UNITED NATIONS
Office on Drugs and Crime

Government of Afghanistan
Counter Narcotics Directorate

AFGHANISTAN

Opium Survey 2003

October 2003

Abbreviations

ICMP	UNODC global Illicit Crop Monitoring Programme
UNODC	United Nations Office on Drugs and Crime
GPS	Global Positioning System
CND	Afghanistan's Counter Narcotics Directorate

Acknowledgements

The following individuals contributed to the implementation of the 2003 opium survey in Afghanistan, and to the preparation of the present report:

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This report, and other ICMP survey reports can be downloaded from :
www.unodc.org/unodc/en/crop_monitoring.html

PREFACE

The United Nations *Office on Drugs and Crime* has conducted annual opium poppy surveys in Afghanistan since 1994. The present Survey, which is no doubt evidence that things are changing in Afghanistan, is the first one done jointly with the national government.

The Survey shows that in 2003 Afghanistan again produced three-quarters of the world's illicit opium. While this is disheartening, the preconditions for change are slowly being put in place. The recently adopted National Drug Control Strategy, for example, foresees rural development and law enforcement initiatives. Similarly, the new drug control law aims to counter opium trafficking and money laundering, reduce abuse and enhance international cooperation. Important progress, albeit slow, is also being made in areas of governance with an indirect bearing on the drug issue -- for example, the constitutional process and the related establishment of a modern administration.

The experience of several countries in Asia and Latin America demonstrates that the dismantling of a drug economy can be a long and complex process, lasting a generation, or even longer. A generation is a long time. This prompts the question -- can Afghanistan, with its democratisation threatened by old terrorists and new drug barons; neighbouring countries, affected by drug addiction, an HIV/AIDS pandemic, corruption and violence; and the international community, with its 10 million people addicted to Afghan opiates – afford to wait that long?

This Survey shows that in 2003 the income of Afghan opium farmers and traffickers was about $2.3 billion, a sum equivalent to half the legitimate GDP of the country. Out of this drug chest, some provincial administrators and military commanders take a considerable share: the more they get used to this, the less likely it becomes that they will respect the law, be loyal to Kabul and support the legal economy. Terrorists take a cut as well: the longer this happens, the greater the threat to security within the country and on its borders.

There is a palpable risk that Afghanistan will again turn into a failed state, this time in the hands of drug cartels and narco-terrorists -- a risk referred to more than once by President Karzai, whom I salute for his courage and dedication.

The country is at a crossroads: either (i) energetic interdiction measures are taken now, and supported by the international community; or (ii) the drug cancer in Afghanistan will keep spreading and metastasise into corruption, violence and terrorism – within and beyond the country's borders.

The present Survey shows that in the drug business of Afghanistan the risk/reward balance is skewed: enormous sums of money are being made with impunity. This must be redressed, by increasing the risk of illegality. Energetic measures are needed to repress the traffickers, dismantle the heroin labs, and destroy the terrorists' and warlords' stake in the opium economy -- thus enabling the legitimate economy and the constitutional process to move forward. Neighbouring countries face the task of supporting these actions with measures of their own.

Yet, law enforcement alone cannot suffice. The United Nations *Office on Drugs and Crime* calls on the international community for adequate resources to help rebuild the economy of Afghanistan where far too many people still have no food security, no electricity, no running water, no roads, no schools and no health services.

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

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Fact sheet

Opium poppy cultivation

- *80,000 ha in 2003 against 74,000 ha in 2002 (8% increase)*
- *Cultivation spreading to new areas : 28 provinces affected in 2003 (out of 32)*
- *Cultivation less intensive in some of the traditional areas (49% decline in Hilmand, 23% decline in Kandahar, but 55% increase in Badhakshan from 2002 to 2003)*
- *Opium poppy covers 1% of total arable land and less than 3% of irrigated arable land*

Opium production

- *3,600 mt in 2003 against 3,400 mt in 2002 (6% increase)*

Opium farmers

- *Number of opium farmers increasing (264,000 opium-growing families in 2003)*
- *Total of 1.7 million people (7% of Afghanistan population of 24 million)*

Income

- *Prices declined by 19% from US$ 350 per kg in 2002 to US$ 283 per kg in 2003*
- *Average income per opium-growing family US$ 3,900 in 2003*
- *Total farm-gate income from opium US$ 1.02 billion (US$ 1.2 billion in 2002)*
- *2003 farmers' opium income equivalent to 23% of 2002 GDP (estimated at US$ 4.4 billion)*
- *Average opium income per capita for opium-growing population: US$ 594 (three times larger than estimated 2002 GDP per capita)*
- *Estimated opium traffickers income in Afghanistan: at least US$ 1.3 billion in 2003*
- *Farmers + traffickers opium income in Afghanistan equivalent to more than 50% of estimated GDP*
- *Estimated annual turn-over of international trade in Afghan opiates: US$ 30 billion (more than half a million people involved)*

Survey Methodology

- *Sampling approach combining analysis of satellite images and extensive field work*
- *Data collected on cultivation, production, prices and number of farmers.*

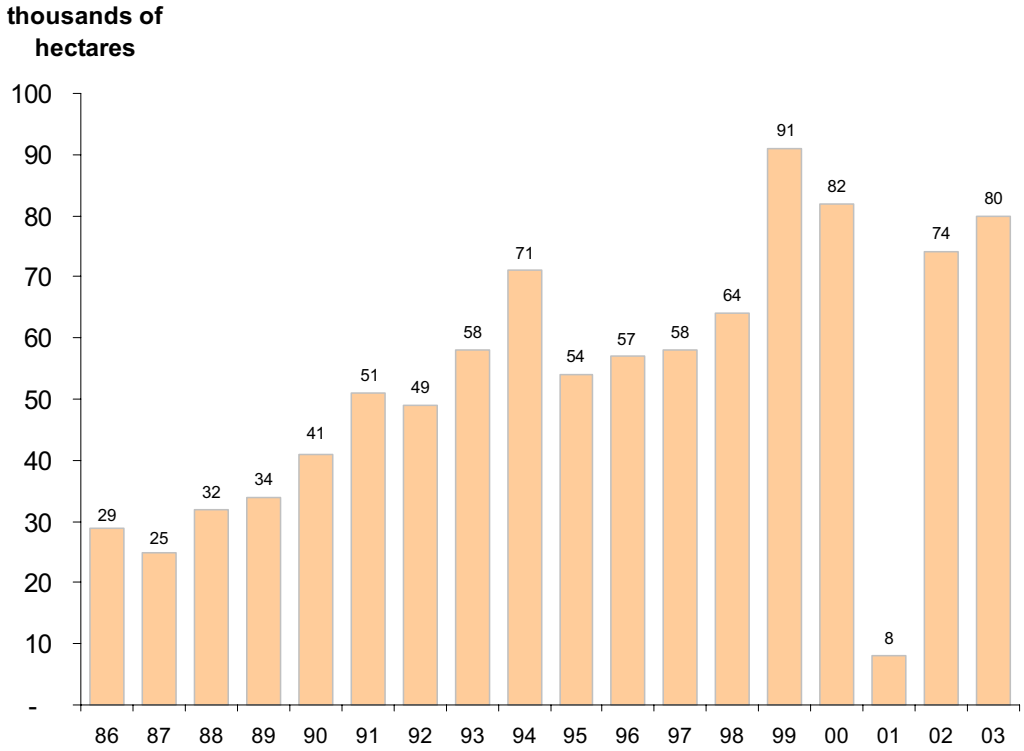
A. Background

During the second half of the 1990s Afghanistan became the world's largest source of illicit opium and its derivative, heroin. In recent years, the country has produced more than 3,000 metric tons of illicit opium annually (over 2/3 of the world's production). About 10 million people (2/3 of opiate abusers in the world) now consume opiates of Afghan origin. Among the most affected societies are Afghanistan's neighbouring countries, Russia and Europe. Heroin injecting is also fuelling the HIV/AIDS epidemic in Central Asia, Russia and Eastern Europe. Along the trafficking chain from Afghanistan to Europe, it is estimated that more than half a million people are involved in the international trade of illicit Afghan opiates, which generates a total turn-over of about US$ 30 billion annually.

In 2001, following the ban imposed by the former Taliban regime, an abrupt decline of illicit opium poppy cultivation interrupted a two-decade increase. It also stimulated a subsequent 10-fold increase in opium prices. After the fall of that regime, cultivation resumed at a high level in 2002 and started to spread outside the traditional areas. Although a new ban was issued in January 2002, poor compliance with the law has so far hindered efforts by the new government to curb opium cultivation – an activity further stimulated by its high revenue.

The United Nations *Office on Drugs and Crime* has conducted the Afghanistan Opium Survey annually since 1994. This year, the Survey was done jointly with the Government of Afghanistan with financial contributions from the United Kingdom, Finland and Italy.

AFGHANISTAN: OPIUM POPPY CULTIVATION FROM 1986 TO 2003



B. Findings

(1) Opium poppy cultivation (hectares) is spreading

In 2003 the total area under opium poppy cultivation in Afghanistan increased by 8%, from 74,000 hectares in 2002 to 80,000 hectares this year[1]. The 2003 harvest area is comparable with the one recorded in 2000 (82,000 ha), prior to the steep decline of 2001. The current level ranks third in the country's recent history.

Afghanistan Opium Poppy Cultivation from 1994 to 2003 (ha, rounded)

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
71,000	54,000	57,000	58,000	64,000	91,000	82,000	8,000	74,000	80,000

It is estimated that the area under opium poppy cultivation covered about 1% of the total arable land and slightly less than 3% of the irrigated arable land in Afghanistan in 2003. Those percentages are of course significantly higher in the opium growing areas (on average 10% of the arable land in opium growing districts, and up to more than 50% in particular cases).

(2) Opium production (metric tons) is also increasing

Potential opium production amounted to 3,600 tons in 2003, an increase of 6% compared to last year's 3,400 tons. The 2003 harvest is the second highest recorded so far in Afghanistan.

Afghanistan opium production from 1994 to 2003 (in metric tons)

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
3,416	2,335	2,248	2,804	2,693	4,565	3,276	185	3,400	3,600

(3) Geographical spread has reached 28 provinces (out of 32)

There has been a clear and accelerating extension of opium cultivation to previously unaffected, or marginally affected areas. The number of provinces where opium poppy cultivation was reported has steadily increased: from 18 provinces in 1999, to 23 in 2000, up to 24 in 2002 and to a staggering 28 provinces in 2003 (out of a total of 32). Almost 90 % of the provinces are now affected, with an increase of over 50% in 4 years. In those 28 provinces, opium poppy was cultivated for the first time this year in 31 districts. Taken together, these newly cultivated districts accounted for about 8,000 ha, or 10% of the country's total harvest area in 2003.

However, important decreases also took place in selected provinces where the severity of the earlier opium problem was reduced, especially in the southern part of the country. A large decline was recorded in the provinces of Hilmand (-49%) and Kandahar (-23%), caused by government prohibition/eradication measures. These declines were only partly offset by a 40% increase in Uruzgan, which is also in the South. In the East, Nangharar, now the first ranking province, remained relatively stable (-4%). In the North East, close to the border with Tajikistan, Badhakshan recorded yet another major increase (+55%).

As a result, while the first five ranking provinces accounted for 95% of opium poppy cultivation in 2002, their share was reduced to 72% in 2003. The province of Ghor (central

[1] The results had a margin of error of +/- 7% in 2002, and +/- 10% in 2003 (the margin of error may vary from year to year, depending on sample size, classification accuracy, etc…).

Afghanistan), where no cultivation was reported prior to 2002, has now displaced Kandahar as the fifth largest cultivating province.

Largest opium poppy cultivating provinces in 2003

Provinces	2002	2003	one year change	% of total in 2003	Cumulative % in 2003
Nangarhar	19,780	18,904	- 4%	23%	23%
Hilmand	29,950	15,371	- 49%	19%	43%
Badakhshan	8,250	12,756	+ 55%	16%	58%
Uruzgan	5,100	7,143	+ 40%	9%	67%
Ghor	2,200	3,782	+ 72%	5%	72%
Kandahar	3,970	3,055	- 23%	4%	76%
Rest of the country	4,850	19,471	+ 301%	24%	100%
Rounded Total	74,000	80,000	+ 8%		

(3) Opium prices are declining, though still high

Although about ten times higher than during the 1990s, when it was around US$ 30 per kg, the average price of fresh opium recorded in 2003 (US$ 283 per kg) decreased by 19% from last year's price of US$ 350. The decline of 2003 opium prices in Afghanistan, larger than the production increase, has resulted in a reduction in the related income to farmers (-15%, as shown below).

(4) 264,000 families now grow opium poppy

In line with the extension of opium poppy cultivation to new areas, the number of opium farmers appears to be growing. For the first time the United Nations *Office on Drugs and Crime* has collected data to estimate the number of families producing opium in Afghanistan. The result amounts to 264,000 families, cultivating an average of 0.3 hectare of opium poppy per family (this is slightly more than one *jerib*, the local unit of land measurement). Considering that the average family consists of 6-7 people (about 5 children per family), it can thus be estimated that opium poppy cultivation plays a direct role in the livelihood of about 1.7 million rural people, or about 7% of the total population of Afghanistan (about 24 million in 2003).

The people engaged in trading opium at bazaars, or in refining it into heroin in clandestine laboratories, and running the trafficking up to the country's external borders are not included in this estimate.

(5) Country's opium income is down 15%

Despite the higher output, the aggregate value of this year's Afghan opium harvest (at farm-gate prices) declined to US$ 1.02 billion, compared to US$ 1.2 billion in 2002 (-15%). Almost 80% of this farmers' income was generated in the traditional opium producing areas of the Eastern and Southern regions.

Afghanistan's GDP in 2002 was estimated at US$ 4.4 billion by the Asian Development Bank. Despite the increase in production, lower opium prices have translated into a lower income from opium than last year, which is now equivalent to 23 % of the 2002 GDP (against 27 % for last year's production[2]).

[2] In UNODC study *The Opium Economy in Afghanistan*, last year's production was cited as 19% of the 2002 GDP estimate. Updated GDP estimates have since become available and were used in this report. The previous GDP estimate would have resulted in the following percentages: 19% for 2002, and 16% for 2003.

These estimates do not include the profits subsequently made by traffickers who collect the fresh opium from farms and local bazaars, partly process it into heroin (a growing trend), and then transfer the lot to border areas for export. In the UNODC study *The Opium Economy in Afghanistan*, the yearly income accruing to traffickers in Afghanistan was estimated at US$ 1.3 billion. Opium and heroin prices in the neighbouring countries have not declined in 2003. The income accruing to traffickers in Afghanistan this year should thus be at least as high as in 2002. If this amount was added to the farmers' income, the total potential income produced by opium-related activities (farming + trafficking) in Afghanistan this year would be equivalent to more than half of the country's GDP in 2002. Obviously these estimates do not take into account any possible multiplier effect of the narco-income.

(6) Per capita income from opium is several times GDP per capita

The 2003 harvest represents, on average, a potential income of about US$ 3,900 per opium-growing family. This average masks regional disparities, ranging from US$ 1,700 in the North to US$ 6,800 in the South. The potential opium income per capita for the 1.7 million people composing those farmers' families ranges from US$ 259 in the North to more than US$ 1,000 in the South, with an average of US$ 594. In comparison, on the basis of a population estimated at 24 million and a GDP estimated at US$ 4.4 billion, Afghanistan had a GDP per capita of about US$ 184 in 2002. This number is less than one-third the average income per capita earned by farmers' families from opium in 2003.

