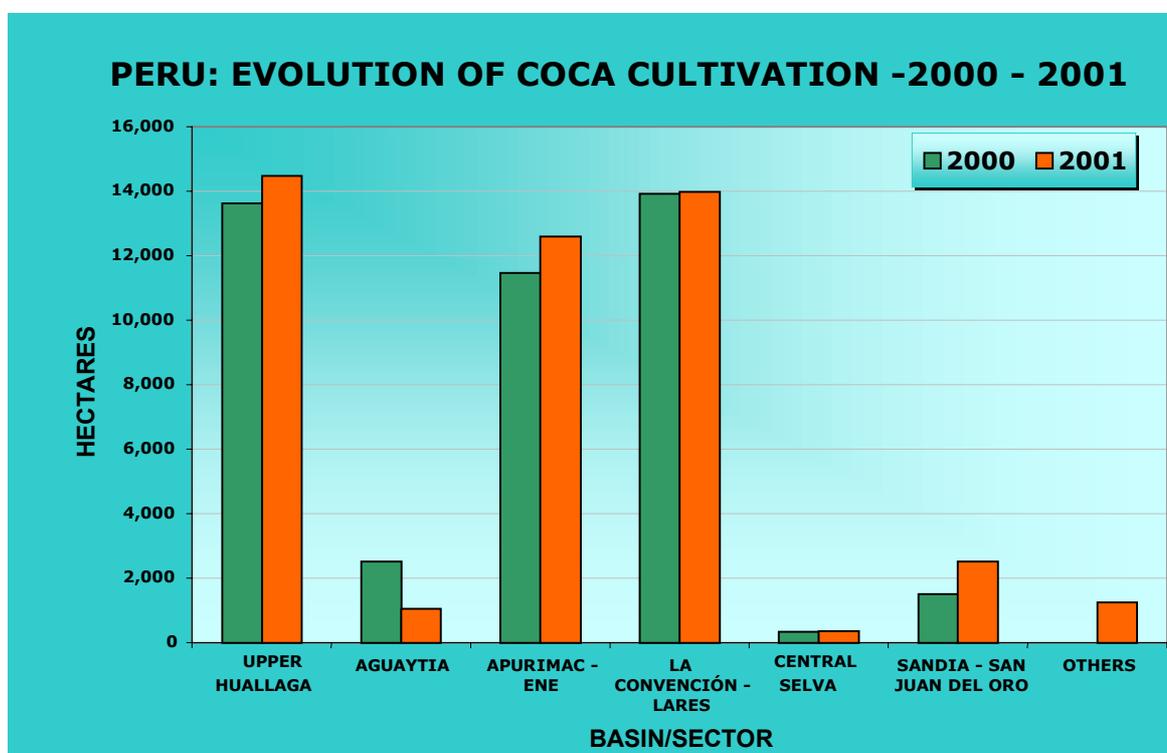
**PERU: COCA SURFACE DISTRIBUTION,**  
(Total Area = 46,232 hectares)



**PERU: EVOLUTION OF COCA CULTIVATION, 2000 - 2001**  
*(Expressed in Hectares.)*

BASIN/ SECTORS	AREA (Ha)		VARIATION	
	2000	2001	HA.	(%)
UPPER HUALLAGA	13,636	14,481	845	6%
AGUAYTIA	2,529	1,051	-1,478	-58%
APURIMAC - ENE	11,475	12,600	1,125	10%
LA CONVENCION - LARES	13,914	13,980	66	0%
CENTRAL SELVA	340	350	10	3%
SANDIA - SAN JUAN DEL ORO	1,511	2,520	1,009	67%
OTHERS	WR	1,250	1,250	-
<b>TOTAL</b>	<b>43,405</b>	<b>46,232</b>	<b>2,827</b>	<b>6.5%</b>

WR = WITHOUT REGISTRATION



#### IV. OBSERVATIONS REFERRING TO THE CHANGES IN AREAS OF COCA CROPS.

In 2001, 46,232 hectares of coca cultivation in production were identified through remote sensing. This figure represents an increase equivalent to 6,5 % compared with 2000 (43,405 hectares of coca).

