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Lao National Commission for
Drug Control and Supervision

LAOS

Opium Survey 2004



July 2004

Abbreviations

UNODC:	United Nations Office on Drugs and Crime
GOL:	Government of Laos
ICMP:	Illicit Crop Monitoring Programme
LCDC	Lao National Commission for Drug Control and Supervision
PFU	Programme Facilitation Unit
DEA:	Drug Enforcement Agency

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Patrick Seramy:	Fieldwork organization and supervision, database management (Research and Analysis Section)
Hakan Demirbükten:	Survey and Data System Analyst (ICMP-Research and Analysis Section)
Sengdeuane Phomavongsa:	Ground survey supervision (Vientiane Field Office)
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Vongkot Inpradith:	Ground survey supervision (PFU)
Kyaw Naing Win:	GIS analyst (ICMP -Myanmar Field Office)
Thibault Le Pichon:	Chief – Research and Analysis Section
Denis Destrebecq:	Programme Management Officer Research and Analysis Section
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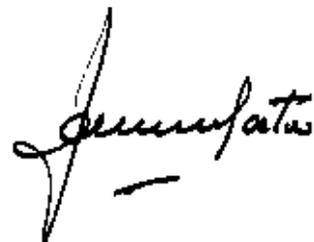
Foreword

For many years Laos was an important producer and supplier of illicit opiates to the world. In 1998 – the year a special session of the UN General Assembly met to discuss drugs and set targets – the country was growing opium poppy to the tune of 26,800 hectares. At the same time the Laotians had one of the highest rates of opium consumption per capita.

Since then, opium poppy cultivation has declined – so much so that by early 2004 the area under poppy cultivation in Laos stood at 6,600 hectares, an impressive cumulative reduction of 75% in six years. Considering the amount of domestic consumption – still important, as this survey shows – this means that the country is probably no longer a significant supplier to the world market for illicit opiates. Together with the parallel decline in opium cultivation in Myanmar, this trend translates into a historical achievement, which, if sustained, will end more than a century of opium production in the Golden Triangle. On behalf of the international community, I would thus like to pay tribute to the Government of Lao PDR for their significant achievement.

The donor community must match this achievement by helping Laos to provide poor farmers, who are now giving up their income from opium, with sustainable alternative sources of livelihood. Not enough has been done so far in this respect. In many areas, opium elimination has been achieved without the farmers having the opportunity to develop other sources of income. Although the opium growers in fact never derived a great deal from this crop, the cash from selling opium was important for farmers living on, or below, the poverty line. For opium-growing households, the average annual GDP per capita is US\$62, compared with US\$309 per capita for the country as a whole.

We have the collective responsibility to ensure that the poorest of the poor are not the ones who pay the price for successes in drug control. Extending a compassionate hand to destitute farmers is also a condition for ensuring the sustainability of the elimination of opium production in Laos. I therefore urge donor countries and development agencies to join forces with us to make this drug control success a humanitarian one as well.



Antonio Maria Costa
Executive Director

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FACT SHEET, LAOS OPIUM SURVEY 2004

	2004	Variation on 2003
Opium poppy cultivation:	6,600 ha	- 45 %
Average opium yield:	6.5 kg/ha	- 34 %
Potential production of opium:	43 metric tons	- 64 %
Number of villages growing opium poppy:	846	- 45 %
Number of households cultivating opium poppy:	22,800	- 43 %
Average farm gate price of opium:	2,280,000 KIP/kg (US\$ 218/kg)¹	+42 % (+27% in US\$)
Total Potential value of opium production:	\$9,400,000	-59 %
Household average total income in opium poppy cultivation villages:	KIP 3,875,000 (US\$ 371)	-
Number of opium addicts ² :	28,000	- 6%
Average male opium addiction prevalence rate (in the 11 Northern provinces)	2 %	-
Average female opium addiction prevalence rate (in the 11 Northern provinces)	0.6 %	-

¹ Based on an average exchange rate of 10,441 KIP/US\$ from December 2003 to March 2004

² Source: LCDC

EXECUTIVE SUMMARY

The 2004 opium poppy survey in the Lao PDR was conducted jointly by the Lao Government and UNODC, across 11 provinces (including Xaisomboum Special Region) of Northern Laos with two, parallel and independent data collection campaigns. The first one, aimed at the estimation of the planted surface and yield, consisted of field surveys on sample sites; the second one was carried out through interviews of village headmen and household heads to collect socio-economic data.

Opium poppy cultivation

The total area under opium poppy cultivation in the Lao PDR for the 2004 season was estimated to be **6,600 ha**, a decrease of 45% compared to the 2003 estimate of 12,000 ha. It was estimated that 22,800 households were engaged in opium cultivation, representing 5% of a total of 425,332 households in the Northern Provinces of Laos.

Opium yield and production

The average national opium yield potential for 2004 was estimated at **6.5 kg/ha**, ranging between 3.5 and 10.1 kg/ha, with a reduction of 34 % with respect to the 2003 estimate of 10 kg/ha. This outcome was due to unfavourable climatic conditions during the growing season and an ensuing drought. Based on the area planted, the average estimated production of opium for the year 2004 was **43 metric tons**, with an overall reduction with respect to 2003, of over 64%.

Opium prices and trade

The average farm gate price of opium was estimated at 2,280,000 KIP per kilogram, corresponding to US\$ 218. This represents an increase of 27% compared with the price attained during the previous season. The increase reflects the scarcity of opium produced during this season that is confirmed by the results of the planted area estimate. The great majority of opium transactions (97%) were reported to take place within the producing or in neighbouring villages

Household income from opium cultivation and trade

The average cash income of an opium-producing household was estimated at KIP 3,875,000 (US\$ 371³). This corresponds to 94 % of the average income of non-opium producing households (4,137,289 KIP, or 396 US\$³) who are less poor than their opium-producing neighbours. Opium production and trade contributes only to 12% to the total income of the producer. These figures reveal that opium is linked to more marginal economic conditions.

Addiction

The 2004 opium survey showed that daily opium addiction took place in 60 % of the villages surveyed. In these villages, the average prevalence rate of addiction amounted to almost 3 % of the population age 15 and above. Opium smoking addiction is mainly a male phenomenon (2 % among the total male population, versus 0.6 % among females).

³ Based on an average exchange rate of 10,441 KIP/US\$ from December 2003 to March 2004.

1 Introduction

The objectives of the UNODC's Illicit Crop Monitoring Programme are to establish methodologies for data collection and analysis, to increase governments' capacity to monitor illicit crops and to assist the international community in monitoring the extent and evolution of illicit crops in the context of the elimination strategy adopted by the Member States at the General Assembly Special Session on Drugs in June 1998.

The Government of the Lao PDR (GOL) has decided to eliminate opium poppy cultivation in the Lao PDR by the year 2005. In 1999 the GOL and UNODC developed the programme strategy "Balanced Approach to Opium Elimination in the Lao PDR". This was backed up in November 2000 by the Prime Minister's order fourteen, stipulating measures against cultivation, abuse, production and illicit drug trafficking. In 2001 the endorsement of the amendment of article 135 of the criminal code provided for a considerable increase in penalties for drug related offences. A National Campaign against Drugs was also launched in October 2001 to mobilize and convince the communities to give up opium production.

The first government-UN survey to produce comprehensive national estimates took place in 1992. It was based on an inventory of all known opium-producing villages and a ground survey of a sample of opium producing villages. Similar surveys were conducted in 1996, 1998 and then annually since 2000. In Laos, the information provided by the surveys is used for planning and monitoring the impact of interventions under the programme "Balanced Approach to Opium Elimination in the Lao PDR".

2 Findings

The 2004 opium poppy survey in the Lao PDR was conducted across 11 provinces of Northern Laos with two, parallel and independent data collection campaigns. The first consisted of field surveys on a sample of sites, concentrated in an area that for environmental and historical reasons, hosts the bulk of the opium poppy production. This survey was aimed at estimating the surface planted with opium poppy and at collecting yield indicators. The second campaign was carried out in the same area through interviews of village headmen and household heads in 388 sample villages with the purpose of collecting socio-economic data and ancillary information on opium cultivation and trade.

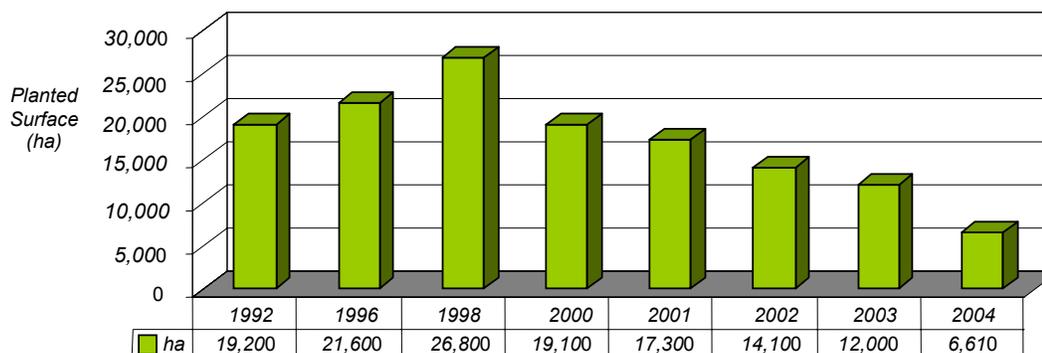
The pressure to overcome the cultivation of illicit crops in Laos is mounting and the risk of receiving untrustworthy answers from the interviewed subjects is therefore higher than in the past. This year, the data for the estimation of the planted area was therefore collected through a random field survey and did not rely on information provided by the local population. The sampling plan for both campaigns was designed on the base of the 2003 findings (12,000 ha cultivated with opium poppy) and was initially aimed at providing data at provincial level. However, the number of opium poppy fields found during the survey campaign proved far too reduced to give a stable and reliable statistical estimate per province. For this reason it was decided to consider the aggregate data and provide the estimate at national level only.

Personnel of the Lao Government (LCDC) carried out the investigation from mid January to March 2004 with a total of 120 surveyors, organized in 47 field teams plus 11 supervisory teams. The survey was conducted in difficult logistic and environmental conditions, and, in order to supplement gaps caused by the inaccessibility of parts of the territory, the information collected was supplemented by the analysis of satellite data.

2.1 Opium Poppy Planted Area

The total area under opium poppy cultivation in the Lao PDR for the 2004 season was estimated to be **6,600 ha**. This corresponds to a reduction of 45 %, from the 12,000 ha in 2003 and indicates an acceleration of the downward trend from 1998, when the opium poppy production peaked at 26,800 ha.

Figure 1: Estimated National Area under Opium Poppy Cultivation, 1992–2004



The estimate of the area planted resulted from the aggregation of the results of the field survey campaign and the analysis of the satellite data. The field survey was conducted on a random sample of 448 sites and it reported an average planted surface of 5,440 ha, with an estimation error of +/- 22 %. Field surveys were concentrated on parts of the territory characterized as more susceptible to opium cultivation. Qualifying features of this disposition are the presence of bare soil in early autumn, altitude and proximity to villages. The use of this “stratification” had the scope of increasing the efficiency of the survey and the probability of finding poppy fields, especially in a situation where the crop is becoming more rare.

Limiting the areas of survey, however, carries the risk of missing part of the crop and the use of satellite images had the specific scope of looking beyond the limits of the stratification to make sure that all possible cultivation of opium poppy would be taken into consideration. The satellite analysis was run on a sample of SPOT 5 scenes, covering portions of the northern Lao territory and the result was the estimation of 1,170 ha outside the areas of the ground survey.