C. Methodology

This Survey's methodology was based on a sampling approach, which combined the analysis of satellite images and extensive field visits. The Rapid Assessment Survey conducted in February, prior to the launch of the main annual Opium Survey, helped to identify target districts reported to be growing opium poppy for the first time in 2003. These districts were then included in the 2003 Opium Survey.

Satellite images, in combination with ground information, offer a reliable and objective way of estimating opium poppy cultivation, independent of field security conditions. Medium-resolution Landsat 7 images were used to derive the extent of agricultural land in those areas in 2003. More than 80 high-resolution IKONOS satellite images were used, together with hundreds of field coordinates collected with GPS on the ground, over a sample of 89,200 ha of agricultural land (or 15% of the total agricultural land in these areas) to identify opium poppy fields.

At the same time, a sample of 1,800 villages was also surveyed throughout the country to collect opium yield and socio-economic data. In 973 villages of this sample, data were also collected on the extent of opium poppy cultivation for districts not covered by satellite images. In total, 61 UNODC field surveyors visited 179 districts of 28 provinces. Their work was verified by international supervisors who visited the fields and participated in data collection and validation.

Data on yield were collected for both irrigated and rain-fed poppy cultivation through interviews with 3,714 farmers. Between April and August 2003, the surveyors obtained data on the price of fresh opium from 2,769 farmers and data on the price of dry opium from 3,612 farmers. In addition, since November 2002, prices for fresh and dry opium have been collected every other week in the provinces of Nangarhar, Hilmand and Kandahar. The sample of persons interviewed was much smaller than during the April-August survey, but provided a more continuous monitoring of opium market conditions in Afghanistan.

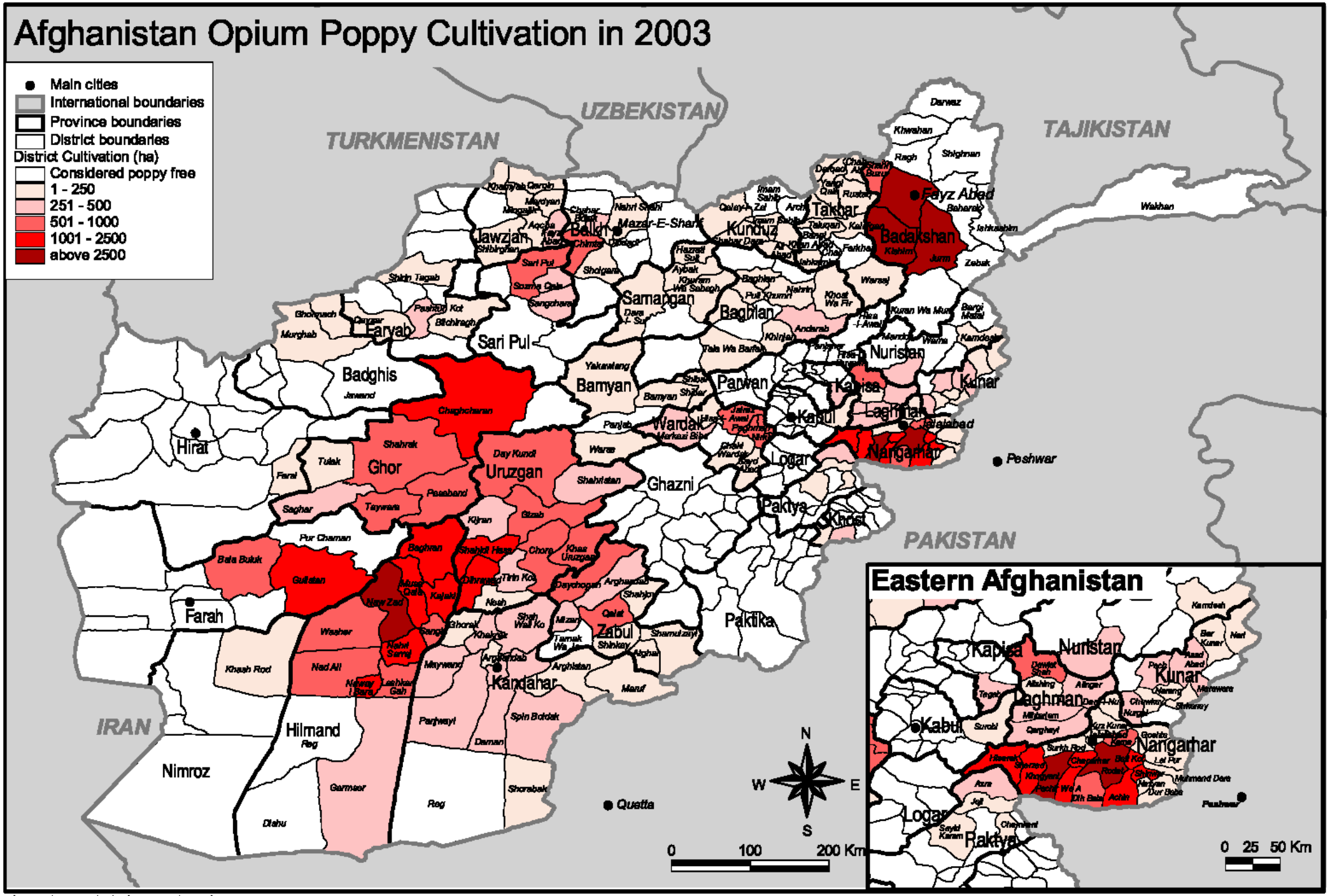
Eradication activities were conducted by the Afghan authorities in a number of provinces. The impact was particularly noticeable in the provinces of Hilmand and Kandahar.

The Afghan authorities reported a total of 21,430 ha eradicated. The present survey neither monitored, nor assessed the effectiveness of the eradication campaign, but the timing of the survey and the methodology employed ensure that the results presented in this report are post-eradication and reflect the net amount of opium poppy which was harvestable.

Conclusion

The results of the 2003 survey confirm that opium poppy cultivation and production continued to increase, though moderately, in Afghanistan. Their extension to previously unaffected, or marginally affected, areas is worrying. It can partly be explained by the persistence of high opium prices, which stimulate an activity now involving 264,000 rural families (representing 1.7 million people, or 7% of Afghanistan's population). These families derive a potential income from opium that amounts to about US$ 1.02 billion in 2003. Although it is down 15% from last year, that income is still equivalent to almost one fifth of the country's legitimate GDP. Taking into account the additional profits made by traffickers, the Afghan authorities must grapple, in their efforts to rebuild the country, with an illicit opium economy that generates revenues about half the size of the legitimate GDP. Even if forecasts of rapid growth of the legal economy materialize, the huge revenues generated by the illicit opium economy will continue to compromise governance of the country.

The Afghan Government has developed a drug control strategy to tackle the formidable task of dismantling the drug economy. Achieving that objective requires the implementation, under adverse conditions, of a complex and well balanced set of measures. They must increase the risk of illegality, unknot the intricate web of warlords and traffickers' relations and remove the pressure they exert on local communities, while creating a socioeconomic environment that offers a way of life to rural households that reconciles the need to secure bare necessities with a sense of civic responsibility. Reaching these goals demands an effort on the part of Afghan society that is unlikely to be sustained unless the international community demonstrates an equal determination to support it.



Source: CND - UNODC Afghanistan Opium Survey 2003
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
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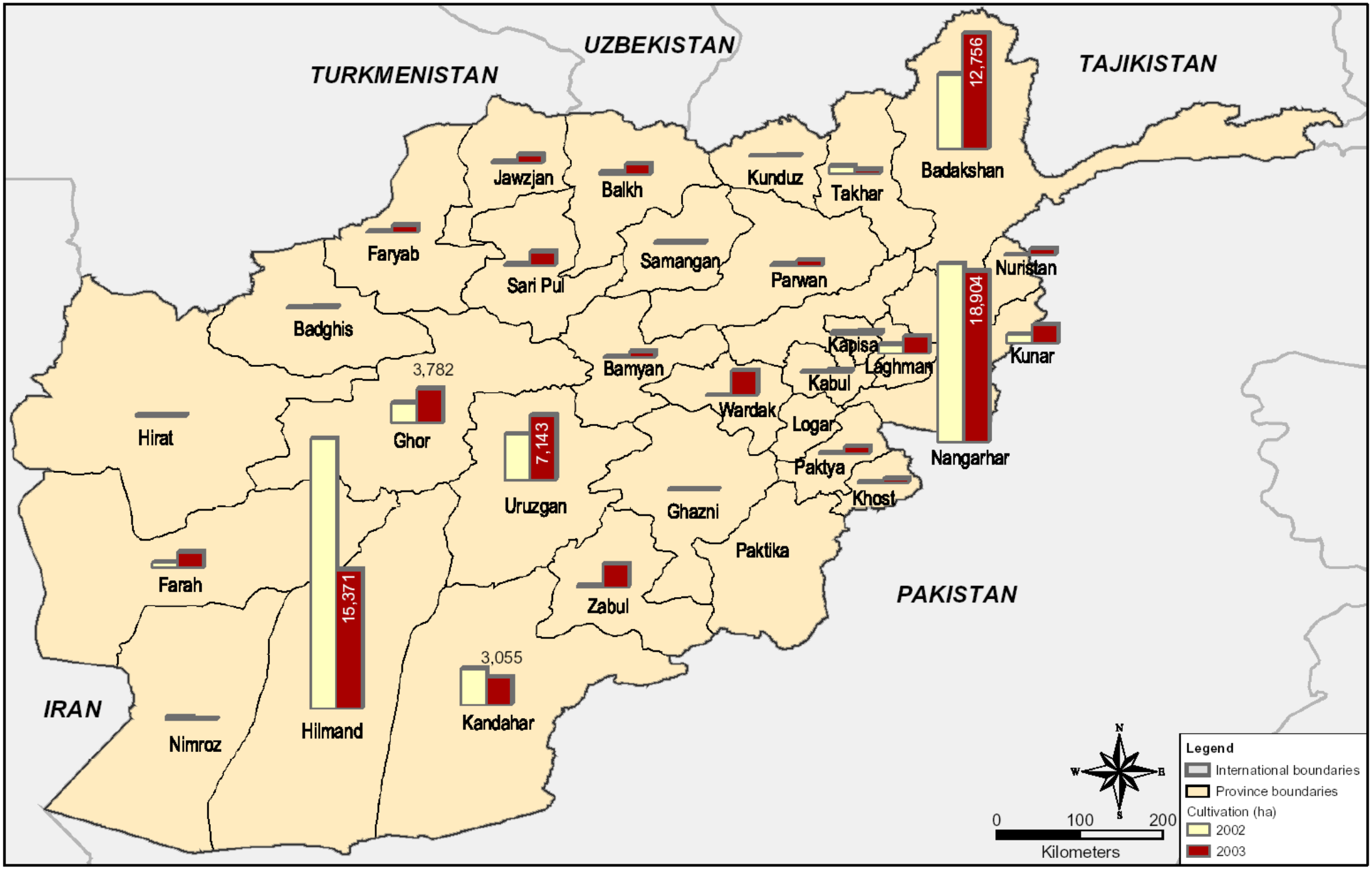
Afghanistan Opium Poppy Cultivation by province 2002-2003



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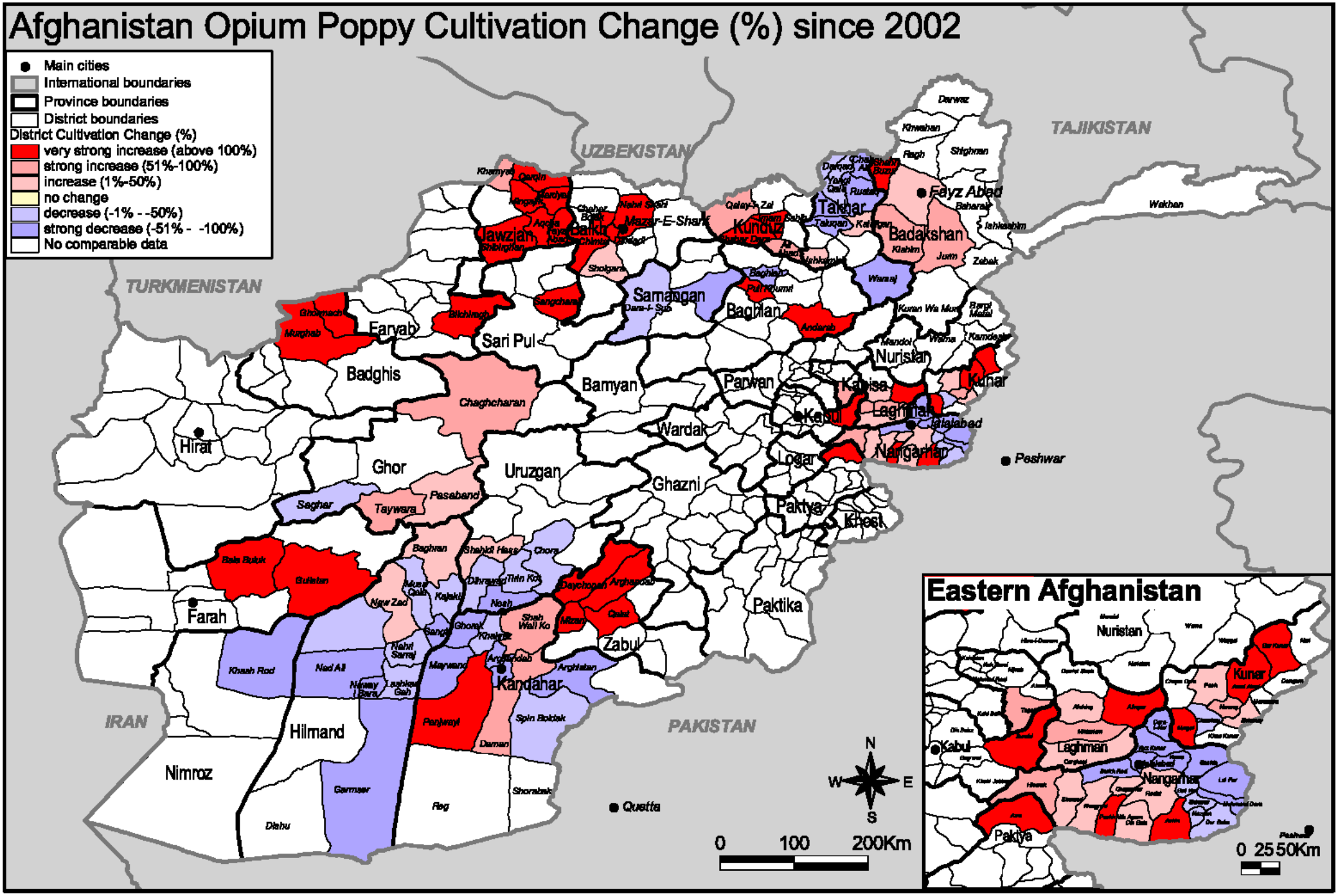
Afghanistan Opium Poppy Cultivation Change (%) since 2002