##### **UPPER HUALLAGA BASIN**

With the exception of Tocache, Chontayacu (Uchiza) and Ongon, all the remaining sub-basins of the Alto Huallaga area, recorded increases in the areas under coca cultivation in 2001. This appears to respond to the prices paid for coca leaf, which on average, have exceeded US\$ 2 per kg (Monzón US\$ 3.7 per kg, June 2001).

The greatest increases in hectares were recorded in the Monzón and Tulumayo sub-basins, with additional areas (in reference to year 2000) of 929 and 536 hectares respectively. In the Monzón area, this arises from the rehabilitation of coca crops in abandoned locations and on a minor scale, by the installation of new crops. In the Tulumayo area, the larger areas arise mainly from the rehabilitation of abandoned coca plantations.

With reference to Tocache and Chontayacu, these two sub-basins continued to record significant reductions in the area of coca. For 2001, the area occupied amounted to 624 hectares, that is 1,396 hectares less than in 2000 (2,020 hectares) and 3,396 hectares less than in 1999 (4,000 hectares).

During the 1980's and the first years of the 1990's, Tocache and Uchiza were the largest illegal coca derivatives trafficking centers in Peru. During that period, the cultivated area of coca in both basins was around 16,000 hectares.

The reduction of coca activity in these areas can be attributed, to a large extent, to the sustained fall in price of coca leaf and derivatives recorded in the period 1995 to 1998, which caused a high level of abandonment, as well as to the programmes implemented in the area. In the last four years, this trend has been consolidated by the eradication measures taken by CORAH (Project for Control and Reduction of Coca Cultivation in Upper Huallaga) of the Ministry of Home Affairs.

The locality Ongón constitutes a small focus point of coca in the upper part of the Mishollo river sub-basin. Coca activity has existed there for more than 10 years, but had not been accounted for by previous surveys or mapping exercises. It was included in the 2001 cartographic survey.

The balance and cartographic mapping of increases and reductions recorded in the interior of the Alto Huallaga basin, shows the existence of 14,481

hectares of coca crops in production (31.3 % of the total cultivated) in 2001, almost entirely linked with drug-trafficking. This data is higher by 845 hectares than the area recorded in the year 2000 (13,636 hectares).

### **AGUAYTIA RIVER BASIN**

Between 1990 and 1994, 18,000 to 20,000 Ha of coca were cultivated in this area, which represented the third most important basin after Upper Huallaga and the Apurímac-Ene river valley for narcotrafficking activities.

In 2001, the area of cultivated coca in production amounted to 1,051 hectares (2.3 % of the total cultivated) only. This result is 1,478 hectares lower than in 2000 (2,529 hectares), and 4,178 hectares lower than in 1998.

The process of reducing the coca areas in this basin is similar to what happened in the Tocache and Chontayacu basins. In the first instance, a high level of abandonment (more than 50 % of the area in production) promoted both by the fall in prices recorded from the second quarter of 1995, and the implementation of interdiction measures (deactivation of clandestine airstrips) against drug trafficking and in the second instance, by the eradication action carried out by CORAH in the last four years.

### **APURIMAC RIVER BASIN**

In 2001, the area of cultivated coca in production amounted to 12,600 hectares (27.3 % of the total). This figure represents an increase of 1,125 hectares compared with 2000 (11,475 hectares) and 3,765 hectares compared with 1997 (8,835 hectares).

According to unofficial reports, it is estimated that, between 1988 and 1994, the area of coca cultivation in the valley amounted to approximately 30,000 hectares. The fall in prices in 1995 and the deactivation of clandestine airstrips used by the narcotraffickers to remove locally produced drugs, caused the abandonment of cultivation in an area ranging between 60 to 70 % of the total previously planted.

To corroborate this information, CORAH/CADA with technical and financial support from UNDCP, recovered and processed aerial photographic information in color to a scale of 1:20,000 in 1997. This enabled the detection of the existence of 8,835 hectares of coca crops in this year and an area of 15,732 hectares abandoned and/or overgrown. The problem with this survey is that it probably did not cover the whole coca area.

In 2000, by using SPOT multispectral information, it was possible to incorporate and account for areas bordering the valleys (high basins of the Acon, Llochegua, Otari rivers, among others) which recorded the presence of coca crops. For 2001, the area amounts to 11,475 hectares of coca in production.