The interviews were conducted in 344 villages, of these, 62 reported cultivating opium poppy, corresponding to 18% of the sample. This is a significant decrease with respect to the 2002 and 2003 figures, where the proportion of opium producing villages was, respectively 34 and 33 %. The reduction between 2002 and 2003 is in the order of 45%, which is consistent with the results of the field survey (See Table 1).

The interviews of the household heads reported 690 households growing poppy out of a total of 23,126 in the sample. This corresponds to 2.98 % of the sample and leads to an estimate of around 12,700 households engaging in opium cultivation out of the total number of households living in the Northern provinces of the Lao PDR (425,332). However, as there might be reluctance from the households to report opium cultivation, an alternative estimate can be derived from the estimate of the planted area and considering that each household cultivates an average of 0.29 ha of opium poppy each⁴. In this case the total number of opium cultivating households rises to 22,800 (with a possible minimum of 14,800 from the estimate). This second figure is more consistent with the results of the 2003 survey where the estimate ranged between 35,000 and 45,000 households (mean of 40,000) and still accounts for an overall reduction of 43%.

⁴ As was reported in 2003 Opium Poppy Survey

Table 1: Estimate of opium producing villages 2002-2004

Year	Estimated n. of villages growing poppy	%
2002	1,610 ⁵	34%
2003	1,537 ⁷	33%
2004	846 ⁶	18%

The presence of poppy was reported and assessed on a number of field survey sites and in the territory of some of the surveyed villages. These data allowed the production of a density map illustrating the distribution of poppy cultivation in a schematic form. This cannot be considered a map of poppy cultivation as such, but simply an indicator of the areas where cultivation is still of some significance (See Map 1).

In 2004 opium poppy was found in Phongsaly, Luang Prabang, Huaphanh, Xieng Khuang and Xayaboury Provinces and in Xaisomboom Special Region. There was no direct evidence of poppy cultivation from either the field surveys or the village interviews in Luang Namtha, OudomXay, Bokeo, Vientiane and Borikhamxay Provinces.

The Lao Government therefore declared these provinces opium free. Similar declaration were made for the following districts:

- # Phongsaly Province: Boon Neua
- # Huaphanh Province: Xiengkhor, Viengxay, Huameuang, Sobbao and Add
- # Luang Prabang Province: Luang Phabang, Xieng Ngeun, Nan, Pakou, PakXeng and Phonxay
- # Xayaboury Province: Ngeuan, Xienghone and Phiang

⁵ Estimate from 2004 Village and Household survey

⁶ Official data reported from Lao District Authorities

Map 1: Northern Laos Opium Poppy Cultivation Density



Source: LCDC - UNODC Laos Opium Survey 2004 (http://www.unodc.org/unodc/en/crop_monitoring.html)

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

2.2 Yield and Production

The average national opium yield potential for 2004 was estimated at **6.5 kg/ha**, ranging between 3.5 and 10.1 kg/ha, with a reduction of 34 % with respect to the 2003 estimate of 10 kg/ha. Based on an area planted estimate of 6,600 ha, the estimated production of opium for the year 2004 therefore amounts to 43 metric tons, or 64%, less than in 2003.

Figure 2: Opium Production since 1992 (in metric tons)

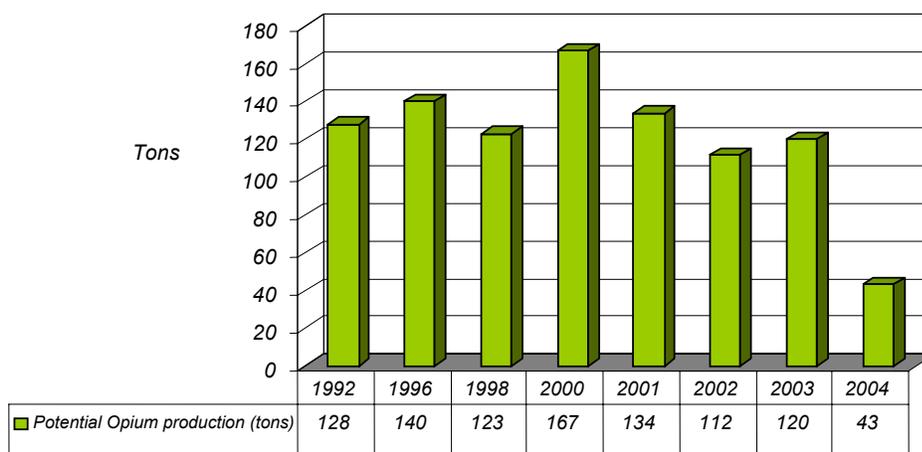


Table 2: Potential Opium Production since 1992 (in metric tons)

	1992	1996	1998	2000	2001	2002	2003	2004
Potential Opium production in tons	128	140	123	167	134	112	120	43

The fields used for the yield estimation measurements, were selected differently in 2004 than in 2003. While last year, opium farmers encountered by surveyors in the villages brought them to their fields, this year the fields were randomly found in the course of a “blind” survey. This approach, while making the samples more representative of average cultivating conditions, greatly reduced the chance of finding opium fields.

Combined with the fact that opium poppy is objectively becoming more rare, this area sampling approach caused a significant reduction in the number of the fields that were measured for yield potential indicators and overall, only 34 fields, for the whole of the survey area in Northern Laos, were actually measured for yield (over 470 in 2003). For this reason, the yield estimate as well can be considered only as an aggregate at national level. The evolution of yield over time (See Table 3) shows a fluctuation that is related to climatic factors.

Table 3: Potential Opium yield since 1992 (in kg/ha)

	1992	1996	1998	2000	2001	2002	2003	2004
Potential Opium yield in kg/ha	6.6	6.4	4.6	8.7	7.2	8	10	6.5

The 2003-2004 season is comparable to the 1992 and 1996 seasons while 2003 was characterized by particularly favorable conditions. For this season the annual monsoon came late and was not of its usual duration or intensity. Temperatures remained quite stable but precipitation experienced a drop of almost 70 % during the critical period of planting and germination (see Table 4). Farmers were able to prepare and germinate their crop but when the window of opportunity came for planting, there was no water, so many seedlings died.

Table 4: Average temperature and precipitation October-December, 1999 – 2003.⁷

Year	Avg. temperature July- December (°C)	Variation from Average (%)	Avg. precipitation July- December (mm)	Variation from Average (%)
1999	24.26	2%	992.0	-40%
2000	25.69	2%	931.5	-18%
2001	23.09	3%	862.0	-33%
2002	19.72	4%	918.5	-6%
2003	26.25	0%	1380.3	-23%
Average	25.21	2%	814.1	-27%

In Map 2 and 3, the July-to-December average temperatures and precipitation, in the 1999–2003 period were compared to the current season. While temperatures remained substantially within norm, precipitation showed a marked decrease in the fall of 2003. The instability of climate caused early crop failure and replanting, all events that impacted negatively on the final yield. This is testified by the fact that the average volume of the capsules shows a reduction of almost 40% while the average cultivation densities are comparable between 2003 and 2004 (See Table 5). Further to this, observation on the moisture conditions of the surveyed fields reported that over 51% of these were “dry” and in a suffering condition.

Table 5: Number of capsules and capsule volume in 2003 and 2004

Year	Avg. number of capsules (per m ²)	Avg. volume (cm ³ /m ²)	Avg. sample yield (kg/ha)
2003	18	193	10
2004	20	119	6.5

The interviews with the farmers revealed that cultivation started during the first 10 days of September 2003, with land preparation that continued well into November and sowing into January 2004. Harvest started, as early as the end of December in the Luang Prabang Province. The crop calendar in Table 6 is the result of 56 observations taken over opium poppy fields in the course of the survey.

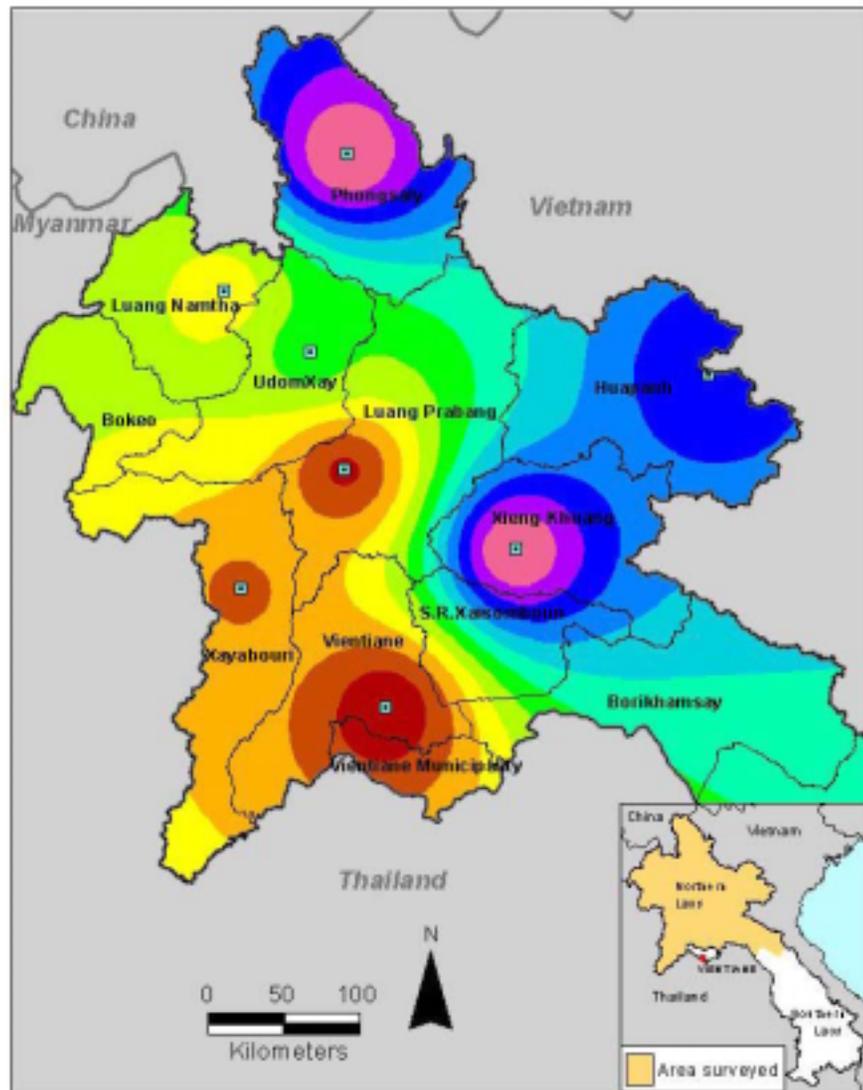
Table 6: Opium poppy calendar of planting for the 2003–2004 season

	Field Preparation		Sowing		Harvest	
	Start date	End date	Start date	End date	Start date	End date
Average	II/Sep/03	III/Sep/03	I/Oct/03	II/Oct/03	I/Feb/04	II/Mar/04