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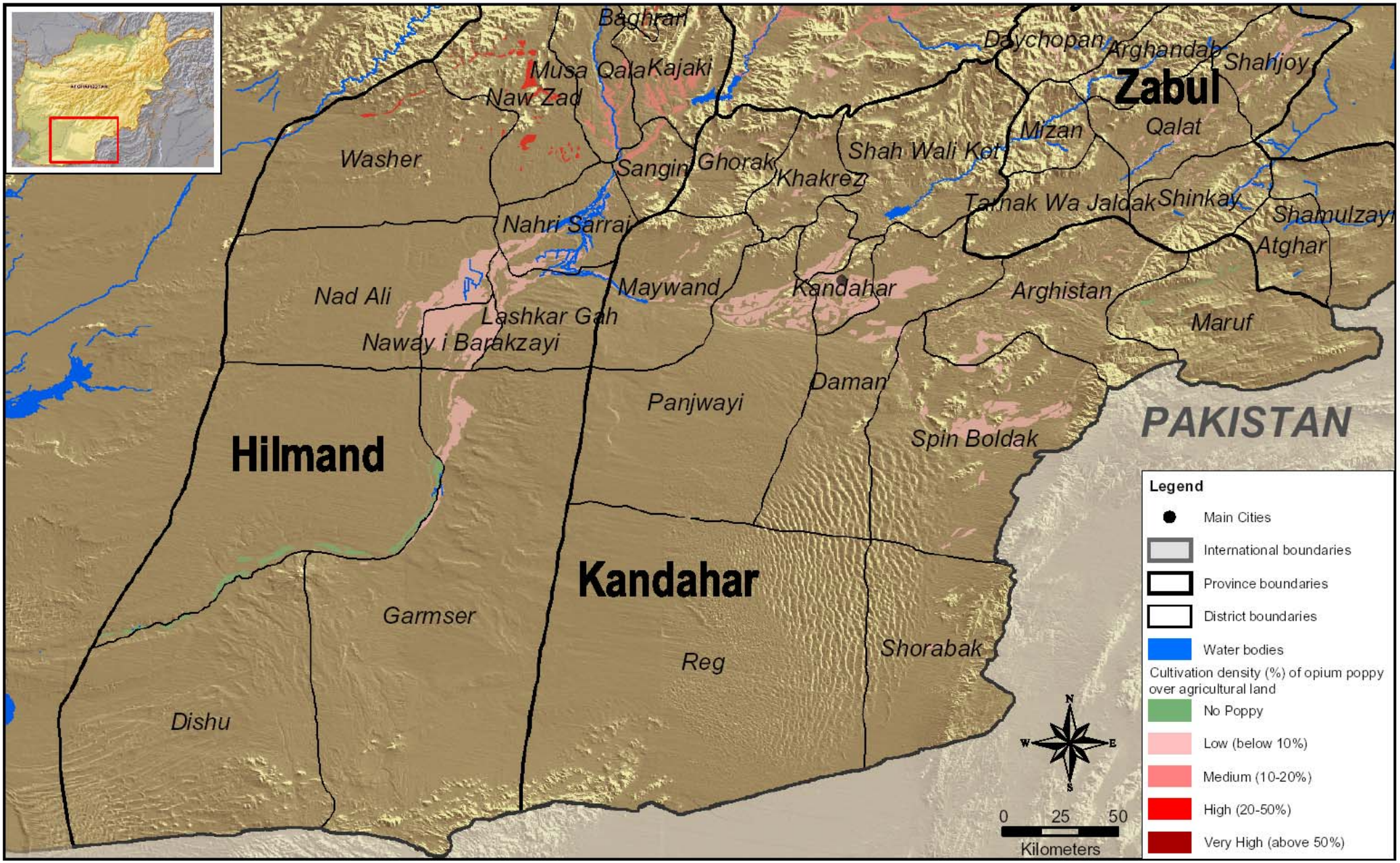
Density of opium poppy cultivation in the Southern Region in 2003 (Hilmand, Kandahar and Zabul)



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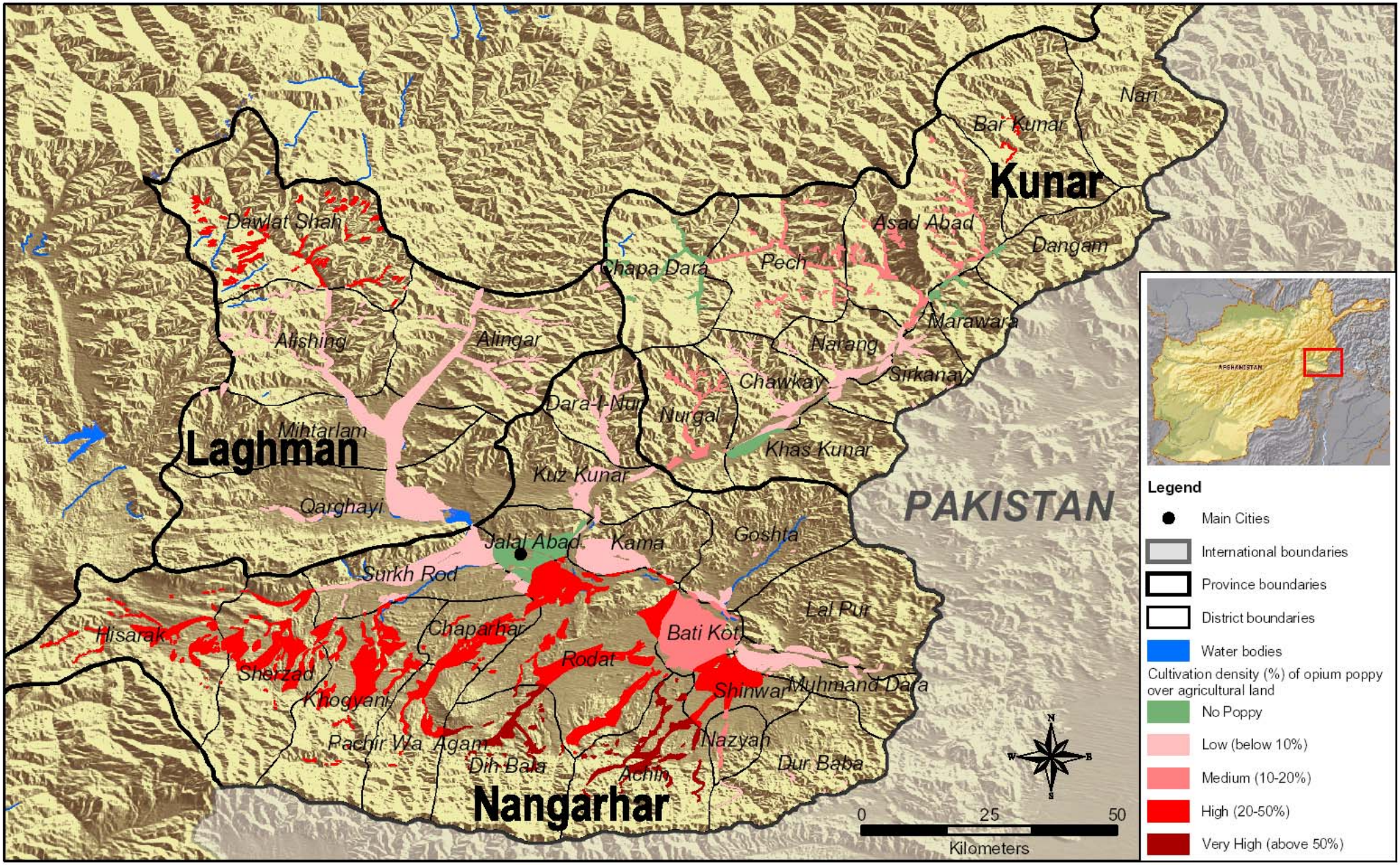
Density of opium poppy cultivation in the Eastern Region in 2003 (Nangarhar, Laghman and Kunar)



Source: CND - UNODC Afghanistan Opium Survey 2003

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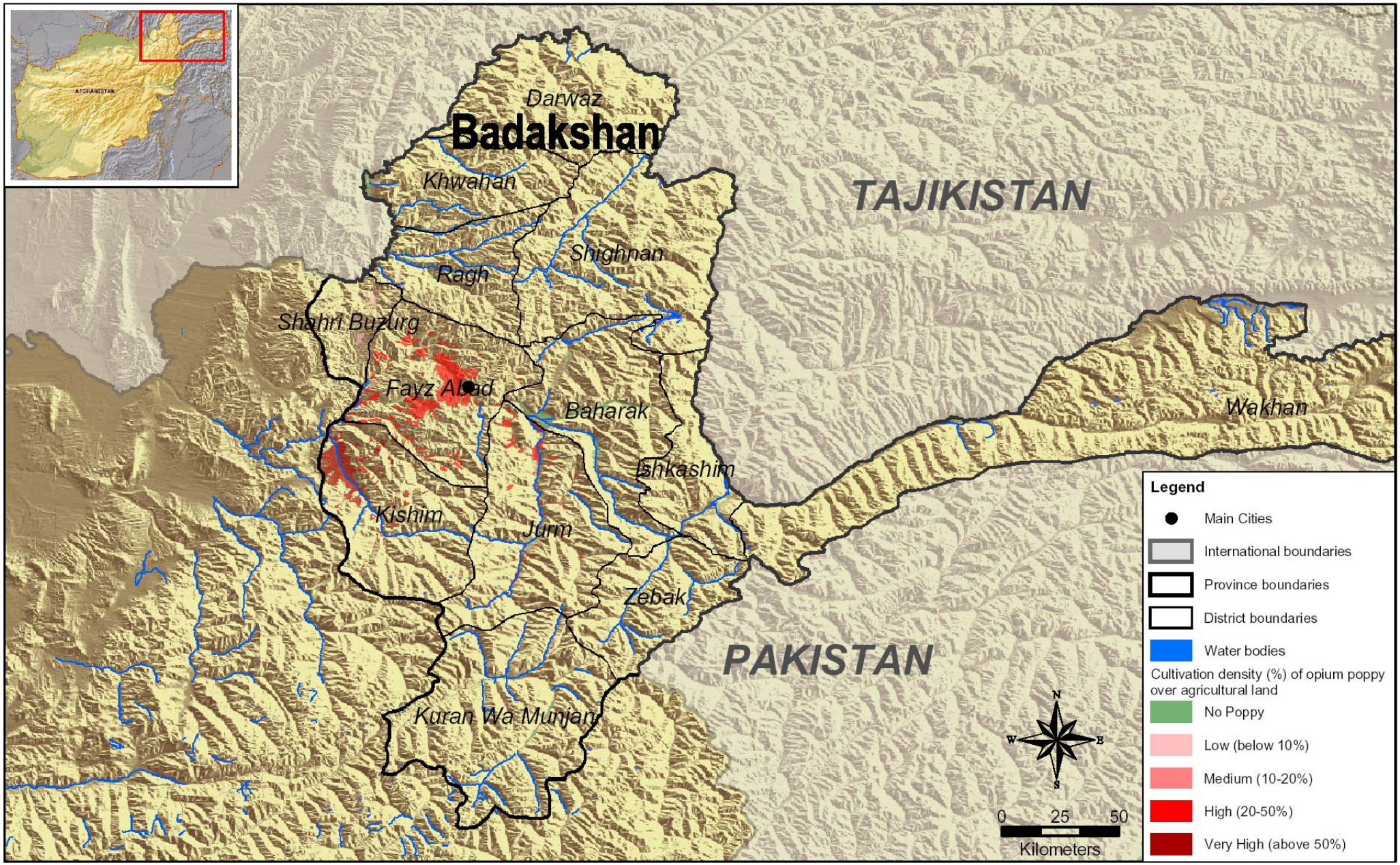
Density of opium poppy cultivation in Badakshan (North Eastern Region) in 2003



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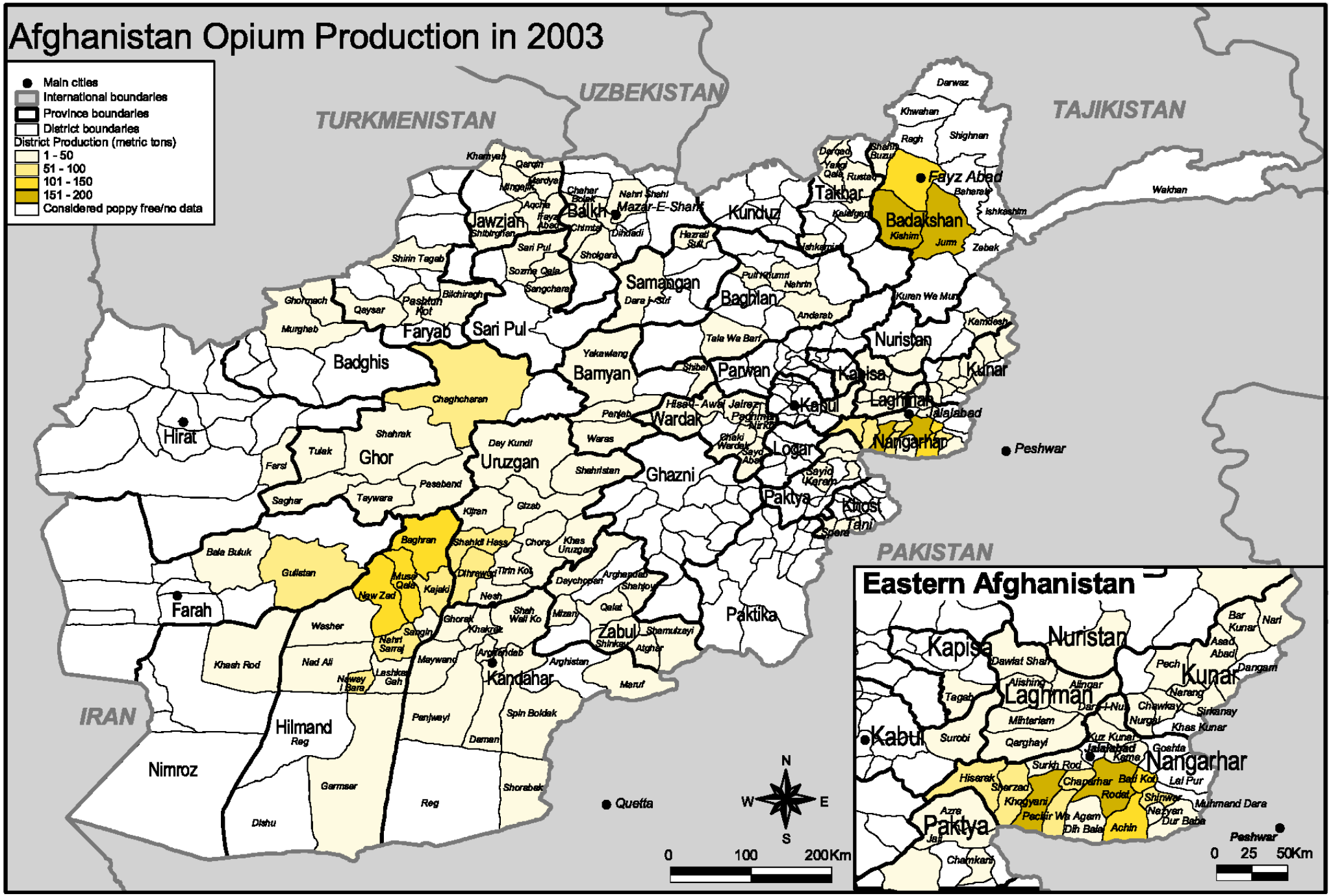