As at 2001, the correlation of SPOT information recorded in this year, with the cartographic data for “year zero” (1997) and information for 2000, has made it possible to up-date the information on the situation in the valley. In principle, significant changes have been detected among the production areas and areas in abandonment, that is to say that a significant area of abandoned crop has been reactivated for production. In addition, it has been possible to detect the implementation of new coca crops located mainly in the southern area of Palmapampa (Monterrico, San Antonio, San Martín, Catarata among others).

This process is linked to the attractive prices offered by the narcotraffickers (US\$ 1,8 per kg of leaf in 2001) since the second half of 1998, and the parallel sustained fall in the price of coffee (US\$ 0.5 per kg) and cocoa recorded in 2001.

## LA CONVENCION AND LARES

The area of 13,980 hectares of coca identified in 2001 varies very little from what was recorded in 2000. In the national context, it represents 30.2 % of the total planted.

Historically, the Urubamba and Yanatile sub-basins have been considered as productive areas of coca leaf for traditional consumption (chewed or masticated). The National Coca Company ENACO in 1990 accounted for 12,685 officially registered producers, with a combined holding of 10,670 hectares.

This State-owned company has the responsibility of marketing coca leaf produced in the zone. On average, between 2,500 and 3,500 metric tons of dried coca leaf is gathered. However, in addition, there is a volume of coca, estimated to be between 2,000 mt to 2,500 mt, which escapes the control of ENACO and is illegally removed from the zone.

Although there is no evidence of the presence of a chemical processing infrastructure for coca leaf, it is estimated that part of the volume that leaves the zone illegally would be destined for the narcotrafficking.

## **SELVA CENTRAL**

The presence of coca crops in the Palcazu, Pichis and Pachitea (Santa Isabel) basins dates from about 1986-87. It appeared in this area as a result of the settlement of coca farmers, displaced or expelled by the anti-drug operations implemented in the Alto Huallaga and the predominant terrorist violence.

It is estimated that in peak time, approximately 12,000 hectares were under cultivation for the production of coca leaf completely linked to the narcotrafficking.

The impact of the 1995 fall in prices resulted in the complete abandonment of the area of coca cultivation in this area. This situation was maintained until the end of 1999. In 2000, due to the rise of coca leaf prices, 340 hectares of abandoned coca were reactivated, and remained, with small variations, in 2001.

Evidently, the rehabilitation of coca crops did not imply the complete elimination of undergrowth developed during the period of abandonment. In the majority of cases, part of the natural vegetation has been left as shade, which has enabled to camouflage the coca crop and elude the aerial controls.

### **SANDIA - SAN JUAN DEL ORO**

In 2001, the area occupied by coca crops amounted to 2,520 hectares (5.4 % of the total planted), concentrated mainly in the Inambari river basin. This figure is higher by 1,009 hectares compared with 2000.

This increase in the area partly reflects the incorporation and dimensioning of coca cultivated areas which, due to climatic factors (high cloud cover), could not be recorded through aerial photography and/or satellite images in 1999 and 2000.

In La Convención and Lares, areas considered as producing for traditional use, with marketing mainly assumed by ENACO, there is clear evidence that, in the last three years, not less than 50% of the volume of coca leaf was linked to illicit drug dealers.

The network of compilation of economic indicators implemented by UNDCP recorded, in 2000 and 2001, in the localities of Masiapo, Pampayanamayo, offers of coca leaf prices higher than those paid by ENACO, prices for crude and washed PBC, as well as for chemical precursors which would corroborate the existence of a significant level of chemical processing of coca leaf.

### **OTHERS**

Under this heading are included the disseminated areas of coca found in the **Upper and Lower Mayo basins** (Pamashto, Lamas, San Antonio de Cumbaza), **Central Huallaga** (Saposa, Sisa, Ponaza, Sauce, Chazuta), **Lower Huallaga** (Shanusi, Cainarachi), **Marañon** (Jaen, San Ignacio, Bagua, Imazita, Santa Maria de Nieva, Sarameriza).

The combined coca area in this zone amounted to 1,250 hectares in 2001, both in production and in the process of productive rehabilitation.