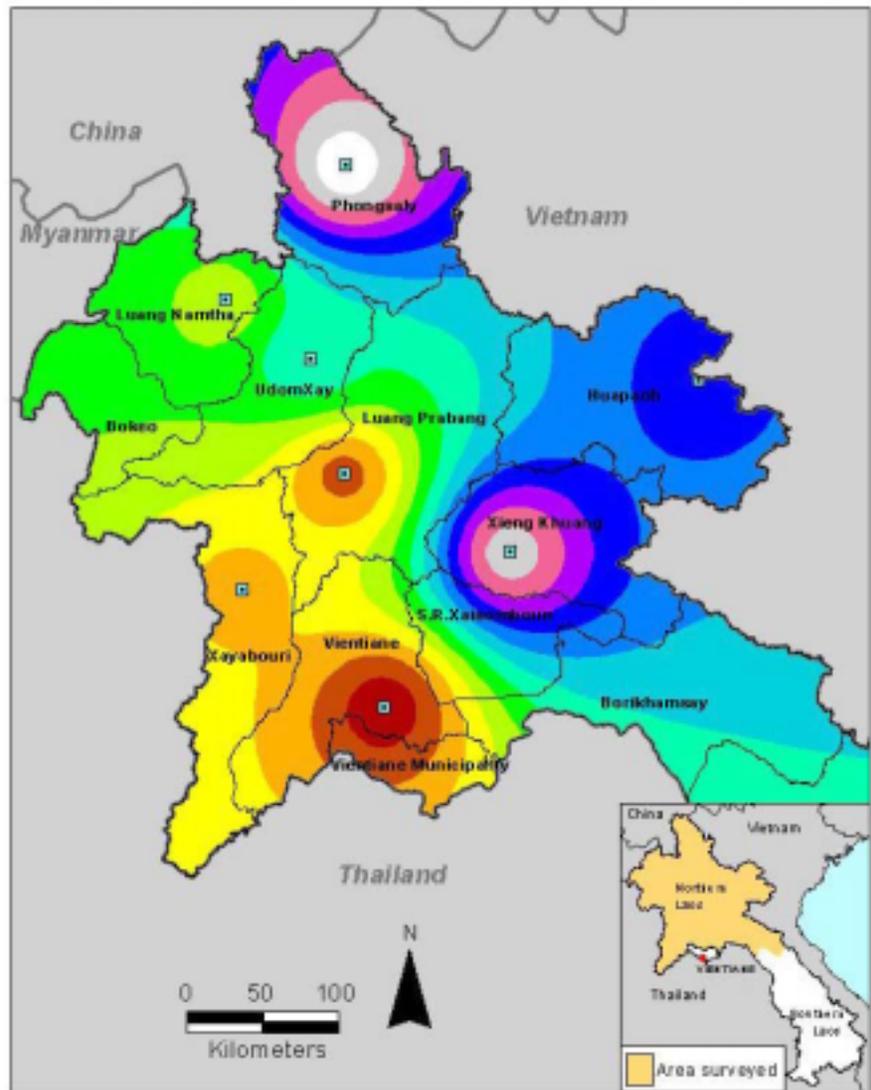
I = first decade (10 days of the month), II = second decade of the month, III = third decade of the month

⁷ Laos National Meteorological Service

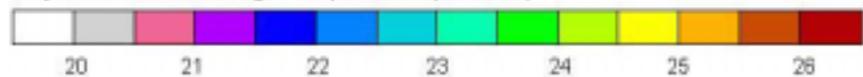
Map 2: July-December average temperatures in 2003 and the 5-year average (1999–2003)



5-year average (1999-2003)



July-December Average Temperature (Celsius)



-  Meteorological Stations
-  International Boundaries
-  Province Boundaries

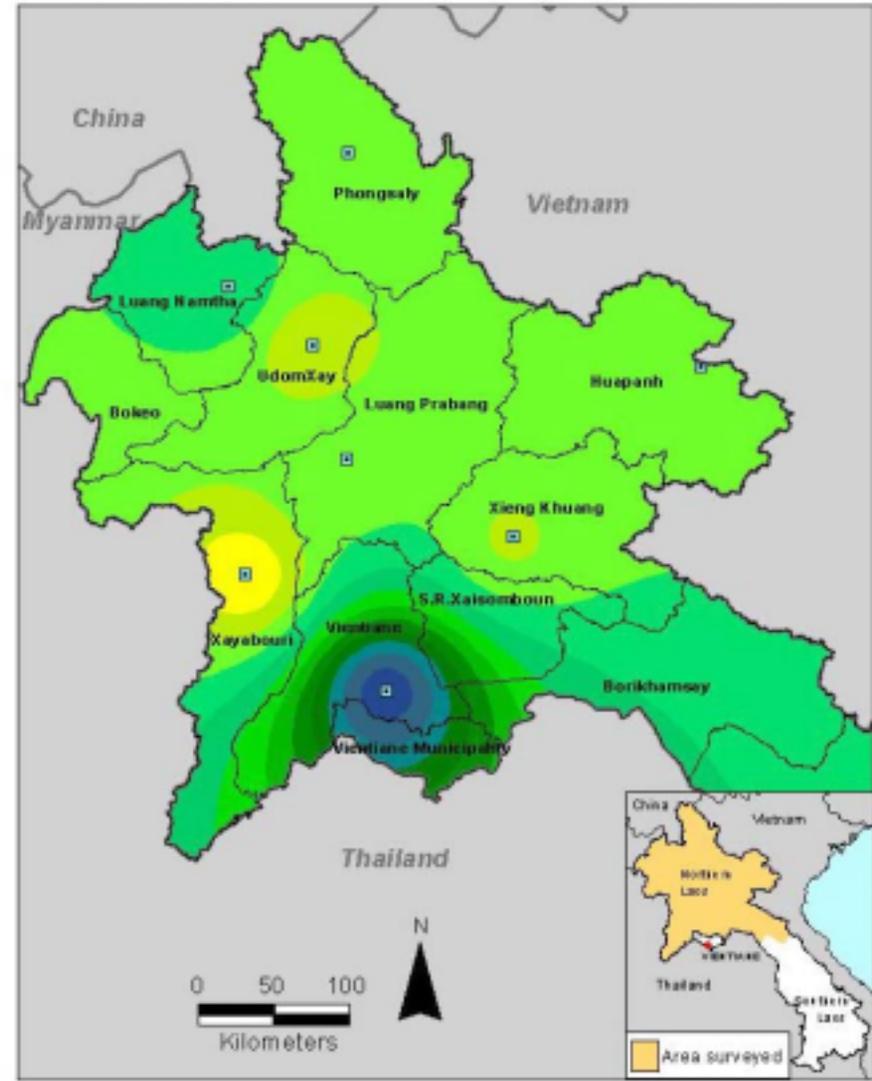
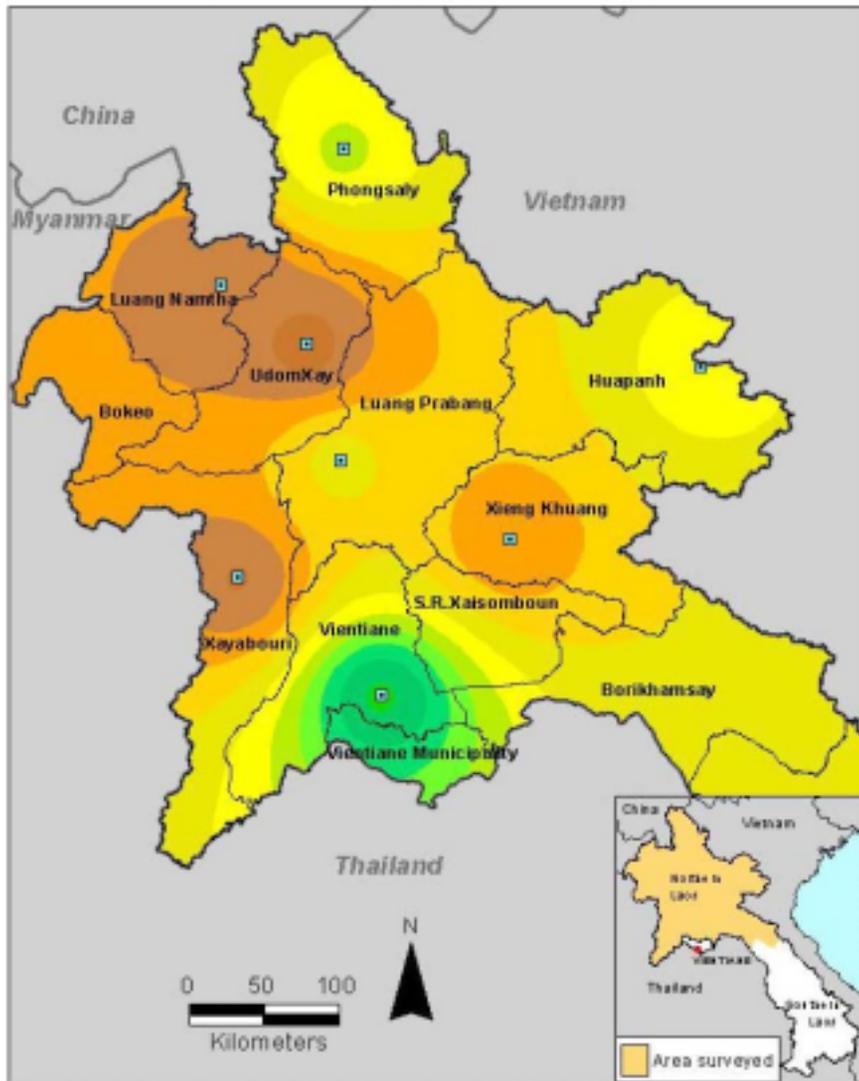
Source: Laos National Meteorological Service

Note: The boundaries and name shown and designations used on this map do not imply official endorsement of acceptance by the United Nations.

Map 3: July-December average precipitation in 2003 and the 5-year average (1999 –2003)

2003

5-year average (1999-2003)



July-December Precipitation (mm)



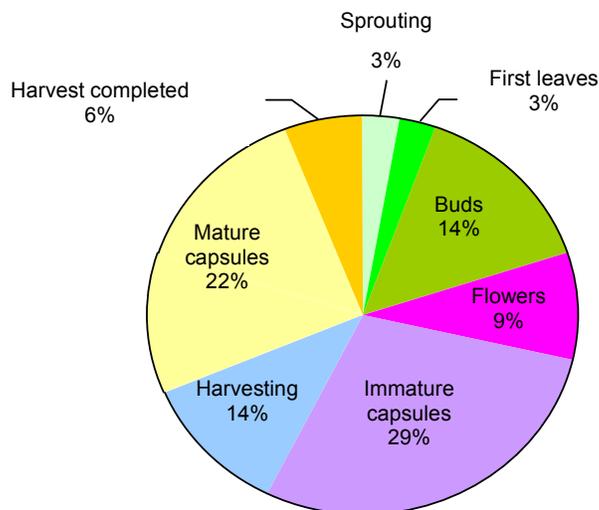
-  Meteorological Stations
-  International Boundaries
-  Province Boundaries

Source: Laos National Meteorological Service

Note: The boundaries and name shown and designations used on this map do not imply official endorsement of acceptance by the United Nations.

The distribution of the development stages observed in the course of the survey is schematically represented in Figure 3. The stages described as “Mature capsules” and “Harvesting” are substantially coinciding, as, in both cases, the capsules are mature. The distinction lies in the opium harvesting activity itself (lancing), which, when observed, was specifically reported as “harvesting phase

Figure 3: Development stage of the opium crop at the moment of the survey



The final phases of maturation (including harvesting) were observed in over 66 % of the fields visited during the survey (II/Jan/04 – III/Mar/04), therefore this proved to be a suited timing to perform yield estimation.