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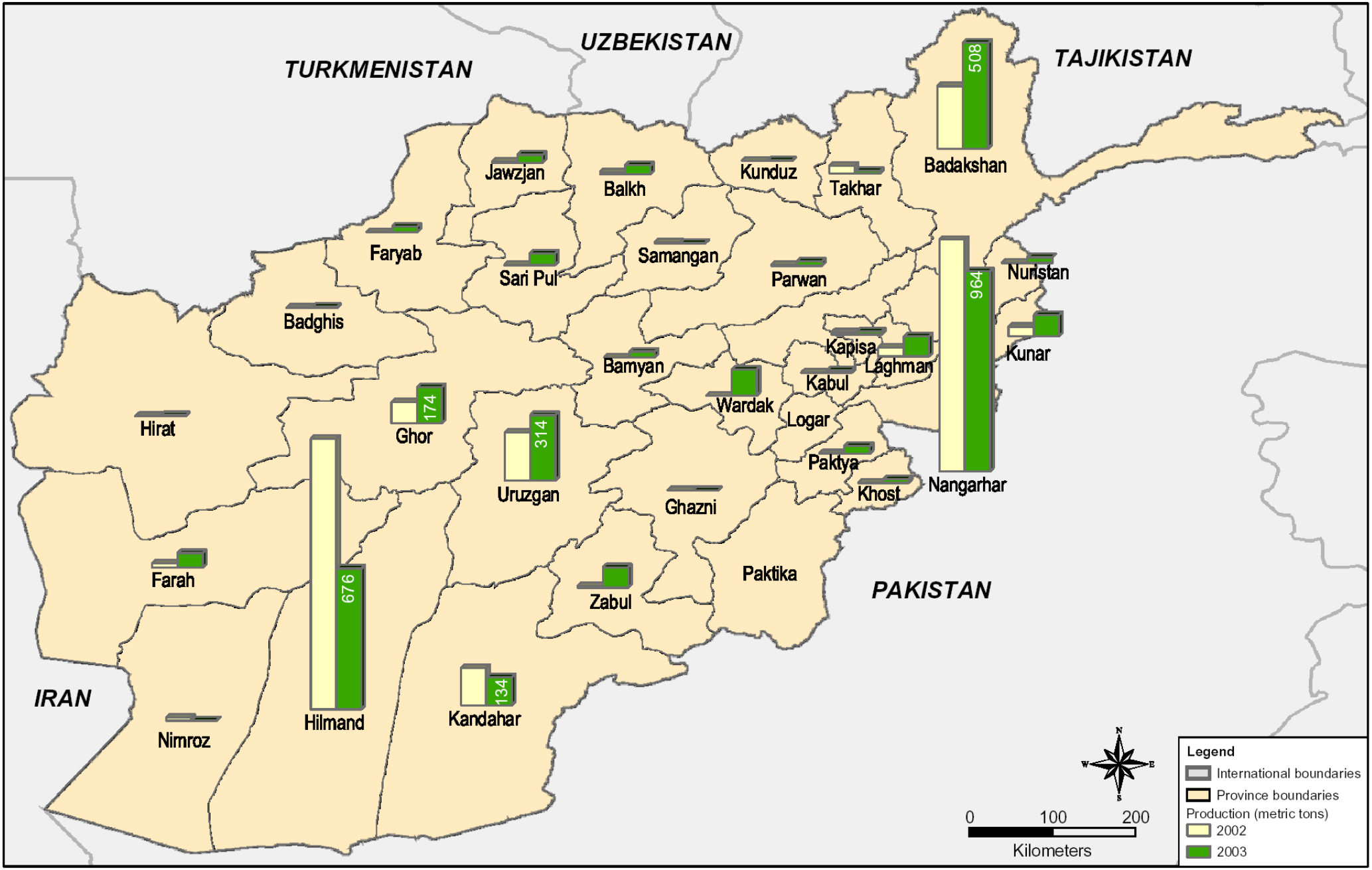
Afghanistan Opium Production by province 2002 - 2003



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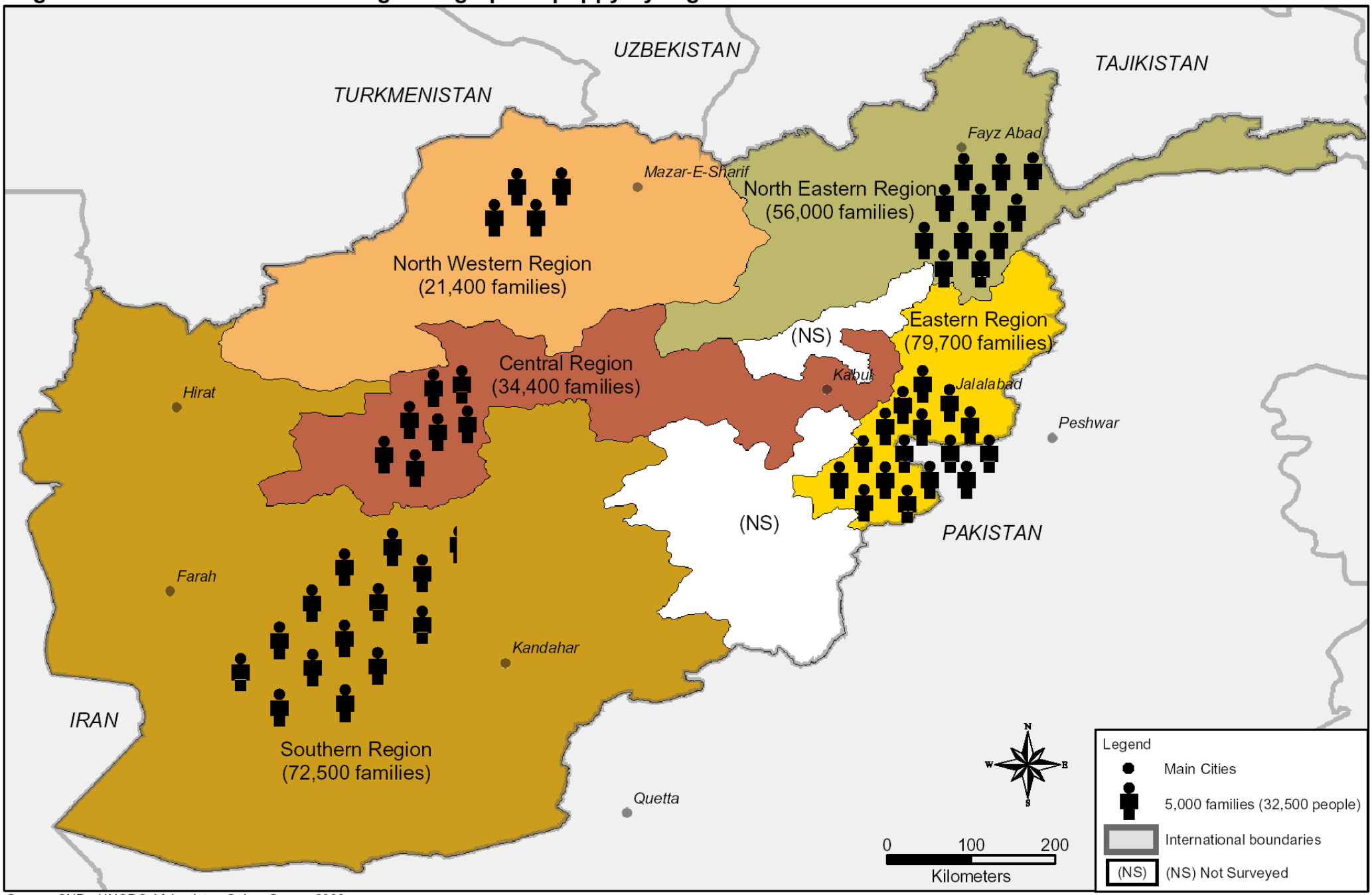
Afghanistan: Number of families growing opium poppy by region in 2003



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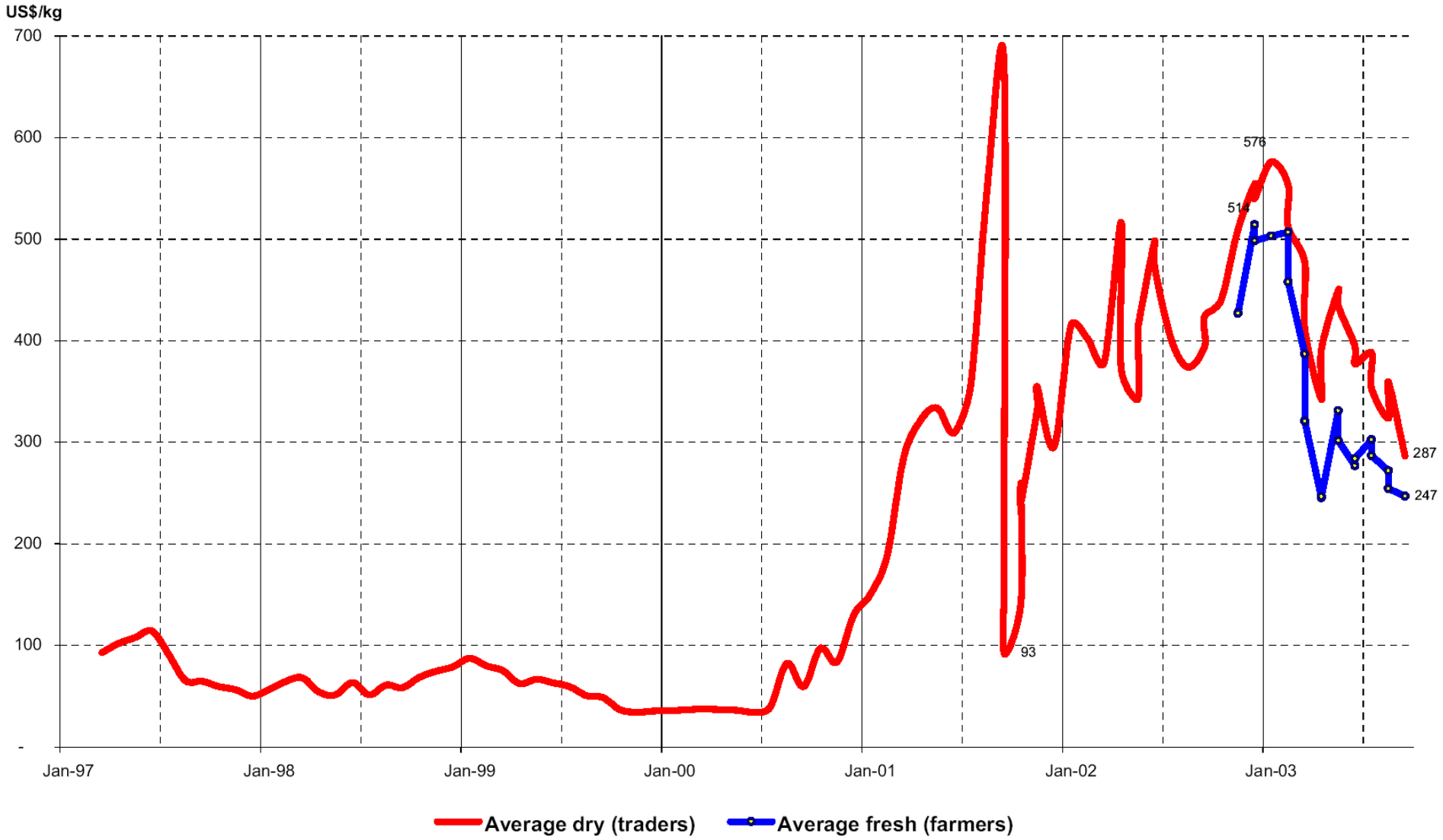
Average prices of fresh and dry opium in Afghanistan
(based on prices collected in Nangarhar and Kandahar provinces, March 1997 - September 2003)



1. INTRODUCTION

During the 1990s, Afghanistan firmly established itself as the largest source of illicit opium and its derivative, heroin, in the world. By the end of the 1990s, Afghanistan provided about 70 % of global illicit opium production, well ahead of Myanmar (about 22 %) and Lao PDR (about 3%). Primarily supplying countries in South West Asia, Central Asia, East and West Europe, as well as in South Asia, the Arabian peninsula and Africa, illicit opiates of Afghan origin were consumed by an estimated 9 to 10 million abusers, which is two-thirds of all opiate abusers in the world. It can be estimated that, all along the trafficking chain, more than half a million people have been involved in the international trade of illicit Afghan opiates in recent years. Although these numbers are only approximate, UNODC also estimates the overall turnover of the illicit international trade in Afghan opiates at roughly US$ 30 billion annually .

In 2001, following the ban imposed by the former Taliban regime, an abrupt decline of illicit opium poppy cultivation interrupted the two-decade increase, but, stimulated by a subsequent 10-fold increase in opium prices, cultivation resumed at a high level in 2002 and started to spread outside of the traditional areas. Although a new ban was issued in January 2002, the situation prevailing in Afghanistan has so far hindered the efforts of the new Afghan government to curb opium poppy cultivation in the country.

The Afghanistan opium survey is implemented annually by the United Nations Office on Drugs and Crime and, since 2003, jointly with the Afghan government. It collects and analyses information on the location and extent of opium poppy cultivation, on the potential production of opium, as well as other socioeconomic dimensions of the problem. The results provide a detailed picture of the outcome of the current year's opium season and, with previous years' data, enable the identification of mid- and long-term trends in the evolution of the illicit drug problem in that country. This information is essential for planning, implementing and monitoring the impact of the measures required for tackling a problem which, in a country that has become by far the largest source of illicit opium and heroin trafficked in the world, has clearly taken international dimensions.

The opium survey is implemented in the technical framework of UNODC's Global Illicit Crop Monitoring Programme (ICMP). The objective of ICMP is to assist the international community in monitoring the extent and evolution of illicit crops in the context of the elimination objective adopted at the General Assembly Special Session on Drugs in June 1998. In the framework of ICMP, monitoring activities are presently supported by UNODC in the other five main countries affected by illicit opium poppy and coca bush cultivation (Myanmar and Lao PDR in Asia, and Colombia, Peru and Bolivia in Latin America) as well as, for the first time in 2003, in Morocco, where one of the main areas of illicit cannabis cultivation is located.

The 2003 opium survey in Afghanistan was implemented under the project AD/AFG/F98 "Monitoring of opium production in Afghanistan" and the project AD/GLO/C93 "Illicit Crop Monitoring Programme Support", with financial contributions from the Governments of the United Kingdom, Finland, and Italy.

2. FINDINGS

2.1. OPIUM POPPY CULTIVATION ESTIMATES

The total area under opium poppy cultivation increased moderately (+8%) in Afghanistan this year, from 74,000 hectares in 2002 to 80,000 hectares (+/- 10%) in 2003. This result is comparable with the level of cultivation recorded in 2000 (82,000 ha), prior to the steep decline of 2001, and ranks third in the historical record of opium poppy cultivation in that country.