## PERU: COCA LEAF PRODUCTION, 2001

BASIN/	VOLUME (MT)	PERCENTAGE (%)
UPPER HUALLAGA	11,56	23.5
AGUAYTIA	1,01	2.1
APURIMAC - ENE	27,72	56.3
LA CONVENCION - LARES	5,60	11.4
SELVA CENTRAL	350	0.7
SANDIA - SAN JUAN DEL	2,26	4.6
OTHERS	750	1.5
<b>TOTAL</b>	<b>49,26</b>	<b>100.0</b>

(\* ) Average yields used to calculate leaf volume:

**Apurimac:** 2.2 MT/Ha

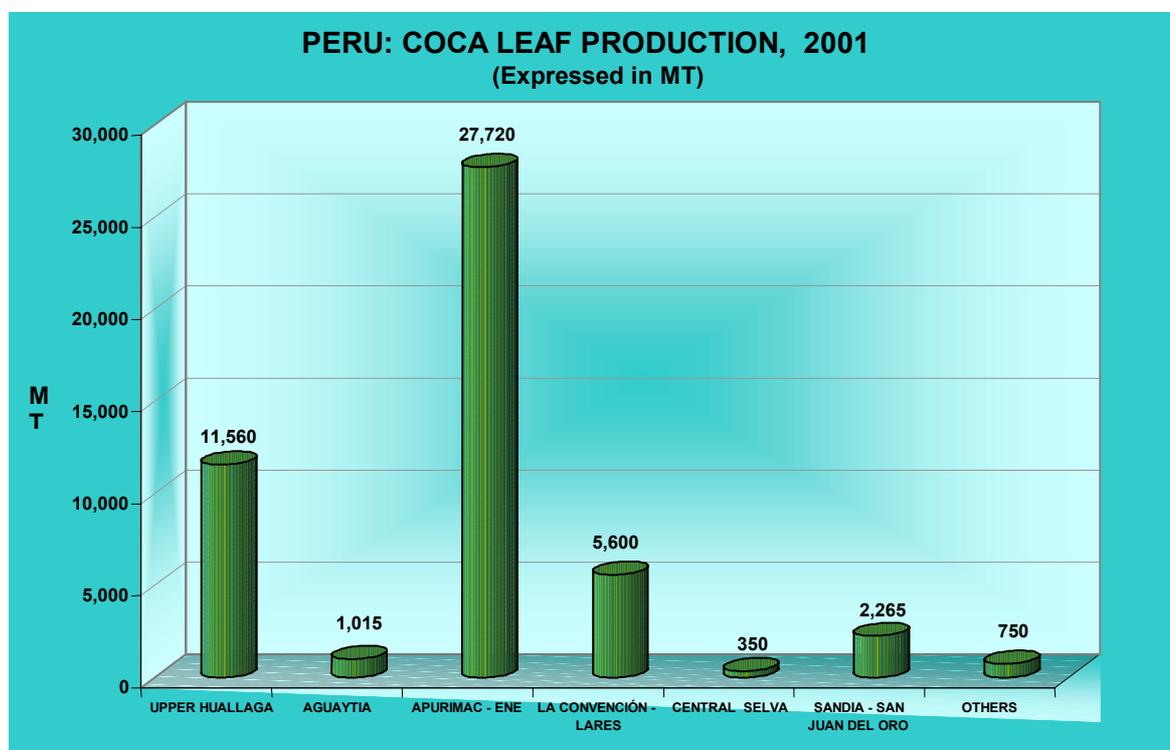
**Uchiza-Tocache:** 0.960 MT/Ha

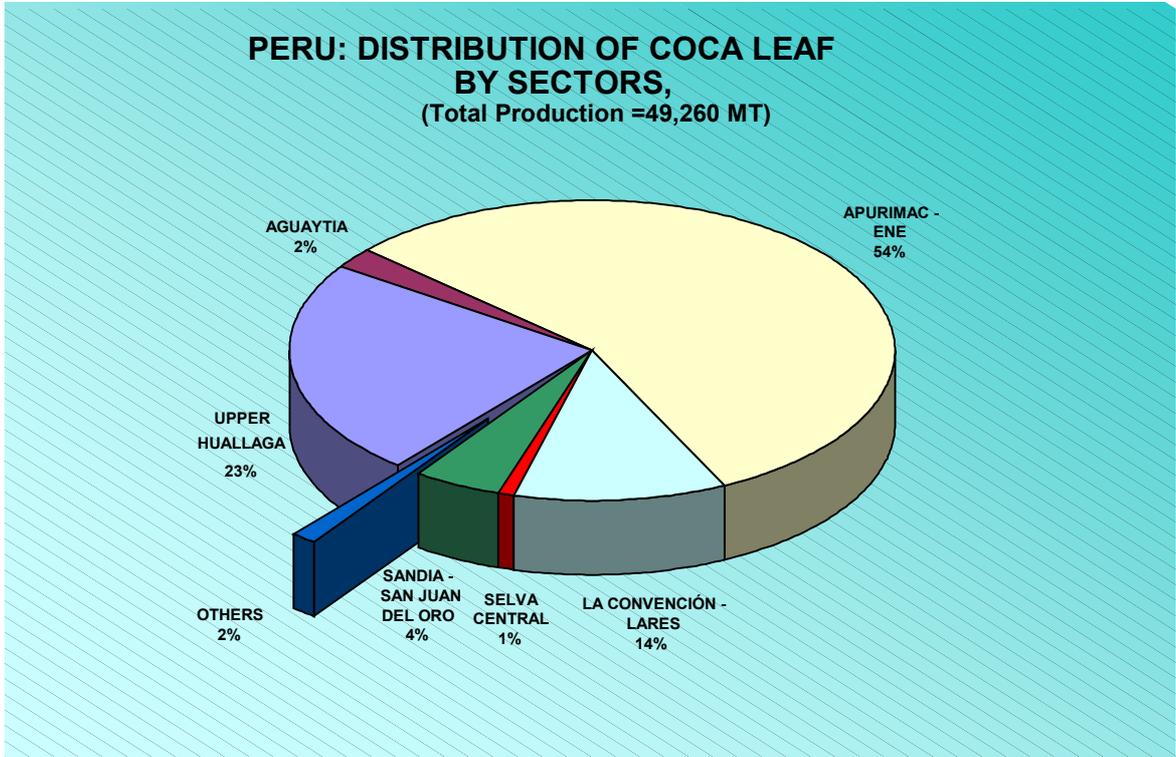
**Aguaytía :** 0.960 MT/Ha

**La Convención/Lares:** 0.400 MT/Ha

**Sandia - San Juan del Oro** 0.900 MT/Ha

**Monzon :** 0.450 TM.

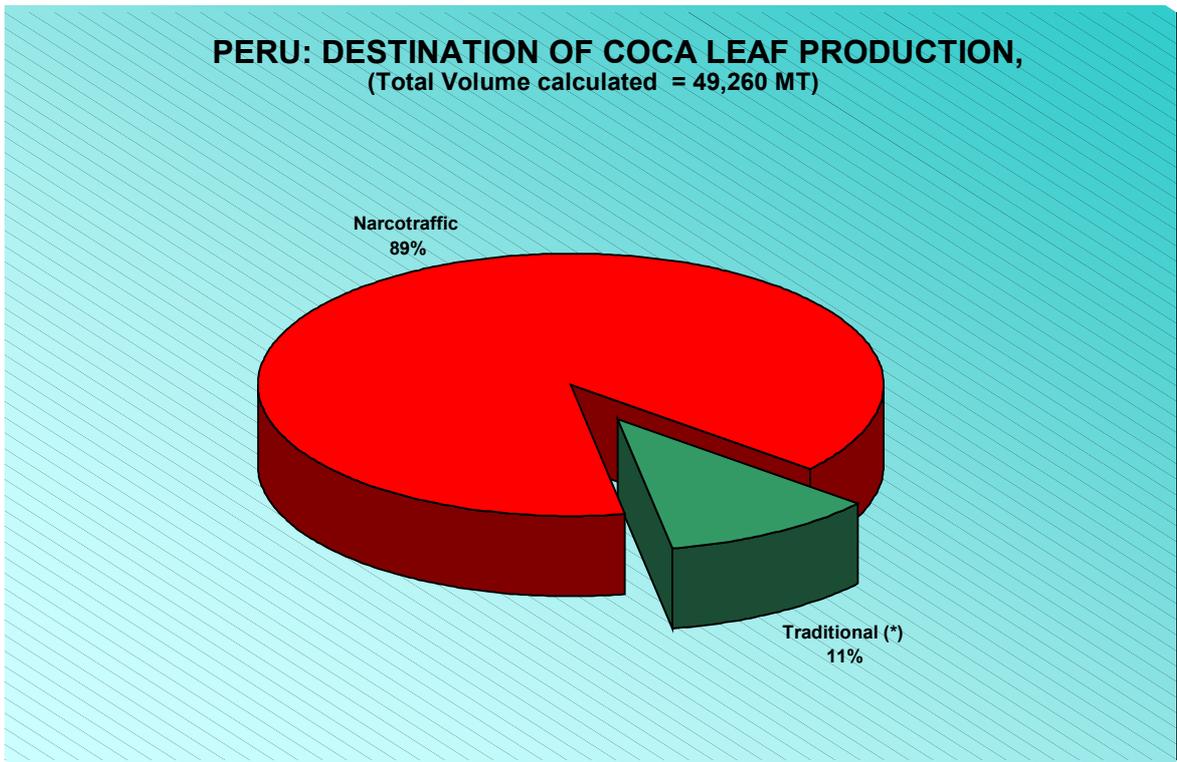




**PERU: USE OF COCA LEAF  
PRODUCTION, 2001  
(VOLUME CALCULATED)**

USE APPLIED	ESTIMATED VOLUME (MT)	PARTICIPATION (%)
TRADITIONAL (*)	5,500	11%
NARCOTRAFFIC	43,760	89%
<b>TOTAL</b>	<b>49,260</b>	<b>100%</b>

(\*) Coming mainly from La Convención - Lares, Sandia and San Juan del Oro



**PERU: PRODUCTION CAPACITY OF COCA DERIVATIVES, 2001**

TYPE	VOLUME (MT)
Pasta Básica Bruta (PBB) (Coca Paste)	360
Pasta Básica Lavada (PBL) (Washed Coca Paste)	180
Cocaine Hydrochloride	150