The survey assessed almost everywhere the absence of irrigation and fertilization, and at the same time very little nutrient, pest and water pest stress. The reduced stress levels are in contradiction with a 35.7 % rate of crop damage (See Table 7) and an explanation of this can be that the surveyors were, in most cases, unable to assign a precise cause for the observed damage.

Table 7: Condition of opium poppy fields in 2004

Field condition	No	Yes	No answer
Fertilized	98.2 %	-	1.8 %
Irrigated	92.9 %	3.6 %	3.6 %
Damaged Crop	60.7 %	35.7 %	3.6 %
Pest Disease	83.9 %	1.8 %	14.3 %
Water Stress	85.7 %	-	14.3 %
Nutrient Stress	70.9 %	14.5 %	14.5 %

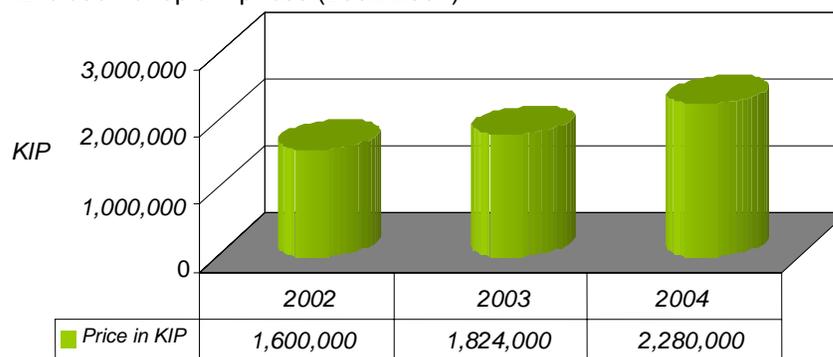
Figure 4: Lanced opium poppy and gum



2.3 Opium Prices and Cash Income

Prices were collected during the village interview campaign and the reference sources were mainly the village headmen and not the farmers directly. Although opium is sold through the year, the collection of information on opium prices at the farm gate was done during and after the harvest cycle. Prices are usually lower during this period because there is a large supply of opium right after the harvest. However, at the time of reporting the information acquired was used as the best estimate for the average prices of the 2003-2004 season.

Figure 5: Evolution of opium prices (2002-2004)



The average price of opium was estimated at 2,280,000 KIP per kilogram, corresponding to US\$ 218, calculated on an average exchange rate of 10,441 KIP per dollar from December 2003 to March 2004. This corresponds to an increase of 25% (+27% in US\$ terms) compared with the farm gate price reported in the 2003 survey⁸.

This increase reflects the scarcity of opium produced during this season. However prices vary across provinces and, according to alternative sources (UNODC AD Project) it reaches peaks of KIP 7,800,000 (US\$ 735) per Kg in Luang Prabang (Chompet Districts) and KIP 5,200,000 (US\$ 500) in Borikhamxay. This seems to confirm a situation of shortage of supply for these provinces, while prices elsewhere, and specifically in Phongsaly and Xieng Khuang, stable on averages of KIP 2,600,000 to 3,900,000 (US\$ 250 to 375), bare witness of availability of the drug.

The bulk of the production (79%) was traded and only 15% used for personal consumption (See Table 8). This last figure shows a marked decrease with respect to the 2003 data, where it was credited for 37% of production. Reduced availability and rising costs may thus be affecting self-consumption.

Table 8: Destination of the opium crop⁹.

Destination of the opium crop	%	Place of Opium Sale	%	Opium Buyers	%
Sold before harvest	23 %	In the village	45%	Middleman	29%
Sold just after harvest	17 %	Other village	42%	Outsider	31%
Sold during the dry season	15 %	Village market	6%	Villagers	40%
Sold during the rainy season	17 %	Town	7%		
Barter	7 %				
For personal use	15 %				
Left over	6 %				

The great majority of opium transactions (97%) were reported to take place within the producing or neighbouring villages. Of these over 70% are conducted among co-villagers or outsiders. Only 29 % went through a middleman.

⁸ KIP 1,600,00 at 10,166 KIP/US\$, at 2002 values

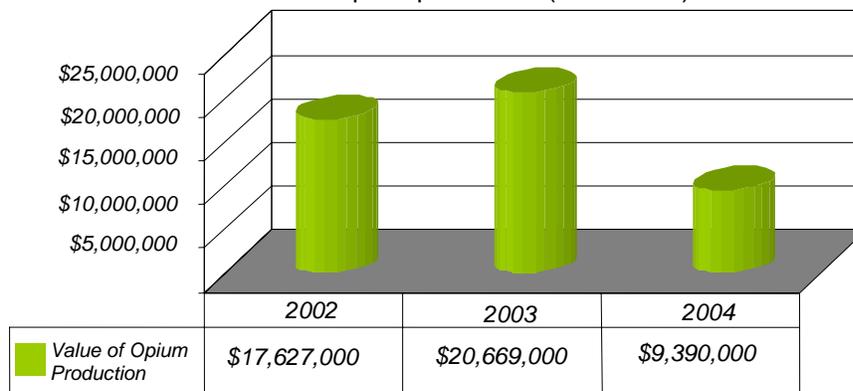
⁹ Place and customers of the sale as reported from the household interviews

The increase in price barely compensated the overall collapse in the total value of opium production from US\$ 23 million to just over US\$ 9 million (-60%). (See Table 9).

Table 9: Evolution of the value of opium production (2002-2004)

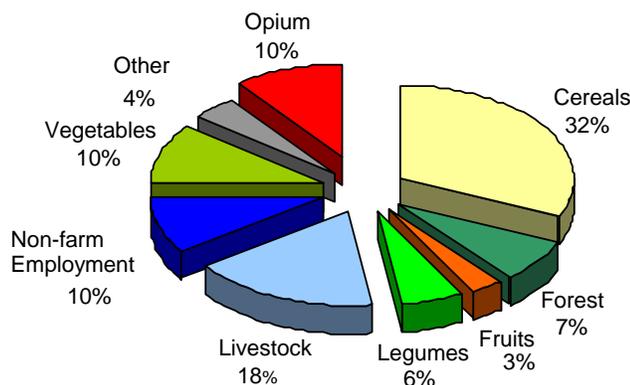
Year	2002	2003	2004
Price per kg of opium (KIP)	1,600,000	1,824,000	2,280,000
KIP/\$ Exchange rate	10,166	10,590	10,441
Price per kg of opium (\$)	\$160	\$172	\$218
Value of Production (\$)	\$17,627,000	\$20,669,000	\$9,390,000
Variation	-	+17%	-55%

Figure 6: Evolution of the value of opium production (2002-2004)



The village and household surveys allowed sketching a picture of the overall rural economy and its links to opium production and trade. The average household income of the villages involved in the survey was 4,410,000 KIP (US\$ 442), with cereal production contributing 32% to this value, followed, in order of importance, by livestock (~18%), external employment (~10%) and opium (~10%).

Figure 7: Average sources of village household income



According to what was reported by the village headmen, in the villages where opium poppy cultivation is present, the overall household income of KIP 3,875,126 (US\$ 371) is 6% lower than that of non-opium-producing villages, KIP 4,137,289 (US\$ 396). These figures reveal that opium is linked to more marginal economic conditions of the opium growing villages. In these villages, apart from the revenues generated by opium, the main differences with non-opium producing villages can be found in a less diversified economy, with cereals contributing 41% and livestock 29% to the income and a much lower relevance of forest produce, fruit, vegetables and non-farm employment.

2.4 Addiction

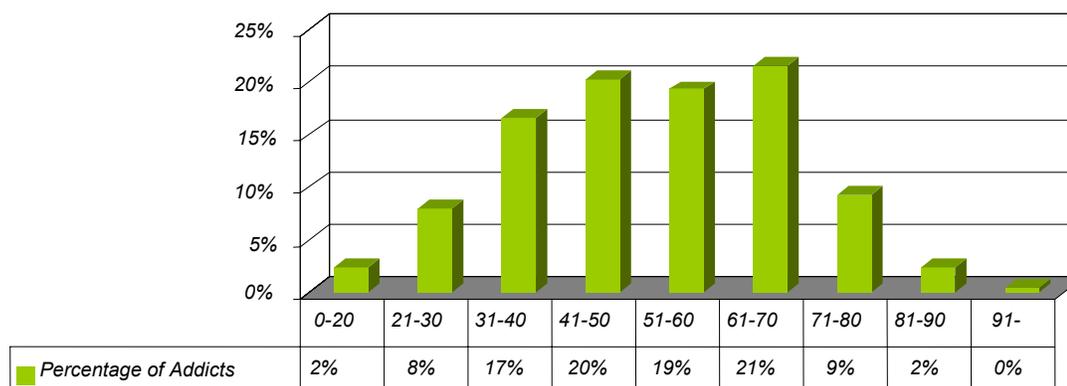
The 2004 opium survey confirmed the main patterns of opium addiction previously found. The data collected (See Table 10) shows that daily opium addiction was present in 60 % of the villages surveyed (237 out of a total of 388 villages). In these villages, the average prevalence rate of addiction amounted to almost 3 % of the population aged 15 and above.

Table 10: Distribution of addiction with the sample

	N.	%
Number of sample villages with addicts	237	61%
Number of sample households with addicts	13775	60%
Female Addicts (>15 years old)	510	0.58%
Male Addicts (>15 years old)	1737	2.00%

The highest proportion of addicts was found for the age groups 41-50 and 61-70 years of age, exceeding 40% of the total number of addicts. Opium smoking addiction is mainly a male phenomenon (2 % among the total male population in the sample, versus 0.6 % among females).

Figure 8: Distribution of Addicts between Age Group



These results should be interpreted with caution, as there might be a reluctance of respondents to report opium addiction in the context of the Government's efforts to curb it. For the geographical distribution of addiction, the official Lao Government statistics data is more complete and shows a higher opium prevalence rate in the Phongsaly Province at 3.2% (See Table 11 and Table 12).

Table 11: Addiction per Province (official Lao Gvt. Data)

Province	Total population	Prevalence		
		Total	Female	Male
Phongsaly	84,800	4.3%	1.1%	3.2%
Luang Namtha	65,500	3.7%	0.8%	2.9%
Bokeo	60,900	3.9%	0.4%	3.6%
OudomXay	113,800	2.4%	0.5%	2.2%
Huaphanh	130,300	2.7%	0.7%	2.1%
Xayaboury	164,700	2.3%	0.5%	1.8%
Luang Prabang	176,300	2.6%	0.4%	2.1%
Xieng Khuang	96,200	1.0%	0.3%	0.7%
Vientiane Province	156,200	0.1%	0.0%	0.1%
Borikhamxay	91,800	1.3%	0.2%	1.2%
Xaisomboom S.R.	24,900	4.6%	1.0%	3.6%
Total	954,200	2.6%	0.5%	2.2%

In Table 12 the same GOL survey shows the relative variation in addiction, with respect to 2003. A major reduction can be observed in the Xayaboury Province. A third of the opium addicts were more than 60 years old.