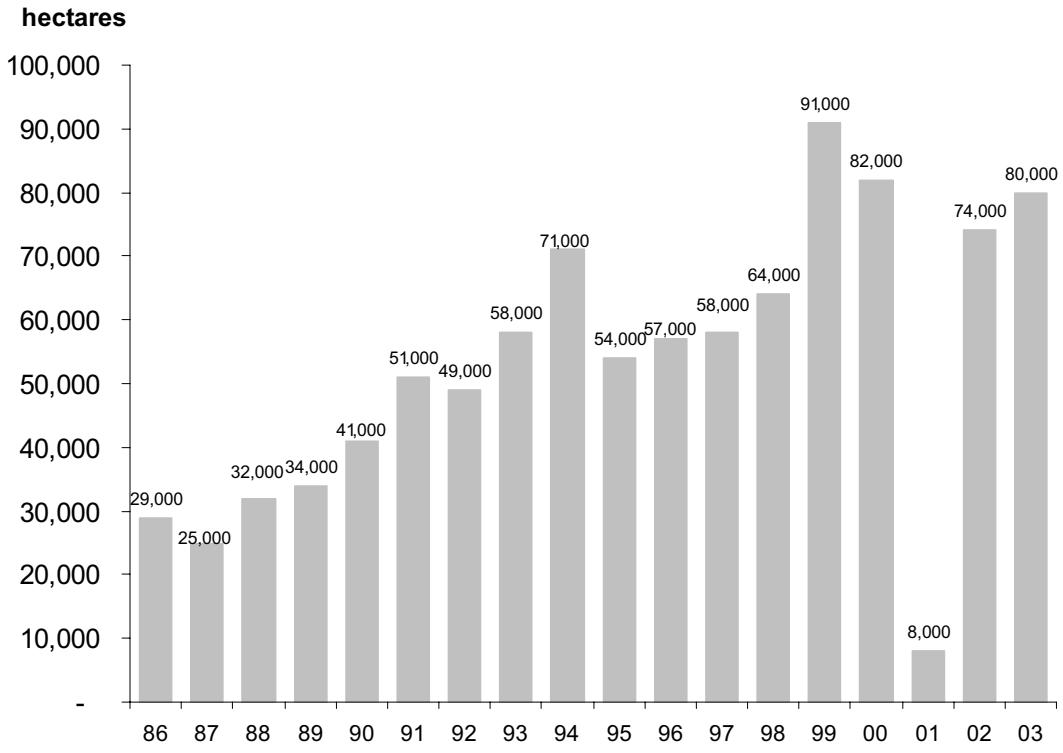
Table 1: Afghanistan Opium Poppy Cultivation 1994-2003 (in hectares, rounded estimates)

1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
71,000	54,000	57,000	58,000	64,000	91,000	82,000	8,000	74,000	80,000

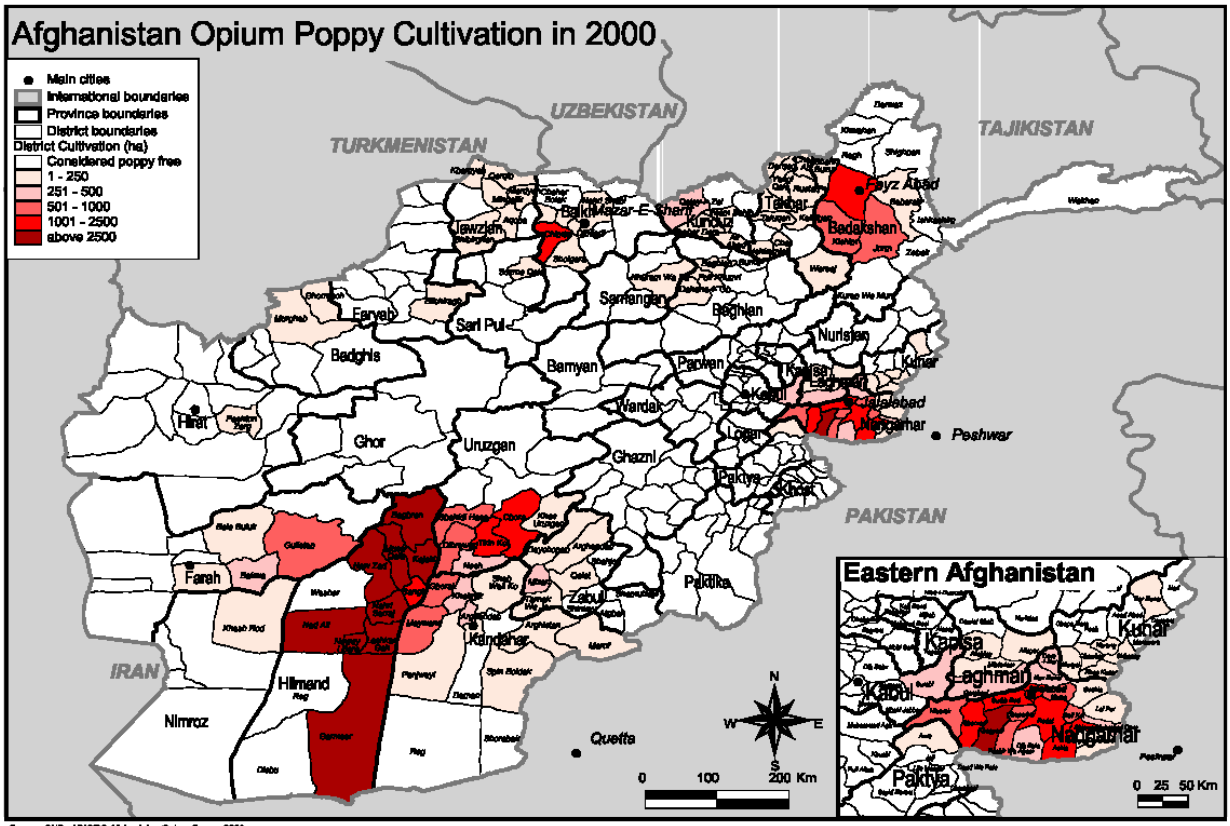
Source: UNODC opium surveys.

It is estimated that the area under opium poppy cultivation covered about 1% of the total arable land and slightly less than 3% of the irrigated arable land in Afghanistan in 2003. Those percentages are of course significantly higher in the opium growing areas (on average 10% of the arable land in opium growing districts, and up to more than 50% in particular cases).

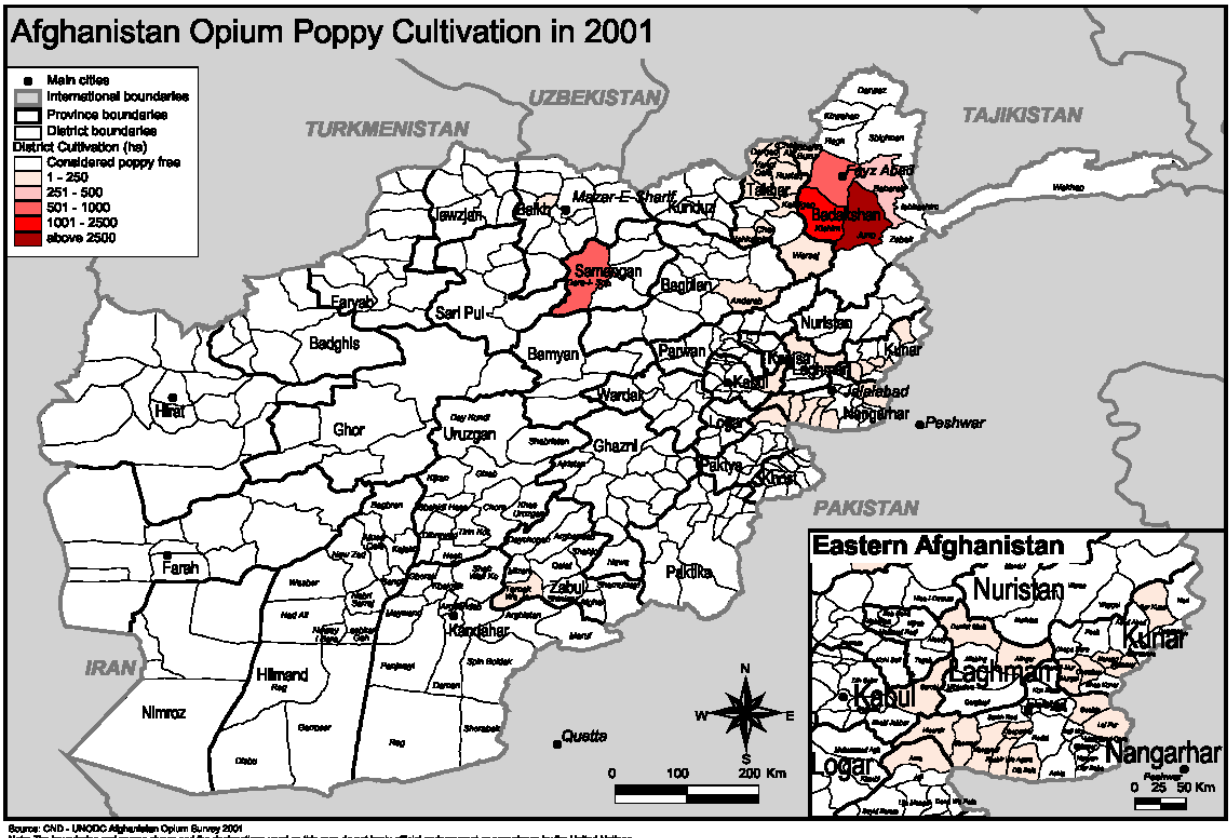
Graph 1. Opium poppy cultivation in Afghanistan, from 1986 to 2003



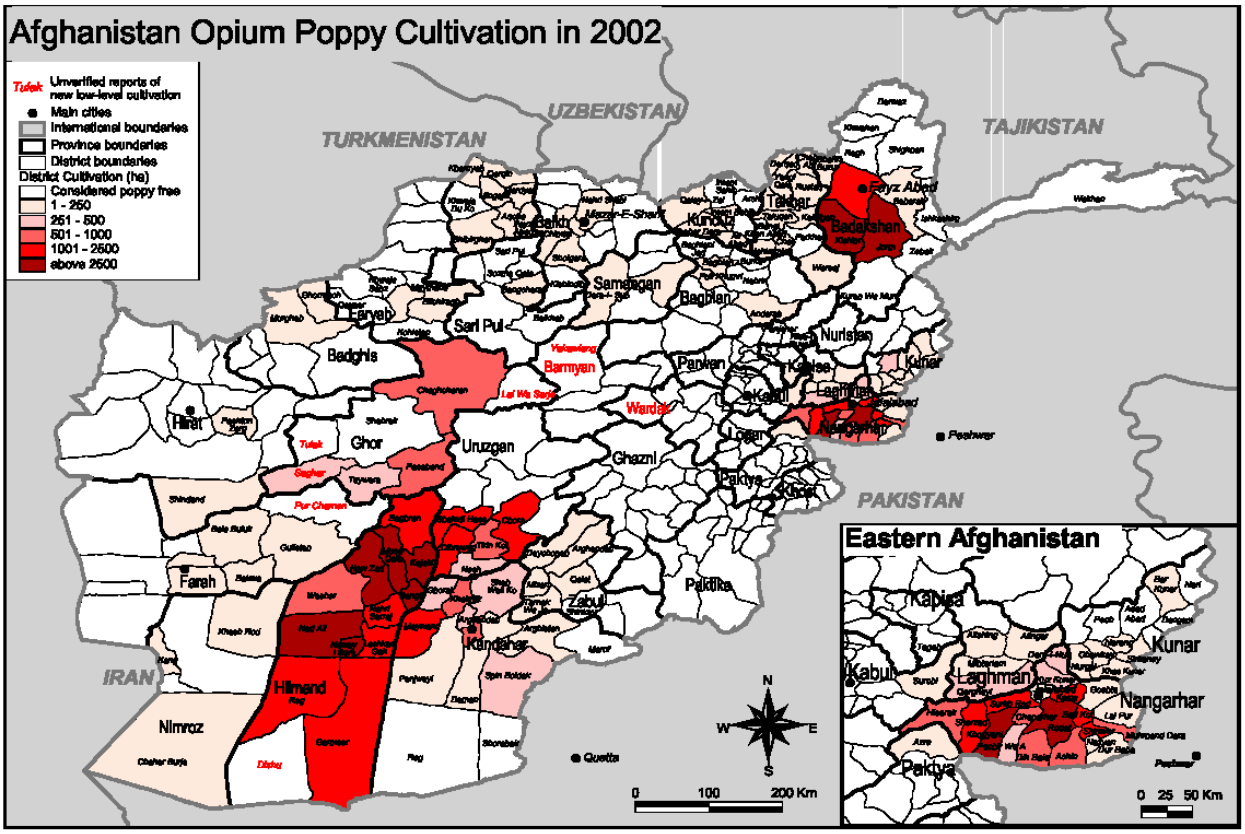
Source: UNODC opium survey for 1994-2003, U.S. Govt for 1986-1993.



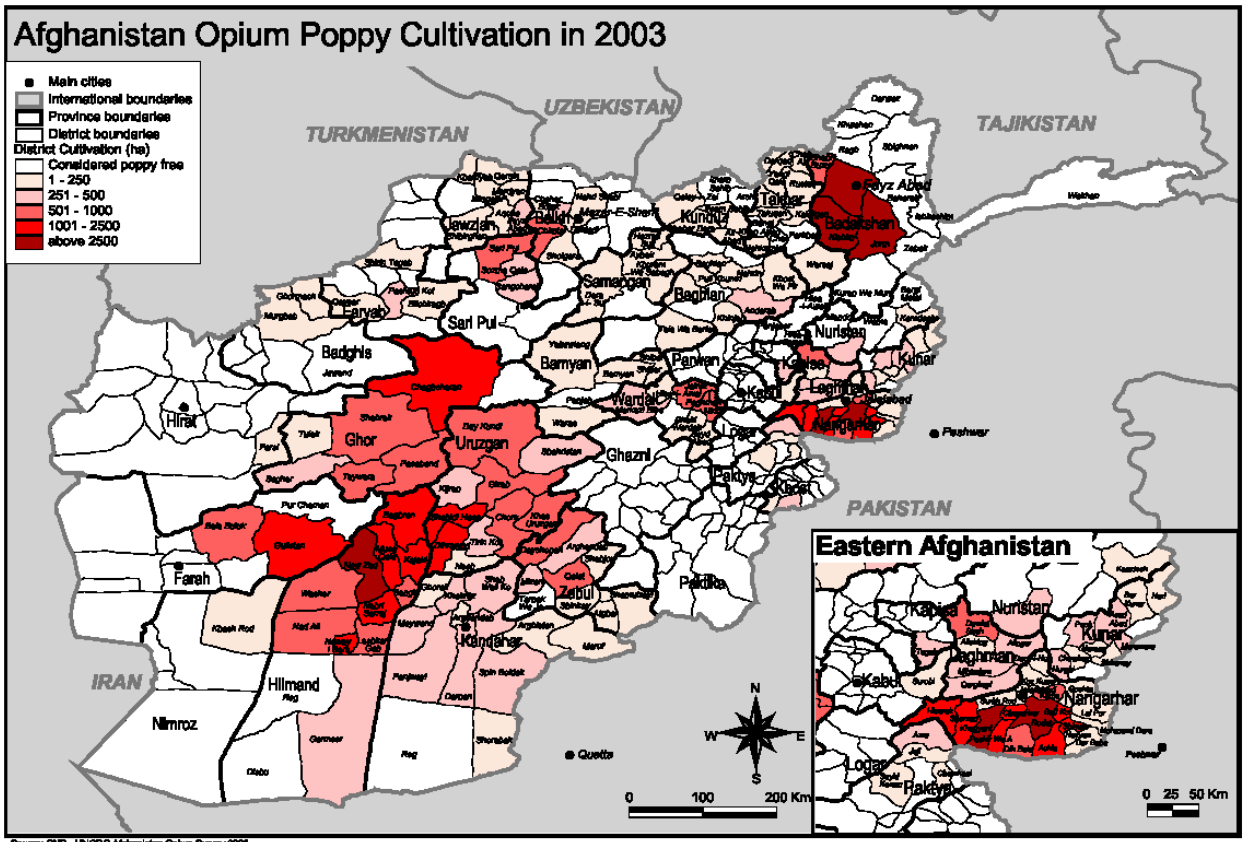
Source: CND - UNODC Afghanistan Opium Survey 2000
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The administrative boundaries have been downloaded from Afghanistan Information Management Service, United Nations (www.aims.org.af).



Source: CND - UNODC Afghanistan Opium Survey 2001
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The administrative boundaries have been downloaded from Afghanistan Information Management Service, United Nations (www.aims.org.af).



Source: CND - UNODC Afghanistan Opium Survey 2002
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The administrative boundaries have been downloaded from Afghanistan Information Management Service, United Nations (www.aims.org.af).



Source: CND - UNODC Afghanistan Opium Survey 2003
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The administrative boundaries have been downloaded from Afghanistan Information Management Service, United Nations (www.aims.org.af).