**IV.2 OBSERVATIONS ON PRODUCTION AND PRODUCTIVITY OF COCA LEAF.**

The total production of dry coca leaf for 2001 has been calculated as 49,260mt. This volume represents an average production equivalent to 1,065mt per hectare, with an average maximum of 2.2mt / hectare reached in the Apurimac Ene river valley and an average minimum of 0.400mt recorded in the La Convención and Lares Valley.

## APURIMAC – ENE RIVER BASIN

This area ranks third for its cultivation area (12,600 hectares), after Upper Huallaga and la Convención and Lares valley, but comes first for its production and productivity, supplying 27,720 mt of leaf, representing 56.3 % of the total national production.

These higher indices are essentially linked to intensive use of chemical fertilizers and high plant density per hectare. In this respect, it is common to find crops in this basin with more than 300,000 plants per hectare and yields exceeding 3mt per hectare.

## UPPER HUALLAGA BASIN

It ranks occupies first for the area cultivated with coca (14,481 hectares) and second for the supply of coca leaf after Apurimac-Ene. The annual production volume has been calculated as 11,560 mt equivalent, to 23.5 % of the total national production.

The highest yields are achieved in Tocache, Uchiza, Tulumayo and Aucayacu sub-basins with 0.960mt/ hectares and the lower ones in the Monzon river basin with 0.450mt/ hectare.

With respect to the Monzon basin, although the yields are low because of the age of the plantations (more than 15 years old) and the low density of plants per hectare (20 to 25,000 plants), the price for leaf (US\$ 3.4/kg - Feb 2002) is significantly higher in comparison with that produced in other basins. This higher price is due to its high alkaloid content, which enables to produce 1 kg of Basic Paste (PBC) with 70 kg of leaf, while in other sectors between 120 to 130 kg of dry leaf are required.

## **LA CONVENCION and LARES VALLEY**

This region comes in second place for the area under coca cultivation and in third place for production. The annual supply is calculated as 5600mt of dry leaf, equivalent to 11.4 % of the national supply. The average yields are 0.400mt/ hectare.

These low production and productivity are essentially due to the age of the plantations (more than 2 years), to the low plant density per hectare (20 to 25,000 plants) and the minimal use of chemical fertilizers.

The majority of the volume produced is aimed at traditional consumption. About 60% of the production on average is marketed by the National Coca Company (ENACO) and the remaining 40 % is marketed illegally as contraband, in the traditional consumers' market (masticated).