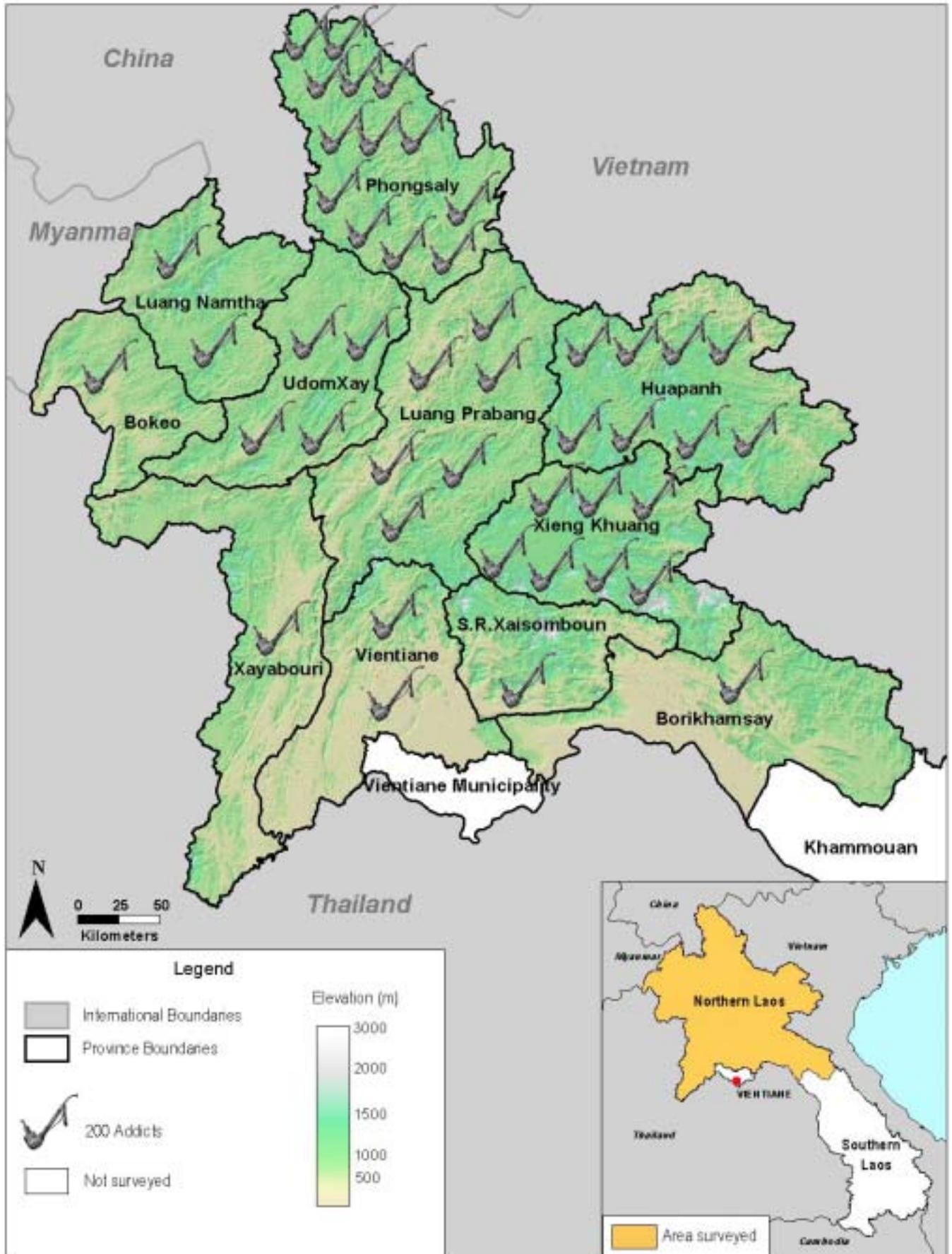
Table 12: Addiction per Province (official Lao Gvt. Data)

Province	Addicts 2003			Addicts 2004			Variation
	Total	>60 years		Total	>60 years		
Phongsaly	5,362	2,564	48%	5,872	2,664	45%	10%
Luang Namtha	2,896	698	24%	2,042	464	23%	-29%
Bokeo	793	201	25%	1,119	202	18%	41%
OudomXay	3,012	810	27%	3,088	826	27%	3%
Huaphanh	5,368	1,655	31%	4,881	1,655	34%	-9%
Xayaboury	1,301	363	28%	385	103	27%	-70%
Luang Prabang	5,513	1,032	19%	5,368	1,104	21%	-3%
Xieng Khuang	3,158	1,596	51%	2,898	1,447	50%	-8%
Vientiane Province	1,356	394	29%	1,342	363	27%	-1%
Borikhamxay	686	183	27%	657	188	29%	-4%
Xaisomboom S.R.	516	215	42%	378	104	28%	-27%
Total	29,961	9,711	32%	28,030	9,120	33%	-6%

It is interesting to observe that 28,000 addicts consuming an average of 1.4 kg of opium per year require some 39 tons of opium. Considering the level of production in 2004 (43 t), these mere fact, means that Laos may soon turn from exporter to importer of opium.

The effects on price, the scarcity of the drug and the persistent pressure for further reduction on the part of the Government will probably give origin to a new form of drug related emergency, also in consideration of the age and social condition of the addicts.

Map 4: Laos Opium Survey 2004: Distribution of addicts



Source: LCDC

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

2.5 Demographics and socio-economics of the sampled population

The campaign of interviews of village headmen and household heads was undertaken to collect reference data, useful in sketching the socio-economic framework in which opium poppy cultivation takes place.

The headmen interviews were aimed at obtaining an overview at village level, then proceeding to a sample of households so as to detail on specific issues such as productive activities, income and expenditures, aiming at detecting possible differences between opium-producing and non-opium-producing households.

As mentioned previously (See chapter. 2.3), the household survey concentrated exclusively on the opium producers that were found only in some of the surveyed provinces (Huaphanh, Luang Prabang, Phongsaly, Xaisomboom S.R., Xayaboury and Xieng Khuang). Table 13 provides a description of the average household composition and the employment distribution.

Table 13: Composition and activities of the Opium Producing Households

Province	Adults	Children (<15 years)	N. of family members working on the farm	N. of family members working outside the farm
Huaphanh	5	4	5	2
Luang Prabang	5	4	4	4
Phongsaly	3	3	3	4
Xaisomboom S.R.	4	4	3	3
Xayaboury	4	3	4	4
Xieng Khuang	5	4	5	3

The overall sample is described in Table 14. A total of 388 villages were visited in 11 provinces, with 23,678 households and a population of over 140,000 people.

Table 14: Demographic composition of the sample

Province	Villages	Households	Population	Avg. population per Village	Ave HH per Village	Children (<15 years)
Bokeo	5	227	1,326	265.2	45	45%
Borikhamxay	5	373	2,209	441.8	75	37%
Huaphanh	89	4,455	29,549	332.0	50	35%
Luang Prabang	41	2,598	16,416	400.2	63	41%
Luang Namtha	48	3,772	14,258	297.1	79	36%
Phongsaly	72	2,828	17,134	237.3	39	46%
OudomXay	53	3,520	22,481	428.1	66	49%
Vientiane Province	3	345	2,272	757.3	115	37%
Xaisomboom S.R.	3	157	1,099	366.3	52	57%
Xayaboury	12	1,076	7,290	607.5	90	46%
Xieng Khuang	57	4,327	26,438	464.1	76	42%
Total	388	23,678	140,472	362.0	61	43%

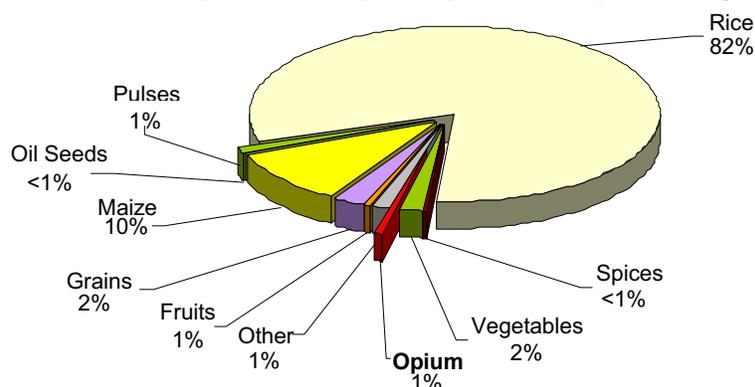
The village headmen interviews provided a picture of the different land use patterns, which obviously vary greatly between provinces due the different environments. The planted area and relative production figures reflect this variability. A word of caution is due on this data as the percentages reported refer exclusively to the sample and may not coincide with the results of larger agricultural surveys conducted by the Lao Government.

Rice is by far the main cultivated crop, with a significant surface covered by ancillary staple crops such as maize and other grains. It is however to be noted the absence of plantations and major industrial crops (See Figure 9).

Table 15: Land use in the sample villages

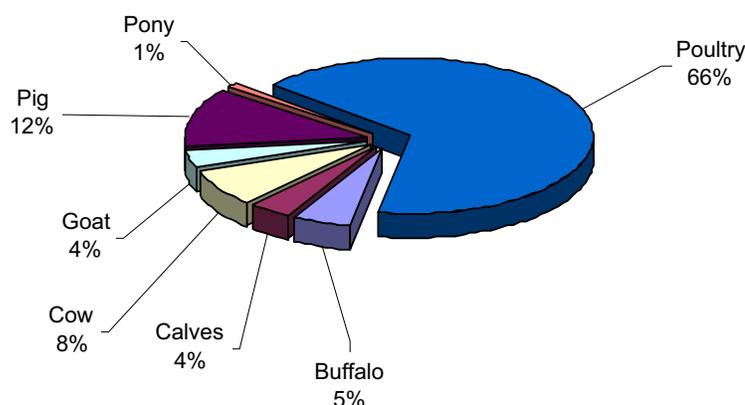
Province	Forest	Fruit trees	Pasture	Permanent Cultivation	Shifting Cultivation	Others
Bokeo	43%	-	-	-	40%	17%
Borikhamxay	70%	-	2%	6%	4%	17%
Huaphanh	59%	1%	4%	9%	17%	10%
Luang Prabang	31%	2%	15%	11%	32%	8%
Luang Namtha	57%	-	3%	20%	16%	2%
Phongsaly	27%	1%	9%	16%	39%	8%
OudomXay	34%	1%	12%	7%	42%	6%
Vientiane Province	18%	14%	15%	44%	7%	2%
Xaisomboom S.R.	16%	-	14%	1%	-	69%
Xayaboury	30%	1%	9%	41%	14%	5%
Xieng Khuang	34%	1%	16%	21%	18%	9%

Figure 9: Distribution of planted area per crop in the sample of villages



The livestock composition (See Figure 10) reflects the characteristics of a subsistence-farming situation, dominated by poultry and with only a little over 4 % of the whole stock going for sale.

Figure 10: Distribution of livestock in the sample of villages



2.6 Voluntary Eradication

The voluntary eradication and public awareness campaign launched by the Lao Government in 2003 continued in 2004. The official figures account for a total of 2,230 ha of opium poppy eradicated and an extra 750 ha that did not reach the harvest stage due to unfavorable climatic conditions. Overall the Lao Government reported that 3556 ha of opium poppy were actually harvested.

The opium survey however was not designed to monitor or validate the results of the eradication campaigns carried out by the Lao Government in parallel to the survey.

3 Methodology

The 2004 opium poppy survey was conducted over an area of 1,039 Km², across 11 provinces of Northern Laos.