2.1.1. Provincial distribution

Essentially confined to a few provinces during the 1990's (Hilmand, Nangharar, Kandarhar, Badhakshan, Uruzgan), the pattern of opium poppy cultivation has since been significantly altered. A clear and accelerating extension to previously unaffected or marginally affected areas has brought the number of provinces where cultivation was reported from 18 in 1999, to 23 in 2000, 24 in 2002 and to 28 provinces in 2003 (out of a total of 32). Opium poppy cultivation was recorded for the first time in 31 districts this year. Together, those districts accounted for about 8,000 ha, or 10%, of the country's total in 2003. Another factor which contributed to changes in the local distribution of opium poppy cultivation in 2003 is the divergence in provincial trends in the main growing regions. In the South, a large decline was recorded in the provinces of Hilmand (-49%) and Kandahar (-23%), caused by government prohibition/eradication activities, and only partly offset by a 40% increase in Uruzgan. In the East, Nangharar, now the first ranking province, remained relatively stable (-4%). In the Northeastern region, close to Tajikistan's border, Badhakshan witnessed yet another major increase (+55%).

As a result, while the first five ranking provinces accounted for 95% of opium poppy cultivation in 2002, their share was reduced to 72% in 2003. The province of Ghor (central Afghanistan), where no cultivation was reported prior to 2002, has now displaced Kandahar as the fifth largest cultivating province.

Table 2: Largest opium poppy cultivating provinces in 2003

Provinces	2002	2003	one year change	% of total in 2003	Cumulative %
Nangarhar	19,780	18,904	- 4%	23%	23%
Hilmand	29,950	15,371	- 49%	19%	43%
Badakhshan	8,250	12,756	+ 55%	16%	58%
Uruzgan	5,100	7,143	+ 40%	9%	67%
Ghor	2,200	3,782	+ 72%	5%	72%
Kandahar	3,970	3,055	- 23%	4%	76%
Rest of the country	4,850	19,471	+ 301%	24%	100%
Rounded Country Total	74,000	80,000	+ 8%		

Graph 2. Provincial distribution of opium poppy cultivation

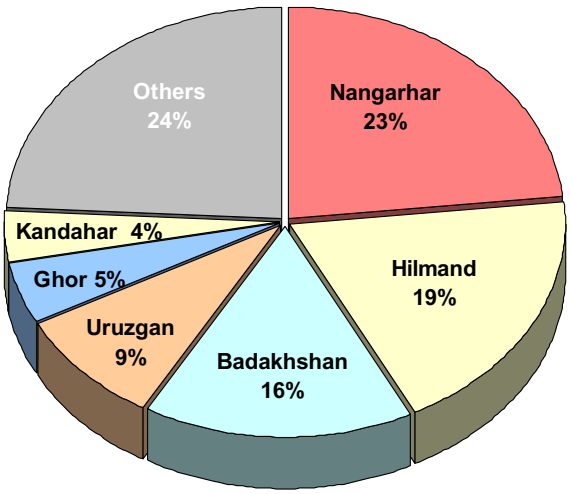


Table 3: Number of districts where opium poppy cultivation was recorded for the first time in 2003 and corresponding area under cultivation by province

Provinces	No of districts	2003 cultivation (ha)
Wardak	7	2,735
Uruzgan	2	1,254
Ghor	2	724
Nuristan	2	648
Bamyan	5	610
Kabul	4	595
Sari Pul	1	595
Kunar	1	345
Baghlan	3	143
Hirat	1	134
Khost	1	118
Samangan	2	43
Total	31	7,944

2.1.2. District ranking

Half of Afghanistan's opium poppy cultivation is now concentrated in 17 districts (against 13 last year). This is another illustration of the spread of poppy cultivation outside traditional areas.

Table 4: District ranking of opium poppy cultivation in 2003

Province	District	2003 (ha)	% of country total	Cumulative %
Badakhshan	Kishim	4,530	6%	6%
Badakhshan	Jurm	4,502	6%	11%
Nangarhar	Rodat	3,313	4%	15%
Badakhshan	Fayz Abad	3,109	4%	19%
Hilmand	Naw Zad	3,096	4%	23%
Nangarhar	Khogyani	2,986	4%	27%
Hilmand	Musa Qala	2,455	3%	30%
Hilmand	Baghran	2,309	3%	33%
Nangarhar	Achin	2,131	3%	35%
Nangarhar	Bati Kot	1,994	2%	38%
Nangarhar	Sherzad	1,641	2%	40%
Nangarhar	Shinwar	1,616	2%	42%
Hilmand	Nahri Sarraj	1,575	2%	44%
Hilmand	Kajaki	1,392	2%	46%
Uruzgan	Shahidi Hass	1,333	2%	47%
Uruzgan	Dihrawud	1,282	2%	49%
Hilmand	Naway i Barakzayi	1,240	2%	51%

The three opium growing districts of Badakhshan are now in the top 4. In 2002, these three districts were in the top 12. Of the 17 largest growing districts, 3 are in Badakhshan, 6 in Nangarhar, 6 in Hilmand, and 2 in Uruzgan.

2.1.3. Findings by region

For the purpose of the opium survey, the provinces were grouped in five regions according to their geographical proximity and agricultural environment (see annex 9 for map illustrating the regional grouping).

Table 5: Opium poppy cultivation by region in 2002 and 2003

Region (province)	2002	2003
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	2,465	7,690
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	565	4,460
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	40,070	29,970
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	21,739	24,580
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	9,206	13,783
Country rounded total	**74,000**	**80,000**

Southern Afghanistan (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)

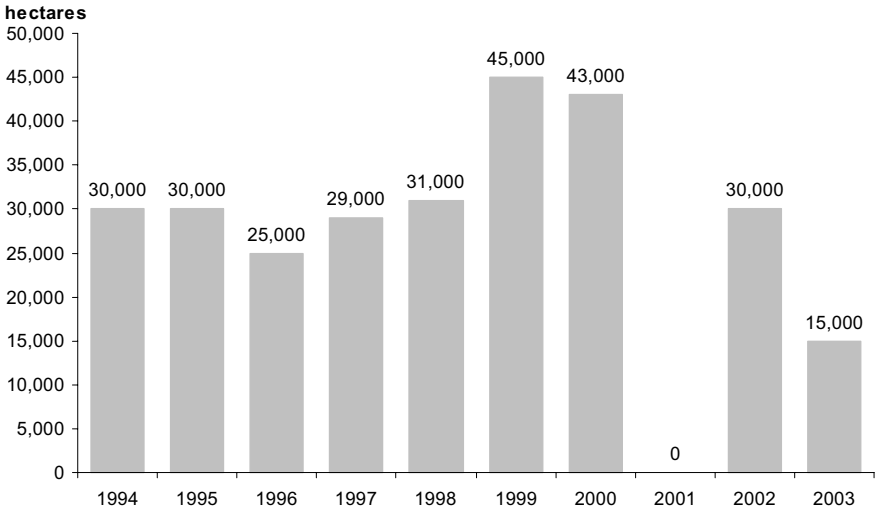
Hilmand

Apart from the short-lived exception of 2001, Hilmand recorded its lowest level of cultivation since 1994, after a one-year 49% decline brought it down to 15,000 ha in 2003. The province now accounts for 19% of the country's total, against 40% in 2002.

Table 6: Opium poppy cultivation in Hilmand province, 1994-2003 (in ha and %)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Hilmand	30,000	30,000	25,000	29,000	31,000	45,000	43,000	0	30,000	15,000
Afghanistan	71,000	54,000	57,000	58,000	64,000	91,000	82,000	8,000	74,000	80,000
Hilmand as % of Afghanistan	42%	56%	44%	50%	48%	49%	52%	0%	40%	19%

Graph 3. Opium poppy cultivation in Hilmand province, 1994-2003 (in ha)



The impressive decline recorded at provincial level mainly reflects 85% decrease in cultivation in the district of Nad-e-Nali and is attributed to an intensive prohibition/eradication campaign. In 2002, Nad-e-Nali was the district with the highest level of cultivation in Afghanistan (5,888 ha) and accounted for 8% of the country's total. In 2003, it recorded the largest decrease in absolute terms (- 5,010 ha).

Two out of 13 districts in that province, however, recorded an increase: Baghran and Naw Zad. Both are located in the northern part of the province, which is characterized by a mountainous terrain, narrow valleys and difficult access.

Kandahar
As in Hilmand, the prohibition/eradication activities implemented in Kandahar resulted in a significant decline of cultivation (-23% compared to 2002). With about 3,000 ha, Kandahar now accounts for 4% of Afghanistan's total opium poppy cultivation and has been overtaken by the province of Ghor (about 3,800 ha).

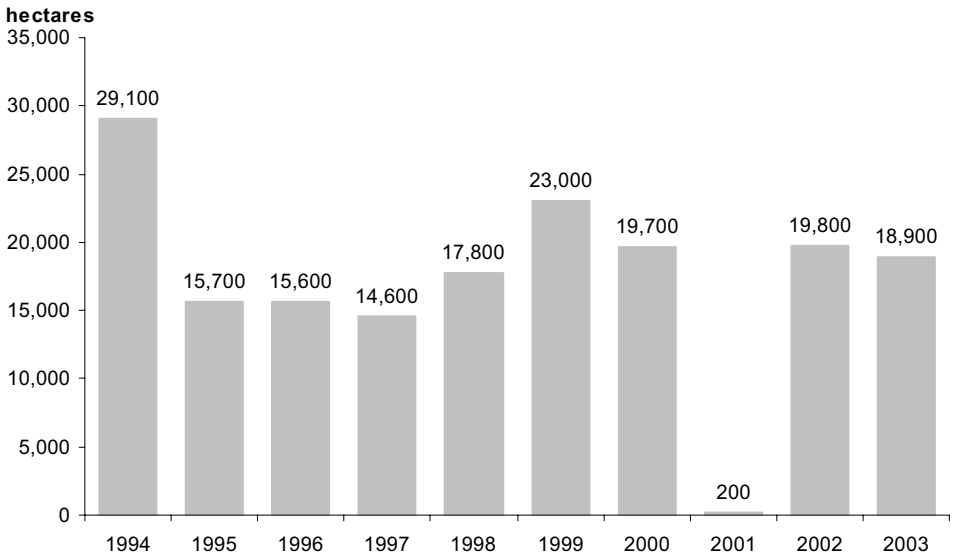
Uruzgan
The fairly large increase (+40%) recorded in the province of Uruzgan took place primarily in the remote areas of its five most northern districts.

Farah
Opium poppy cultivation more than tripled in Farah province, from 500 ha in 2002 to 1,700 ha in 2003. In that province, the district of Gulistan, located close to the main growing areas of Hilmand, alone accounted for close to 1,200 ha.

Eastern Afghanistan (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)

Nangarhar

Graph 4. Opium poppy cultivation in Nangarhar province, 1994-2003 (in ha)



Although the overall level of cultivation remained relatively stable in that province in 2003 (-4% compared with last year), this resulted from diverging trends which split the province along a North-South divide created by the road that crosses the province to link Kabul and

Peshawar through the Kyber Pass. North of this divide, cultivation decreased; South of it, it increased to reach 85% of the provincial total.

Table 7: North/South distribution of opium poppy cultivation in Nangarhar province (in ha)

Districts	2003 Cultivation	% of provincial total
12 Southern districts (Rodat, Khogyani, Achin, Sherzad, Shinwar, Chaparhar, Pachir Wa Agam, Hisarak, Dih Bala, Surkh Rod, Dur Baba)	16,090	85%
9 Northern districts (Bati Kot, Kama, Kuz Kunar, Nazyan, Dara-I-Nur, Muhmand Dara, Goshta, Lal Pur, Jalalabad)	2,814	15%
Total	18,904	

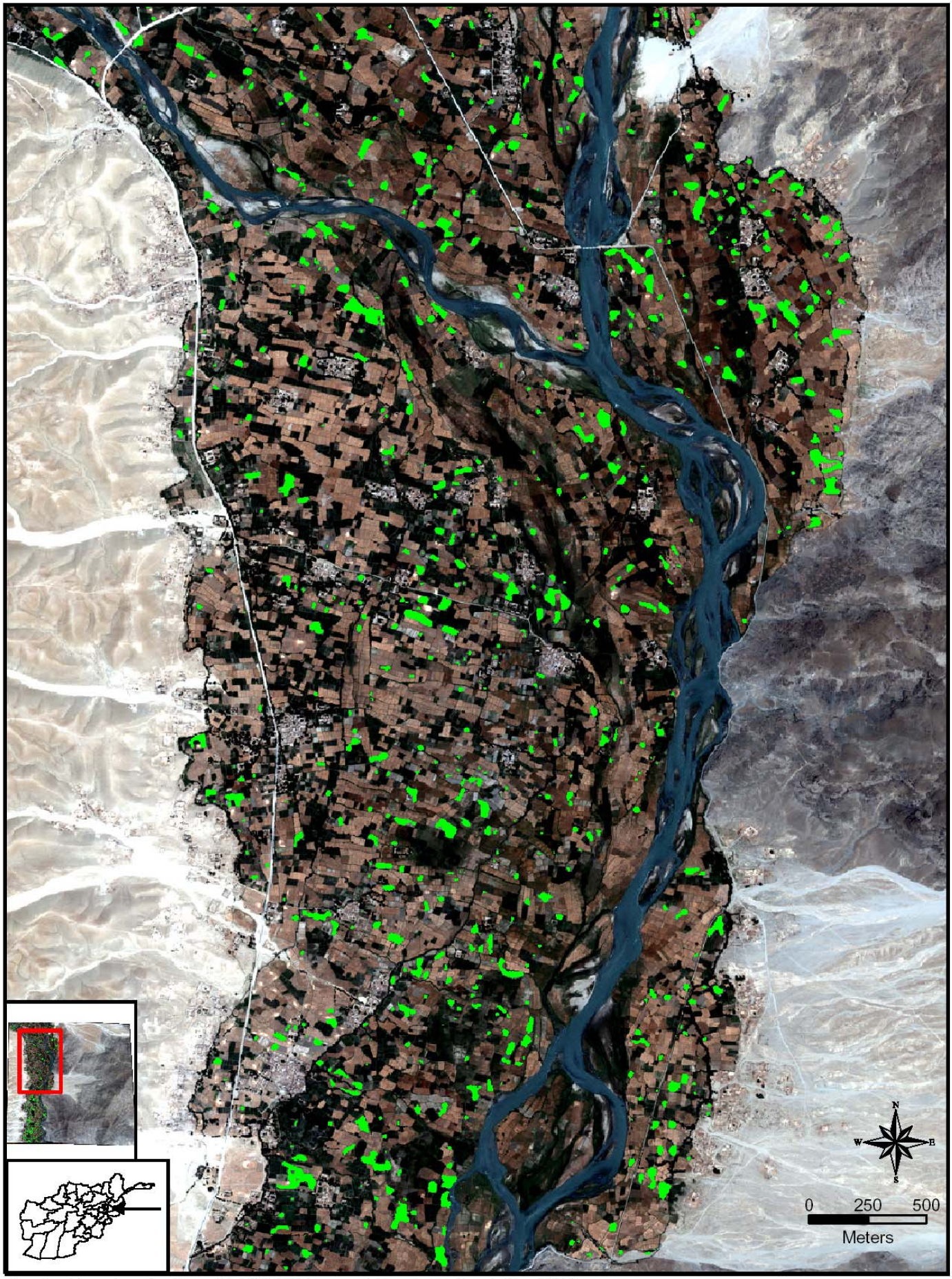
Figure 1: Opium poppy cultivation on terraces in Achin district, Nangarhar province (May 2003)

Jalalabad district is now virtually opium poppy free (only 4 ha were found during the survey, compared to 90 ha in 2002). A very important decrease was also noted, near Jalalabad district, in Surkh Rod district, from 1,440 ha in 2002, to 118 ha in 2003 (-92%).