Northern Laos covers an area of 150,000 Km²; a little over the size of Bangladesh¹⁰ and it is a mostly mountainous territory with a reduced road network. The size and limited accessibility of this area, coupled with the relative rareness of the target crop, strongly affected the planning and implementation of the sampling campaign, suggesting an integrated approach for the production of an exhaustive estimate by combining field surveys, interviews and the use of satellite remote sensing.

The area planted and production of opium poppy was estimated by integrating the ground survey data with the use of satellite images. The interviews, for their part, were directed at collecting socio-economic information as well as ancillary data on opium farm gate prices, addiction and on agricultural practices related to opium poppy cultivation.

3.1 Organization and Staff

The survey was initiated, supervised and implemented by the Lao National Commission for Drug Control and Supervision (LCDC) through the Programme Facilitation Unit (PFU) and UNODC (Illicit Crop Monitoring Programme).

120 surveyors from January 15, to March 30 2004 carried out the survey campaigns. They were organized in 47 field teams plus 11 supervisory teams, each team comprising 2 surveyors. These were all involved in interviews to village headmen and heads of household as well as field measurements. The survey was conducted on a sample of 388 villages and 559 field sites (segments).

The UNODC Illicit Crop Monitoring Programme provided technical support and international supervision of the fieldwork, throughout the survey. The surveyors, divided in two groups, received a training course respectively in Vientiane from January 15 to 18 and in Oudomxay from, January 21 to 23. The training covered interview techniques, description of the survey process, description of the questionnaire, and the use of GPS, field measurement techniques, poppy capsule measurement techniques and the procedure for the selection of households. A day and a half of field practice followed the theoretical part of the training.

The course was completed with the distribution to participants of the map of the respective target areas and of the GPS instruments. The Vientiane group received integration training on January 30 and 31 to supplement for last minute modifications applied to the field survey procedures.

The operational survey started on January 28 in the Huaphanh Province for the Oudomxay trainees, while the Vientiane trainees were in the field by February 1 in the Borikhamxay, Province

DEA officials participated as observers in this year's opium yield survey, accompanying teams in Xieng Khuang and Luang Prabang provinces during survey's initial phases.

By February 23 the supervision teams met for a first reporting session to assess the progress of the survey. On that occasion, the survey teams coordinated with a US Government team performing its opium yield survey. Following this meeting, a quality control campaign on the data collected was initiated and run between February 26 and March 6. A second reporting meeting with supervisors was held on March 8, leading to the completion of the survey, which wrapped up within the last week of March.

¹⁰ 138,0000 SqKm

3.2 Sampling procedure

Planning the sample survey started with the establishment of a stratification map. This document has the scope of optimising the sampling process by focusing on where the survey could have the highest probabilities of finding the crop.

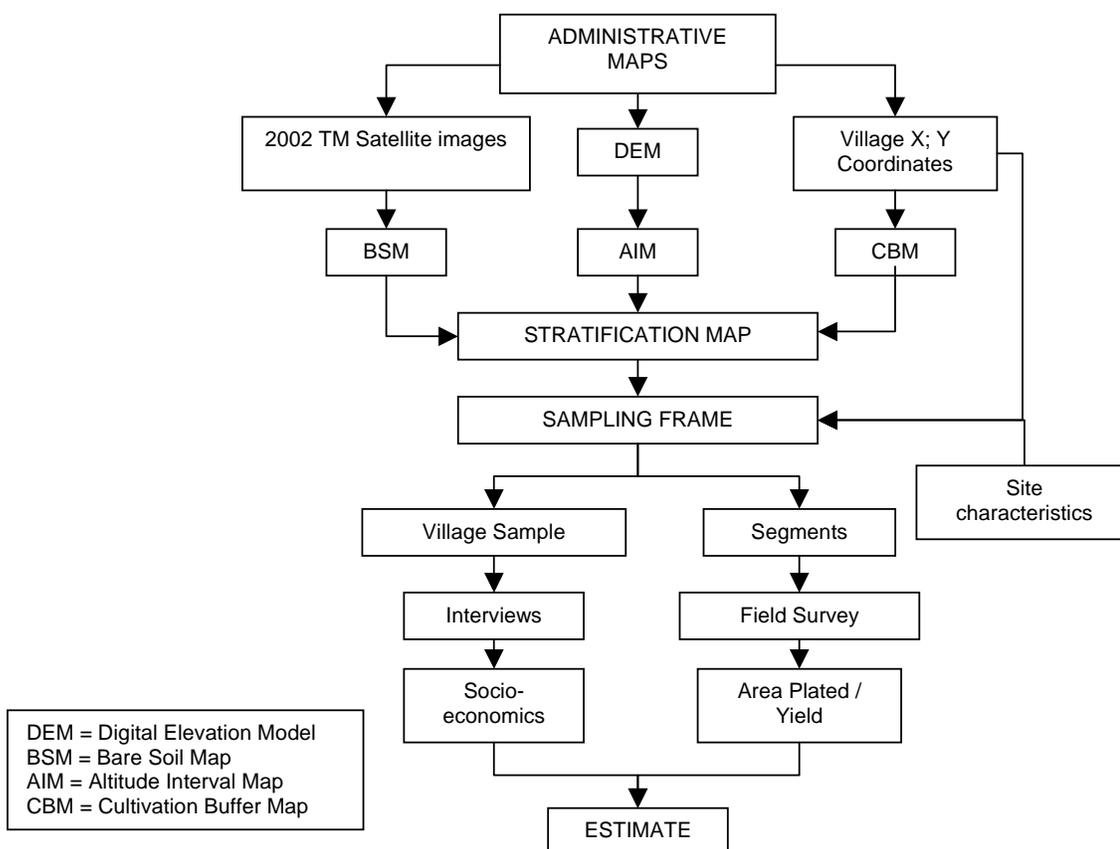
Within this stratification map, a “sampling frame” was defined, by segmenting the area into sub-units that make up the population among which the sample is selected.

In the 2004 Laos Opium Poppy Survey there were 2 types of samples:

- The field sites that were quantitatively described in order to collect data for the area planted and yield estimation. These were made up of a grid of 3*3 points of observation, 66 m apart, set on a square portion of land of 200 * 200 m (0.04 Km²) in size.
- The villages where the interviews took place.

The stratification map became a sampling frame for the field sites simply by griddling it into segments of 200*200m. The villages are identified by longitude and latitude coordinates and are consequently points on the stratification map positioned on a portion of territory shaped by a buffer, of 5 km in radius, around the point itself (see following chapter for details)

Figure 11: Flow chart of the methodology



The Sampling Frame

The sampling frame is essentially a map that summarizes all the criteria that help optimise the sampling process and at the same time leads to the definition of the size and nature of the sample itself.

The construction of a sampling frame starts with the pooling of all possible criteria that can contribute to focus on the area where the best result can be achieved with the minimum survey effort. Given the nature of the opium survey these criteria have to be in the form of maps.

The following maps provided the criteria for the definition of stratification:

- ## **Bare Soil Map (BSM)**: This map identifies all those surfaces¹¹ that are ploughed and bare in autumn and are consequently potentially destined to opium poppy growing as few other crops require land preparation in that season. The source information was the satellite image coverage of Laos provided by Landsat TM7 in the period October-November 2002¹². Though not synchronous with the current season, last year's data was still considered reliable, providing an indication of the areas of potential opium cultivation.
- ## **Altitude Interval Map (AIM)**: This map identifies the average environmental conditions of poppy cultivation in South East Asia, ranging between 700 and 1800 m of altitude.
- ## **Cultivation Buffer Map (CBM)**: This map identifies circular areas, with a radius of 5 Km, around each village. These buffers can be considered areas where the highest concentration of opium poppy cultivation is to be found. The radius was considered as a maximum threshold distance, corresponding, on average, to 4, up to 6 walking hours from the village itself, for peasants to be able to take care of their crops in very tormented territory as that of Northern Laos. Over the 5 Km limit, the possibility to find opium fields is theoretically much lower. For the Xieng Khuang Province, where very few village locations were available, a buffer limit of 8 km radius was used.
- ## **Administrative Boundaries Map (ABM)**: This map provided the boundaries of the provincial administrations.

These maps were overlaid one over the other in a GIS, to identify an area where all the criteria overlap. The sampling frame for the 2004 opium poppy survey can be thus defined as:

"That area of bare soil, within the 700–1800 m altitude range, in a radius of 5 km (8 km in the Xieng Khuang Province) from all the villages of the 11 provinces of Northern Laos"

The provinces where the survey took place cover an area of 150,000 Km². The potential area for opium poppy cultivation established through the sampling frame, covers around 7% of this, for a total of 10,532.5 Km². All the villages that did not have any BSM or AIM surfaces within their buffer radius were excluded from the sampling frame.

The sample villages, identified by a latitude and longitude coordinates, were selected among the ones that were left in the sampling frame and the sample survey sites, (squares surfaces of 200 by 200), were randomly selected within the buffers of the previously selected villages.

Determination of number of sample villages

The number of village samples was calculated as a function of an estimated work capacity of 48 teams over 2 months, considering the actual conditions of transport between villages and

¹¹ At the resolution provided by the satellite sensor

¹² Processed according to a Principal Component Analysis

accessibility of the survey sites. The sample so calculated totalled 450 (of which only 388 actually surveyed).

Each village has an assigned code and the selection of the sample was systematic within the list of codes, ordered sequentially. The selection interval was determined by dividing the total number of villages by the target sample size (450 villages). A number of controls¹³ were applied in order to avoid clumping of the samples.

Determination of the number of sites to be surveyed

The characteristics of each field sample segment (a 200*200 m square containing a grid of 9 points of measurement) were determined beforehand as a function of practical survey criteria. The number of such survey sites was determined starting from the definition of the amount of territory to be surveyed so that it would satisfy the requirements of a sample (target confidence level and target relative error). This area would then be broken down in units having the size and characteristics of segments and distributed randomly within the sampling frame.