Laghman and Kunar

Cultivation increased in those two provinces located north of Nangharar, especially in their most northern areas. Both provinces are mountainous, insecure, with narrow valleys difficult to access.

Result of the classification of IKONOS images in Mihtarlam district, Laghman province



Result of the classification of 2 IKONOS images taken in April and May 2003
Opium poppy fields are in green

North eastern Afghanistan (Badakhshan, Baghlan, Kunduz, Takhar)

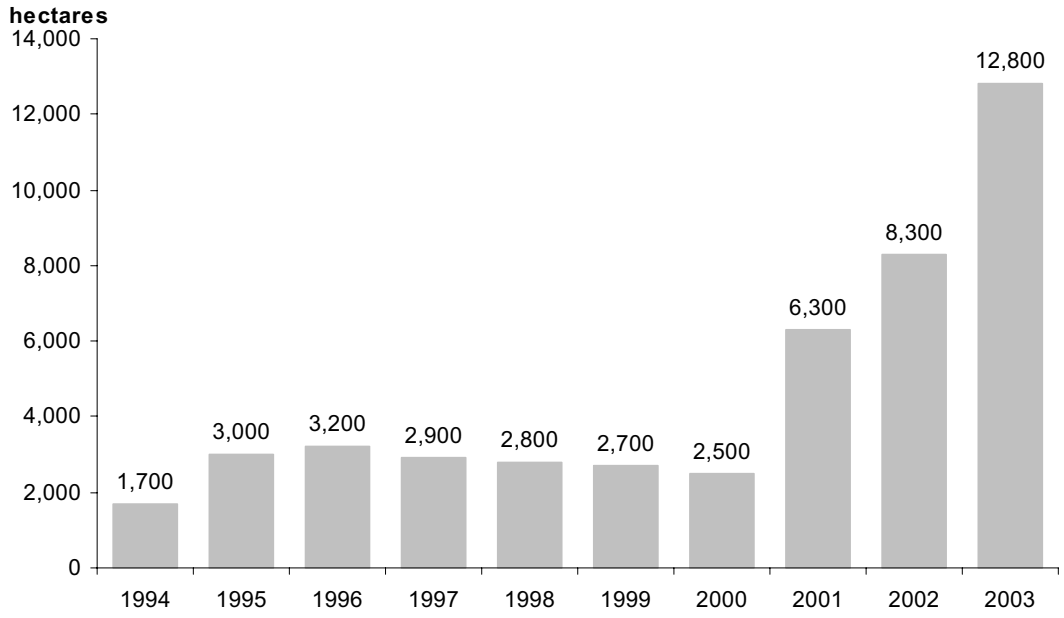
Badakhshan

For the third consecutive year, a considerable increase in opium poppy cultivation was noted in Badakhshan province (+ 152% in 2001, +32% in 2002 and + 55% in 2003). Cultivation is now 7 times higher in that province than it was in 1994, when UNODC started to implement an annual opium survey in Afghanistan.

Table 8: Opium poppy cultivation trend in Badakhshan 1994-2003

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Ha (rounded)	1,700	3,000	3,200	2,900	2,800	2,700	2,500	6,300	8,300	12,800
% of country's total	2%	6%	6%	5%	4%	3%	3%	79%	11%	16%

Graph 5. Opium poppy cultivation trend in Badakhshan 1994-2003 (rounded, in ha)



Opium poppy cultivation in Badakhshan, the oldest opium producing province in Afghanistan, had traditionally been confined to less productive rain-fed land. The pattern has changed and the recent increase came at the expense of licit cultivation on irrigated land, which now accounts for 95% of the provincial opium poppy cultivation, versus 39% in 2002. As a result of the higher yield on irrigated areas, opium production in Badakhshan increased by 93% compared to 2002 (see section on production).

Table 9: Irrigated and rain-fed opium poppy cultivation in Badakhshan 2002 – 2003

District	2002			2003		
	Irrigated (ha)	Rainfed (ha)	Irrigated (%)	Irrigated (ha)	Rainfed (ha)	Irrigated (%)
Fayz Abad	430	1,940	18%	2,791	318	90%
Jurm	2,450	240	91%	4,502	-	100%
Kishim	180	2,660	6%	4,278	252	94%
Total	3,060	4,840	39%	11,571	570	95%

North western Afghanistan (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)

Although opium poppy cultivation in that region still represents a relatively modest 6% of the national total, it has increased by a factor of 8 in one year, from 565 ha in 2002 to 4,460 ha in 2003. The increase was mostly concentrated in the provinces of Sari-Pul and Balk, which accounted for more than half of the regional total.

Table 10: Opium poppy cultivation in the north-western provinces (in ha)

Provinces	2002	2003	% of regional total
Sari Pul	57	1,428	32%
Balkh	217	1,108	25%
Jawzjan	137	888	20%
Faryab	28	766	17%
Badghis	26	170	4%
Samangan	100	101	2%
Total	565	4,460	

Central Afghanistan (Bamyan, Ghor, Kabul, Kapisa, Wardak)

Previously unaffected by opium poppy cultivation, the provinces of Bamyan and Wardak were surveyed for the first time in 2003. A significant amount of land was found under opium poppy cultivation in Wardak (about 2,700 ha) and a more modest one in Bamyan (about 600 ha).

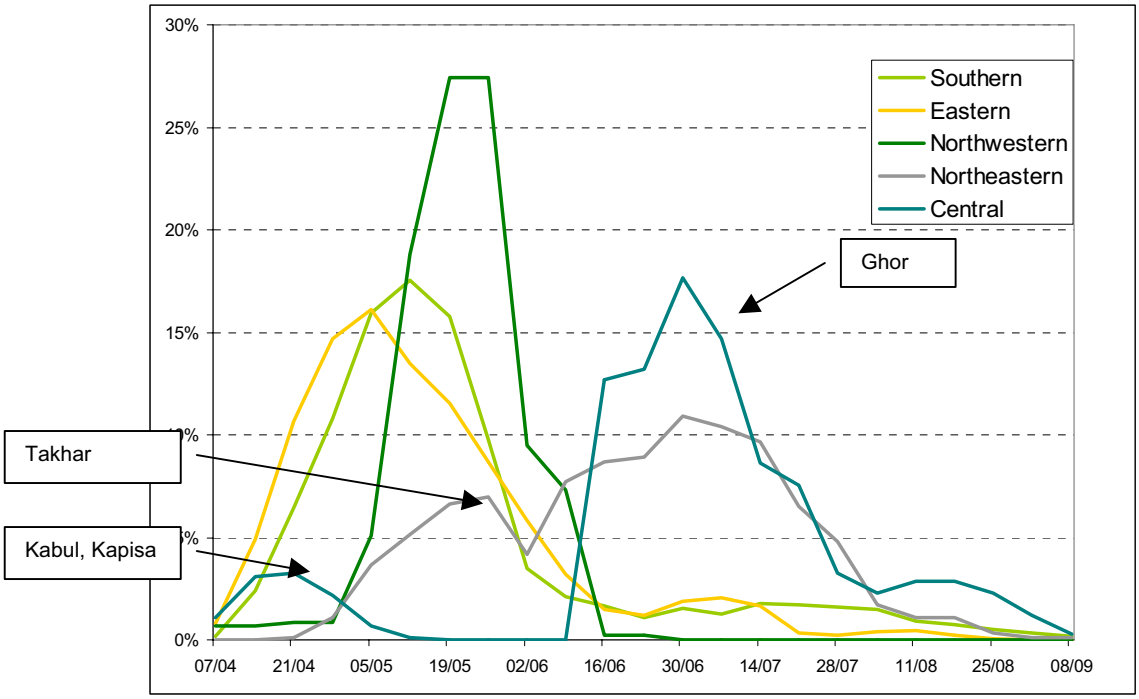
Confirming the partial findings of the 2002 survey, the 2003 results now show that Ghor, with close to 3,800 ha, has become one of the top five provinces for opium poppy cultivation in 2003, accounting for 5% of the country's total.

Table 11: Opium poppy cultivation in Central Afghanistan

Province	2002 (ha)	2003 (ha)	% of Central region's total
Ghor	2,200	3,782	49%
Wardak		2,735	36%
Bamyan		610	8%
Kapisa	207	326	4%
Kabul	58	237	3%
Total	2,465	7,690	

2.1.4. Opium Poppy calendar

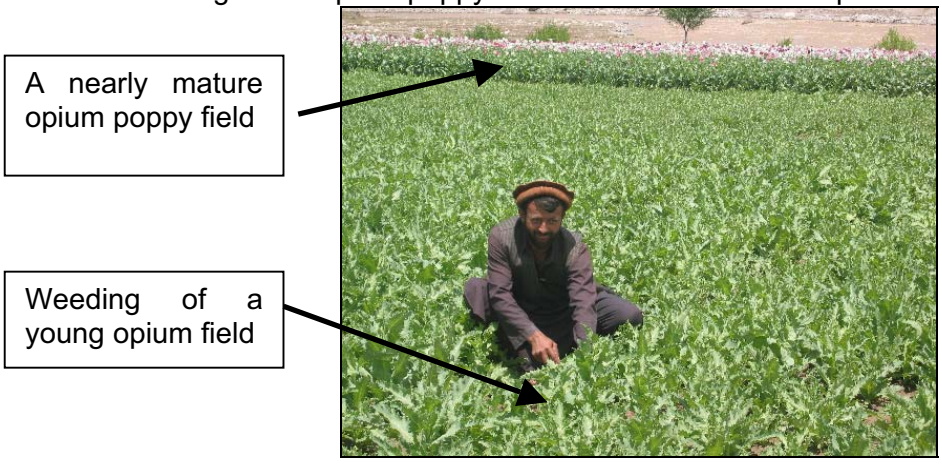
Graph 6. Relative frequencies of opium harvest time by region

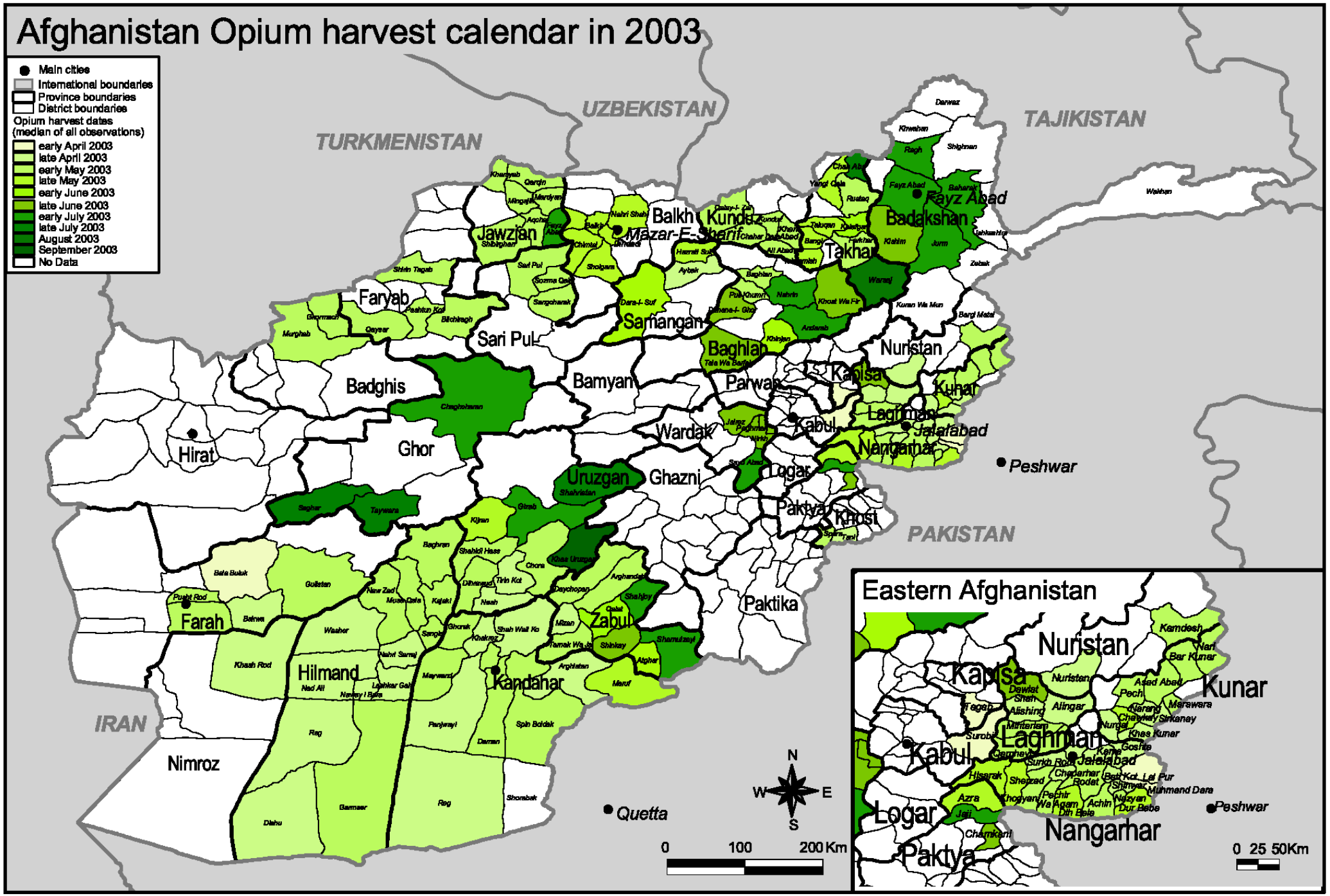


This graphs shows the relative frequencies of farmers reporting harvesting their opium fields at a certain date. For example, in the Eastern region (around Nangarhar province), 15% of the farmers reported harvesting their opium fields around 5th May 2003.

It is interesting to note that the curves for all but the North eastern region, rapidly reach their maximum value, indicating a short period of time between the beginning of the opium harvest and its peak. After the peak however, the curves show a more progressive decline and some farmers were still harvesting in July/August. This indicates that some farmers planted opium poppy seeds later on some of their fields, possibly to spread the opium harvest workload. There was no evidence of two opium crops on the same field. In the North eastern region (Badakhshan province), the curve is more bell-shaped, reflecting the more staggered planting pattern in this region. Some provincial harvesting windows create small peaks on the regional curve as indicated on the graph.

Figure 2. Opium poppy cultivation in Badakhshan province, July 2003





Source: CND - UNODC Afghanistan Opium Survey 2003
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
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2.2. OPIUM YIELD

Table 12: Opium yield by region 2002-2003 (in kg/ha)

Regions	2002*		2003			
	Irrigated	rain-fed	irrigated	*number of farmers' answers*	rain-fed	*number of farmers' answers*
Center (Bamyan, Ghor, Kabul, Kapisa, Wardak)			**46**	*190*	**28**	*151*
North East (Badakhshan, Baghlan, Kunduz, Takhar)	36	32	**41**	*141*	**24**	*76*
North West (Baghis, Jawzjan, Samangan,Balkh, Faryab, Sari Pul)			**43**	*111*	**34**	*36*
South East (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	54		**51**	*290*	**32**	*36*
South West (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	45		**43**	*431*	**18**	*3*
TOTAL				*1,163*		*302*

*In 2002, the security situation limited the collection of data on opium to a few provinces. Although the security situation has not improved since, careful planning enabled this year's survey to be conducted in more provinces.

The yield per hectare remained relatively stable in the Eastern (Nangarhar) and the Southern (Hilmand) regions. In the North eastern region (Badakhshan), a slight increase in opium yield on irrigated land was noted, while the yield on rain-fed land decreased. Opium yield on rain-fed areas are reported to vary widely depending on rainfall at critical times. For example, surveyors reported that in some areas, the opium poppy fields on rain-fed land seemed very healthy, whereas in other areas they appeared as relatively poor.