The size of the sample has been calculated considering a possible opium poppy planted area (in consideration of the 2003 estimate) ranging between 10,000 and 20,000 ha. The planted area was calculated using the following formulas:

$$n | S_n / 0.04$$

Where: n = Number of samples
 S_n = Sample surface (in Km²)
 0.04 = Area of a single sample site

$$P | \frac{S_{Ops}}{S_{St}}$$

Where: P = Ratio between opium planted surface¹⁴ and surface.
 S_{Ops} = Surface planted to opium poppy in 2003
 S_{St} = Surface of the stratum

$$S_n | \left(\frac{z}{c} \right)^2 * \frac{14 P}{P}$$

Where: z = Target confidence level
 c = Target relative error

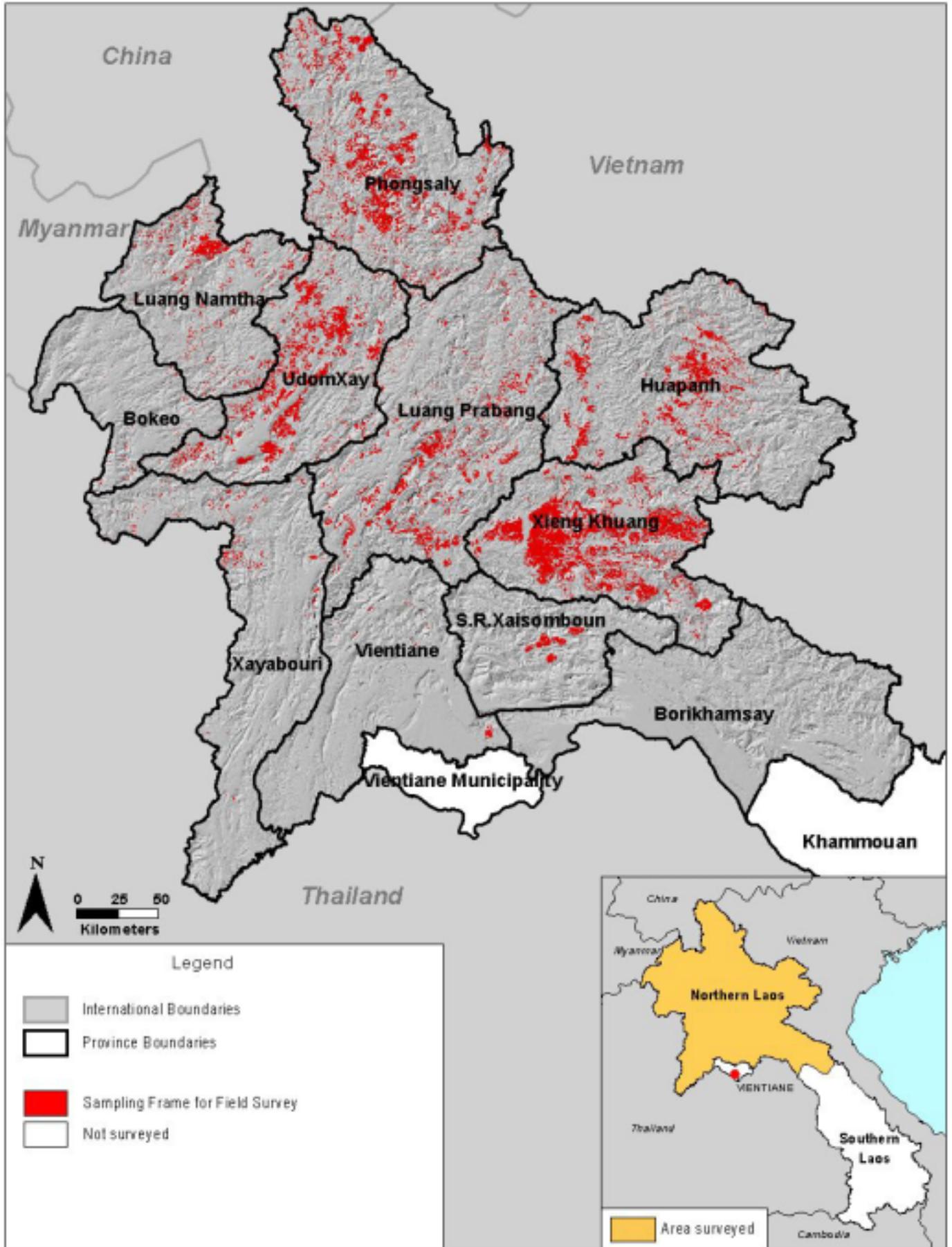
Notations: Ops = Opium planted surface; St = stratum

The result of this calculation called for a sample of 1124 segments. This target amount was reduced to comply with the logistic constraints of the survey and only the segments falling within the buffer boundaries of the selected villages were actually surveyed. The final sample size was 649 segments of which 448 actually surveyed.

¹³ No adjacency between samples

¹⁴ 2003 estimate

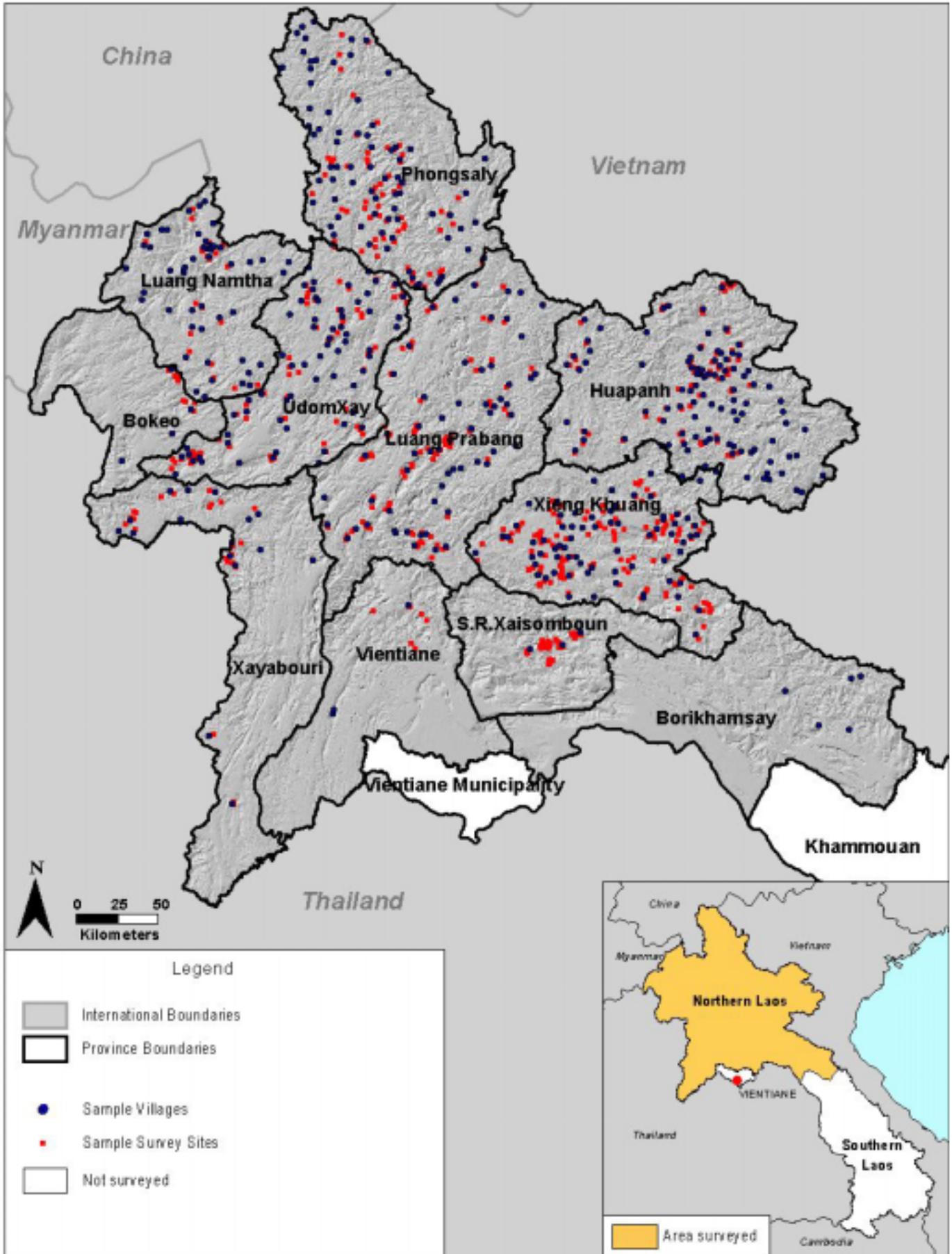
Map 5: Laos Opium Survey 2004: Stratification area for the sample survey



Source: LCDC - UNODC Laos Opium Survey 2004

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

Map 6: Laos Opium Survey 2004: Sample villages and fields



Source: LCDC - UNODC Laos Opium Survey 2004

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

3.3 Survey procedure

Data was collected by means of interviews with key informants and by physical measurement of the opium fields. The survey was conducted by field teams, which had the task of filling up all the contents of a questionnaire following a standardized interview protocol made of 3 parts:

- # Village head man/key informants interview,
- # Household head/key informants interview
- # Site/Individual field measurement questionnaire

Surveyors were equipped with GPS instruments and maps to record the geographic location of the villages and of the field sites. For the Village interview, the survey teams reached the target using both the coordinates of the location, the coding system and the information provided by the topographic maps.

Village head man /key informants interview

Once reached the village, the headman was identified and approached. The interview started after the necessary introductions to explain the purposes of the survey and homaging. The main purpose of the village headman interview was to obtain first hand information on the village demography and socio-economics, ethnical composition, land tenure, distribution the number of households growing opium poppy and on addiction by gender and age. This information was then used to crosscheck or complement the data provided by the district authorities.

Household /key informants interview

After the headman the survey team proceeded with the selection of a variable number of households to interview, chosen among opium producers, if present, function of the size of the villages. The number of households was determined as follow: The households to interview were limited to a maximum of 12 per village, so that the surveyors would not spend more than one or two days within the same village.

Table 16: Number of households to interviews

N. of opium producing households in the village	From:	1	11	21	31	41	51	61	71	81	91
	To	10	20	30	40	50	60	70	80	90	100
Number of households to interview		3	6	9	12						

The household head was questioned regarding the composition of the family and the various economic milestones. Surveyors collected data on property, cash income and expenditures, the costs associated with opium poppy cultivation and information on the opium poppy cultivation calendar and opium sale practices.

Field Measurement

For the site survey the team utilized a GPS instrument to navigate to the target. They were also provided with navigation maps derived from the 2002 Landsat TM coverage of Laos. The site is made of 9 points placed on a grid of 3*3 points, spaced 66 m from each other. The main measurements were the identification of the land cover class and the estimation of the percentage cover of the class, on each single point. The various land use classes are listed in Table 17.

Table 17: Survey legend

(1) Forest	(5) Cultivated Land	(9) Maize	(13) Chinese Pea
(2) Pasture/Grassland	(6) Shifting Cultivation	(10) Opium	(14) Buildings
(3) Barren Soil	(7) Paddy	(11) Sugarcane	(15) Water bodies
(4) Ploughed	(8) Wheat	(12) Vegetable	(16) Other

Any peculiarity was noted including the non-accessibility of the survey point or parts of it. If an opium poppy field was present on the site, besides the percentage coverage estimation, its presence was reported by placing a sequential number on its relative position over the

scheme provided on the questionnaire. The GPS position of the field was also reported. If there was more than one field, all were reported with a sequential number and position. For each survey site where the presence of opium poppy was assessed, the surveyors proceeded with the collection of the yield estimation data.

Yield estimation measurements

A transect was laid randomly in the field and 5 plots of one square meter selected along it. From each plot the number of flowers, immature capsules and mature capsules were recorded, as well as the diameter and height of up to 10 opium poppy capsules. A set of data on the opium poppy agricultural practices and physiological conditions was also collected at this stage. When the opium fields were mature, i.e. when the plants were ready for harvest or being harvested, the surveyors also measured the capsule diameter and height.

3.4 Data capturing and storing

Following the survey, all the compiled questionnaires were collected and brought back to the UNODC field office in Vientiane. Once there, all the forms were reviewed for possible inconsistencies and then entered into a consolidated database. Data entry took place from March 17 to April 15, 2004. The database was designed to process data reports concerning socio-economic, opium cultivation and population data. It was structured for easy data recovery and consultation.

3.5 Estimating procedure

The estimation of the planted surface utilized the information collected during the field survey. The expansion area for the segment survey was limited to the sampling frame, and it does not consider possible opium poppy fields present over the 5 km limit (8 km for the Xieng Khuang Province) of the buffer area surrounding the villages. The estimator runs at national level using the following formulas:

$$O_{ps} = \bar{X} * S$$

Where: O_{ps} = Opium poppy planted surface
 \bar{X} = Average opium poppy surface (%)
 S = Surface of the expansion area

$$\bar{X} = \bar{x} * \frac{\sum_{i=1}^n a_i}{N}$$

Where: \bar{x} = Average opium poppy surface per sample grid (%)
 N = Total number of grids
 n = Total number of sample grids

$$S_{\bar{x}} = \bar{x} \pm 2s_{\bar{x}}$$

$$s_{\bar{x}} = \sqrt{\frac{1}{N^2} (N-1) \frac{s^2}{n}}$$

95 % Confidence level of the estimation:

Where: $S_{\bar{x}}$ = Standard error for the sample
 a_i = Poppy percent in grid i
 s^2 = Variance of Sample measurements

Notations: i = grid id.

Table 18: Estimation Variables

Variables	Values
Expansion area (BSM + AIM + CBM)	1,038,727.6 ha
N	5,901
N	2,369,816
Sampling ratio	0.25 %
Total poppy % in the sample	3,090
Average % poppy in Grids	0.52 %
Variance	41.22
Standard Deviation	6.42
Alfa	0.05
Confidence Level	95 %
Estimation (Ha)	5,439
Upper Limit (Ha)	6,610
Lower Limit (Ha)	4268.14
Upper Limit (%)	21.5%
Lower Limit (%)	-21.5%

Yield Estimation

Yield estimates were calculated for each square metre-plot, based on the following formula:

$$Y = 1.89 + 0.0412 * VC$$

Where: Y = Dry gum weight (kg/ha)
VC = Projected mature capsule volume per square metre (cm³/m²)

The estimate was then averaged at field level and finally at national level. Opium gum yield for Laos in 2004 was calculated using a linear correlation between capsule volume per one square metre (cm³/m²) and oven dry gum yield (kg/ha)

Yields at field level are simple averages of the figures for individual square-metre plots (five per field). From the average field yield, the field production was calculated. The sum of the sampled fields production divided by the sum of the sampled fields areas gave the sample national yield. Practical field procedures used to collect data (number, and height and diameter of poppy capsules) and to estimate opium gum yield are based on the "Guidelines for Yield Assessment of Opium Gum and Coca Leaf from Brief Field Visits"¹⁵ prepared by UNODC. The guidelines provide for practical field procedures and for options to calculate yield from capsule volume using different formulae.

¹⁵ ST/NAR/33, United Nations, New York, 2001.

3.6 Remote Sensing Component

Scope of the remote sensing component of the survey was to supplement the estimate from the ground survey for all the possible opium poppy cultivation taking place outside the boundaries of the stratification map and the relative sample. The possible options for the supply of satellite images were quite limited but the SPOT5 satellite provided a valid solution. The sensor, mounted on this French satellite, provides the best compromise between coverage and resolution (10 m) and images are acquired from the SPOT ASIA receiving station in Singapore.

Figure 12: Example of a SPOT 5 satellite image

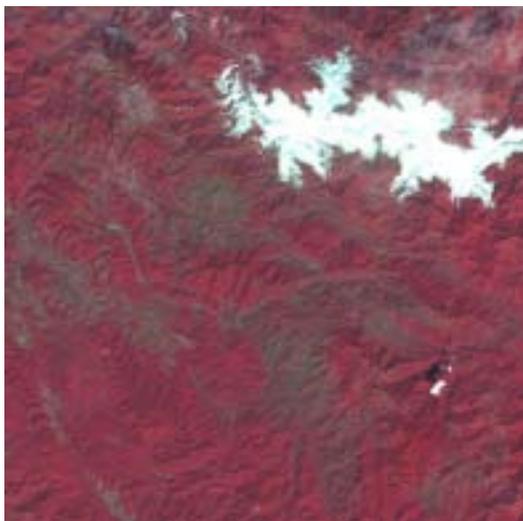


Image selection

The decision was taken to acquire as many images as possible given the available budget and selecting them randomly among the ones that were available for the period of interest (January-February 2004)

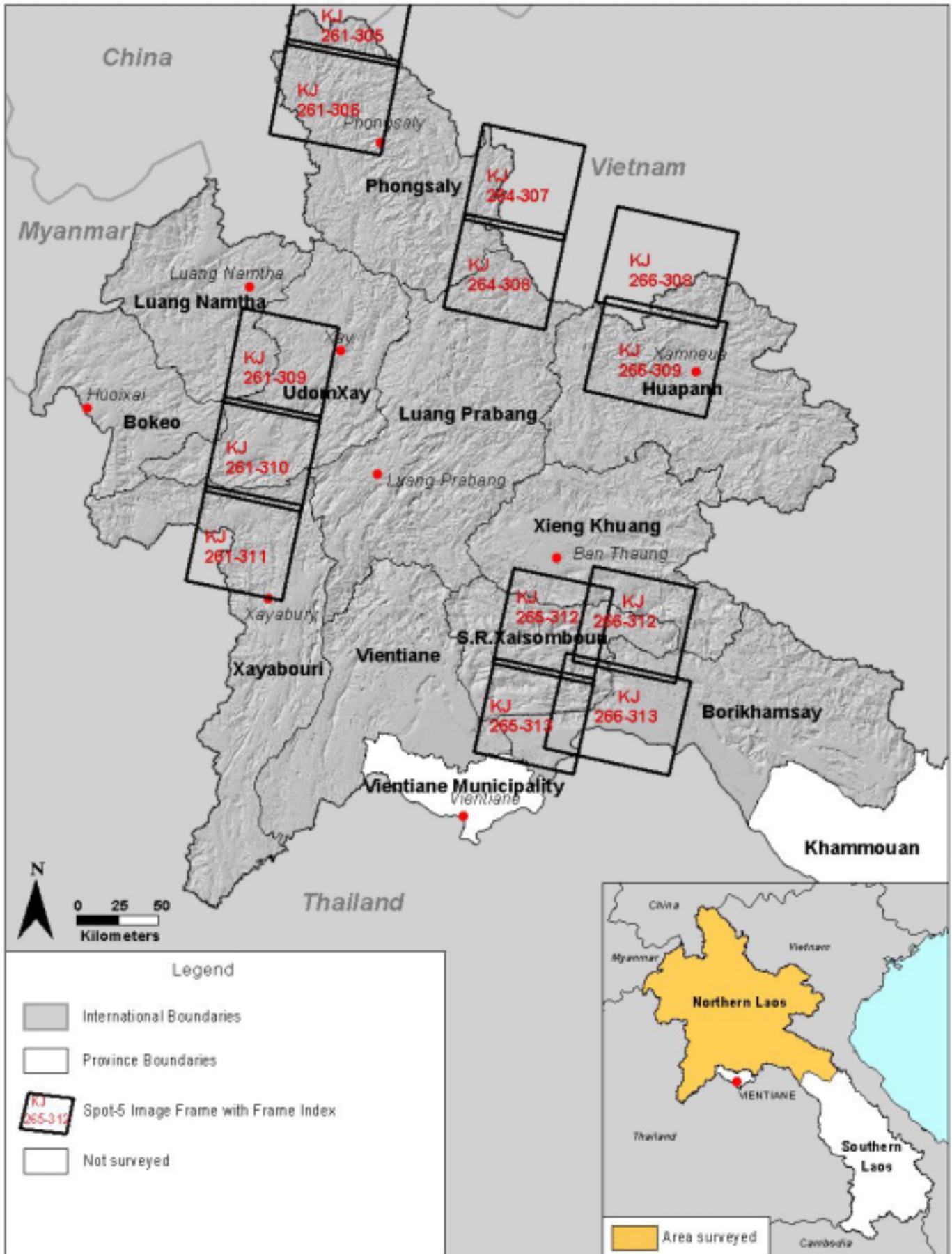
The result of the selection is reported in Table 19 and Map 7.

Table 19: SPOT 5 images acquired for the 2004 Laos opium survey

Trek	Frame	Acquisition date	Latitude ¹⁶	Longitude ¹⁵
261	305	01/17/04	22.51667	102.03333
261	306	01/17/04	22.02000	101.93000
261	309	01/01/04	20.52000	101.58000
261	310	01/01/04	20.02000	101.47000
261	311	01/01/04	19.02000	101.22000
264	307	01/11/04	21.52000	103.05000
264	308	01/11/04	21.01667	102.91667
265	312	01/06/04	19.02000	103.15000
265	313	01/06/04	18.51667	103.03333
266	308	12/21/03	21.01667	103.86667
266	309	01/16/04	20.51667	103.80000
266	312	12/11/03	19.01667	103.63333
266	313	12/11/03	18.51667	103.50000

¹⁶ Decimal degrees, UTM 47

Map 7: Laos Opium Survey 2004: SPOT5 Coverage



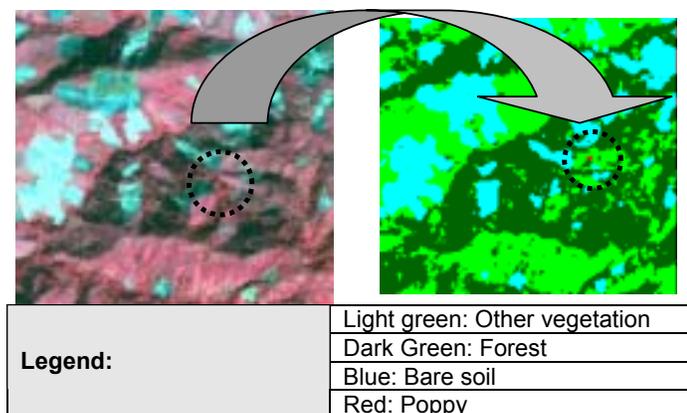
Source: UNODC Laos Opium Survey 2004

Note: The boundaries and names shown and the designations used on this map do not imply official endorsement of acceptance by the United Nations

Image classification

Each image was classified separately utilizing the information gathered on the survey sites and specifically those sites in which poppy cultivation, in a vegetative stage that would make them distinguishable, was reported. Since the position of the poppy fields was recorded, it was possible to trace them on the geo-referenced images and use the spectral signature as training base for the classification. Mainly 5 classes were targeted for classification: opium poppy, bare soil, other vegetation, forest and cloud. Ground truth data was however very limited and therefore it was not possible to make an accuracy assessment of the classifications.

Figure 13: Classified image



Estimation

The poppy fields classified from the satellite images and filtered with a 3x3 majority filter. They were then converted to vector form and the resulting polygons overlaid to the portion of the stratification map intersecting the frames of the images. This operation allowed separating the poppy classified outside and inside the sampling frame for each image and run a proportional estimation for the whole area of interest, according to the following formula:

$$p_o = p_{sat} / a_o$$

Where: p_o = Percent of opium poppy surface outside the stratification
 p_{sat} = Classified poppy area outside the stratification (ha)
 a_o = Surface of the image frame outside the stratification

$$P_o = p_o * A_o$$

Where: P_o = Surface of opium poppy outside the stratification
 A_o = Surface of territory outside the stratification (expansion area)

Table 20: Estimation parameters

Parameter		Value
Total Area covered by satellite images (ha)		3,172,931
Total Area covered by satellite images outside the stratification (ha)	a_o	2,861,665
Classified poppy area outside the stratification (ha)	p_{sat}	410
Percent opium poppy surface outside the stratification (%)	p_o	0.01%
Expansion area (ha)	A_o	8,193,364
Estimated poppy area outside stratification (ha)	P_o	1174

The result of the satellite estimation was 1174 ha outside the areas of the ground survey.

Map 8: Northern Laos



Source: LCDC - UNODC Laos Opium Survey 2004

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