There were anecdotal reports of disease affecting the opium yield, but the UNODC ground survey based on the interview of 1,141 opium growing farmers, showed that the relatively small number of farmers (11%) who reported damage to their opium fields due to pests (pests includes disease and fungal damage) was not unusual. In the North east, very few farmers (6%) reported damage to their opium fields in 2003. This confirmed the better than average conditions in Badakhshan leading to a better yield this year.

Table 13: Farmers reporting damage to their opium fields in 2003

Region	Number of farmers cultivating opium interviewed	Number of farmers reporting damage	% of farmers reporting damage from any cause	Number of farmers reporting damage by pest	% of farmers reporting damage by pest
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	293	90	31%	56	19%
Northeastern (Badakhshan, Baghlan, Kunduz, Takhar)	177	10	6%		
Northwestern (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	126	43	34%	1	1%
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	321	76	24%	51	16%
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	517	52	10%	12	2%
Total	1,141	271	24%	120	11%

2.3. POTENTIAL OPIUM PRODUCTION

Potential opium production was calculated by multiplying the average regional yield by the regional cultivation results. At the national level, potential opium production amounted to 3,600 metric tons in 2003, an increase of 6% compared to last year's 3,400 metric tons. This is the second highest opium production figure recorded so far in Afghanistan.

Table 15. Potential opium production by region and at national level in 2003

Region	Yield irrigated (kg/ha)	Yield rainfed (kg/ha)	Cult. irrigated (ha)	Cult. rainfed (ha)	Prod. irrigated (mt)	Prod. rainfed (mt)	Prod. total (mt)
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	46	28*	7,605	85	350	2	352
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	41	24	12,559	1,224	515	29	544
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	43	34	3,618	842	156	29	184
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	51	32	24,103	478	1,229	15	1,245
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	43	18	29,815	156	1,282	3	1,285
Rounded total			**77,700**	**2,780**	**3,530**	**80**	**3,600**
Average Weighted Yield	**45**	**29**					**45**

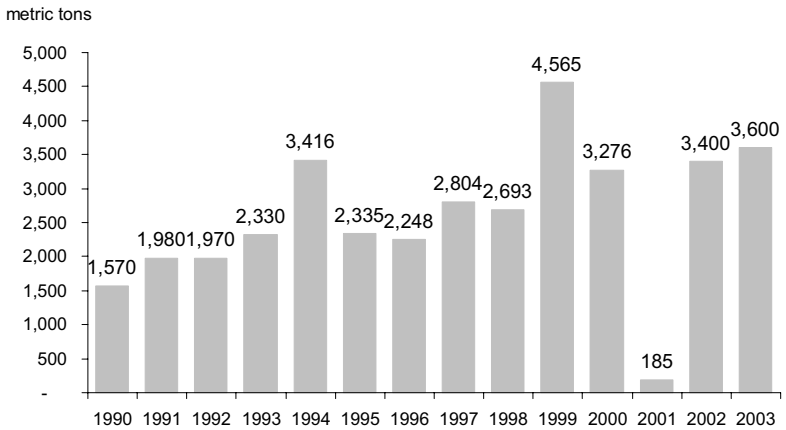
** no data on rain-fed yield were obtained from the central region. The sample average at the national level was used instead.*

Table 16. Afghanistan opium production from 1990 to 2003 (in metric tons)

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1,570	1,980	1,970	2,330	3,416	2,335	2,248	2,804	2,693	4,565	3,276	185	3,400	3,600

Source: UNODC survey for 1994-2003; U.S. Govt for 1990-1993

Graph 7. Afghanistan opium production from 1990-2003 (in metric tons)



Source: UNODC survey for 1994-2003; U.S. Govt for 1990-1993

The ranking of the six opium producing provinces in 2003 was similar to the opium poppy cultivation ranking.

Table 17. Largest opium producing provinces in 2003

Provinces	Opium production in metric tons	In % of total
Nangarhar	964	27%
Hilmand	676	19%
Badakhshan	508	14%
Uruzgan	314	9%
Ghor	174	5%
Kandahar	134	4%
Others	849	24%
Rounded Total	3,600	

Graph 8. Largest opium producing provinces in 2003

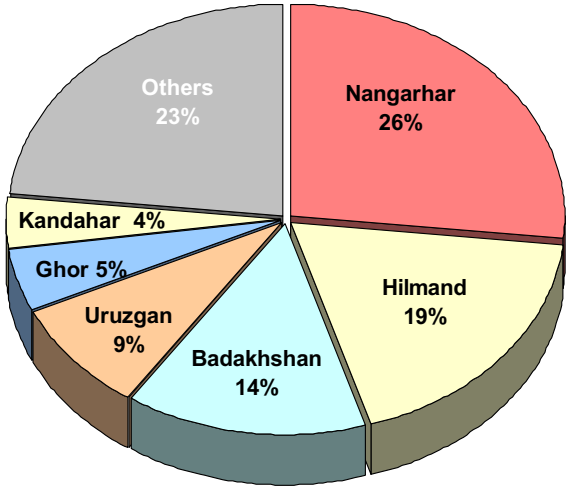


Figure 3. Opium gum

Opium gum oozing from an opium poppy capsule

Seized opium bag

2.4. OPIUM PRICES

Although still much higher than it was throughout the 1990s, when opium prices were typically around 30 US$/kg, the average price of US$ 283 per kg of fresh opium recorded by the survey at farm-gate level this year reflects a decrease of 19% compared with last year's price of US$ 350.

Table 17. Average farm-gate prices for fresh opium (in US$/kg)

Region	2002	2003	number of farmers answers in 2003
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)		261 (May-July)	546
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	207 (July)	175 (May-July)	480
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)		197 (March-May)	243
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	333 (August)	244 (March- July)	558
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	385 (July)	383 (April-August)	942
Country weighted average*	350	**283**	**2,769**
One year change		-19%	

** weighted by opium production*

A comparison of prices for fresh opium with prices for dry opium shows that the difference between the two increased significantly in 2003. That would indirectly confirm indications that fresh opium had a higher moisture content in 2003, and therefore will lose more weight while drying, than was the case in the past. This higher moisture content is a result of higher rainfalls in 2003.

Table 18. Average farm-gate prices for dry opium (in US$/kg)

Region	2002	2003	number of farmers answers in 2003
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)		380 (May-July)	954
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	257 (July)	269 (May-July)	300
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)		295 (March-May)	168
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	398 (August)	465 (May- July)	984
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	422 (July)	481 (April-August)	1,206
Country weighted average*	305	**425**	**3,612**

** weighted by opium production*

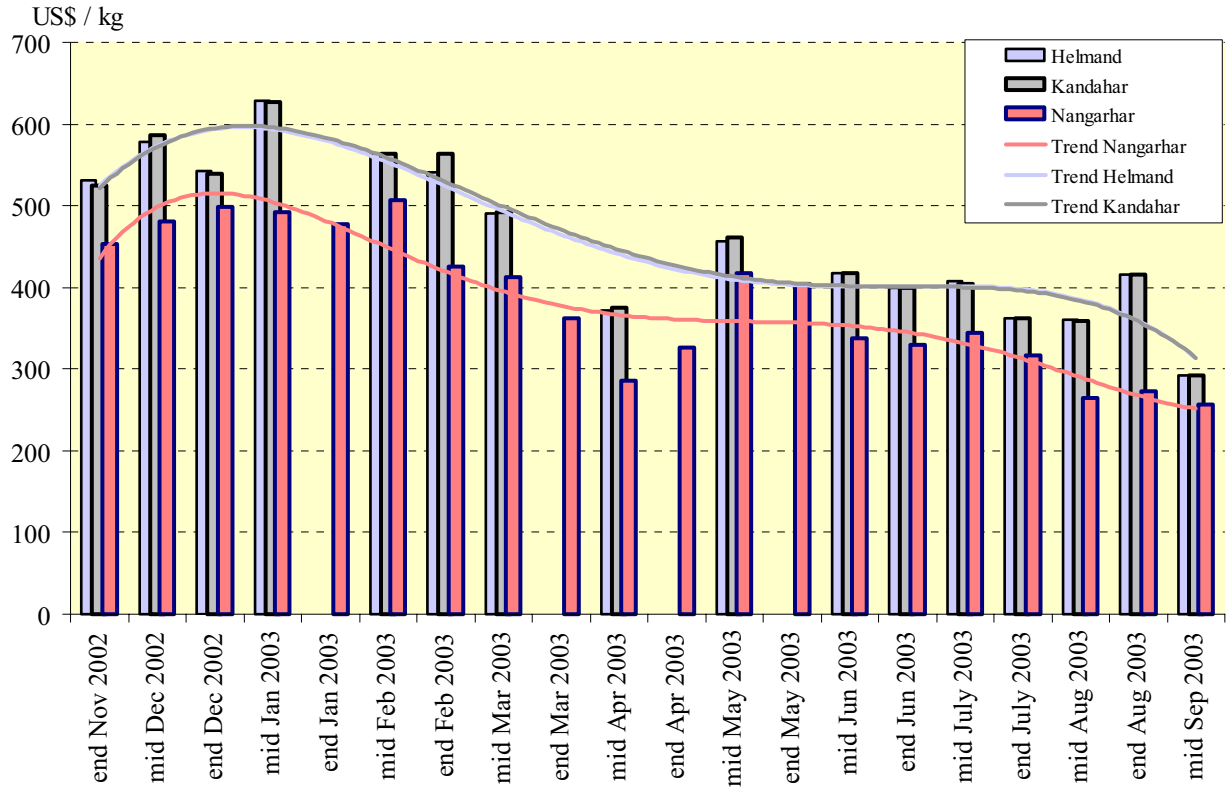
Table 19. Difference between dry and fresh opium prices for 2002 and 2003 (in percent)

Region (Province)	2002	2003
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)		46%
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	24%	53%
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)		50%
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	20%	90%
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	10%	26%

The total value of opium was calculated based on the production and prices for fresh opium obtained at the regional level.

In addition to the collection of opium prices during the annual survey, UNODC has also been monitoring the evolution of opium prices in three provinces every other week since November 2002. The data confirms the decline of opium prices since last year.

Graph 9. Afghanistan farm-gate price for dry opium (November 2002 – September 2003)



2.5. OPIUM FARMERS

For the first time, the survey also collected data to estimate the number of families cultivating opium poppy in Afghanistan this year. At the country level, the result amounts to 264,000 families, with an average of 0.3 hectare of opium poppy per family. With an estimated average of 6 to 7 members per family[1], this would represent a total population of about 1.7 million, or about 7% of the total population of Afghanistan (about 24 million in 2003[2]).

Table 20. Families cultivating opium poppy in 2003

Region	Opium poppy cultivation (ha)	Nr of families growing opium poppy	Estimated Nr of people (rounded to 500)	Average poppy area cultivated per family (ha)
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	7,690	34,400	223,500	0.22
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	13,783	56,000	364,000	0.25
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	4,460	21,400	139,000	0.21
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	24,580	79,700	518,000	0.31
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	29,970	72,500	471,500	0.41
Rounded Total	**80,000**	**264,000**	**1,716,000**	**0.3**

2.6. POTENTIAL VALUE AND INCOME

At country level, the potential farm-gate value of the opium harvested this year would amount to about US$ 1.02 billion (compared to about US$ 1.2 billion in 2002). Almost 80% of this potential income would be generated in the Eastern and Southern regions, where the main opium producing areas have been traditionally located. For comparison purposes, Afghanistan's GDP in 2002 has been estimated at US$ 4.4 billion[3]. Based on those estimates, the potential farm-gate value of Afghanistan's opium production in 2003 would be equivalent to 23% of the country's 2002 GDP. This does not include the profits subsequently made by traffickers who redistribute the opium they purchase from the farmers (including them would at least double the percentage).

At the level of the farmers engaged in opium poppy cultivation, the 2003 opium harvest would represent, on average, a potential income of about US$ 3,900 per family. This average masks regional disparities, with the Southern region reaching an average of US$ 6,800 per family, while families in the North eastern and North western regions would obtain an average of US$ 1,700. The estimates for the Eastern region and the Central region are US$ 3,800 and US$ 2,700 per family respectively. The tables below show how those numbers translate into per capita income for the farmer's families. The potential per capita income from opium would range from US$ 259 in the North western region to more than US$ 1,000 in the Southern region (and US$ 261 in the North East, US$ 412 in the North West and

[1] *FAO activities update in Afghanistan*, N° 2, p. 2, Jan 2003
[2] United Nations, Population Division, Department of Economic and Social Affairs, *World Population 2002*
[3] Asian Development Bank, *Annual Report 2002*, p. 101, 2003

US$ 587 in the Eastern region). In comparison, with a population of 24 million and a GDP of US$ 4.4 billion, the GDP per capita amounted to about US$ 184 in Afghanistan in 2002.

These estimates do not include the profits subsequently made by traffickers who collect the fresh opium from farms and local bazaars, partly process it into heroin (a growing trend), and then transfer the lot to border areas for export. In the UNODC study *The Opium Economy in Afghanistan*, the yearly income accruing to traffickers in Afghanistan was estimated at US$ 1.3 billion. Opium and heroin prices in the neighbouring countries have not declined in 2003. The income accruing to traffickers in Afghanistan this year should thus be at least as high as in 2002. If this amount was added to the farmers' income, the total income produced by opium-related activities (farming + trafficking) in Afghanistan this year would be equivalent to more than half of the country's GDP in 2002. Obviously these estimates do not take into account any possible multiplier effect of the narco-income.

Table 21. Afghanistan farm-gate opium value in 2003 (in US$)

Region	Fresh Opium Price (US$/kg)	Opium production (mt)	Potential rounded value (US$)
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	261	352	92,000,000
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	175	544	95,000,000
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	197	184	36,000,000
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	244	1,245	304,000,000
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	383	1,285	492,000,000
Rounded Total		3,600	**1,019,000,000**
Weighted Average	283		

Table 22. Average family and per capita income from opium production in 2003 (in US$)

Region	Total farm-gate opium value (US$)	Nr of families growing opium poppy	Average family income (rounded US$)	Estimated Nr of people (rounded to 500)	Average per capita income (US$)
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	92,000,000	34,400	2,700	223,500	412
North eastern (Badakhshan, Baghlan, Kunduz, Takhar)	95,000,000	56,000	1,700	364,000	261
North western (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	36,000,000	21,400	1,700	139,000	259
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	304,000,000	79,700	3,800	518,000	587
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	492,000,000	72,500	6,800	471,500	1,043
Rounded Total/Average	**1,019,000,000**	**264,000**	**3,900**	**1,716,000**	**594**

2.7. ERADICATION

Eradication activities were conducted by the Afghan authorities in some provinces. The impact was particularly noticeable in the provinces of Hilmand and Kandahar (see section on cultivation findings). The results of the eradication campaign, as reported by the Afghan authorities, are presented in annex 8. They amount to a total of 21,430 ha. The Afghanistan opium survey 2003 neither monitored, nor assessed the effectiveness of the eradication campaign, but the timing of the survey and the methodology employed ensure that the results presented in this report are post-eradication and reflect the net amount of opium poppy which was harvestable.

3. METHODOLOGY

The survey's methodology was based on a sampling approach which combined the use of satellite imagery and extensive field visits. The Rapid Assessment Survey conducted in February, prior to the launch of the main annual Opium survey, helped to identify target districts reported to be growing opium poppy for the first time in 2003. These districts were then included in the 2003 Opium Survey.

The 2003 Opium Survey provides estimates for opium poppy cultivation area, opium yield and production, opium prices, opium poppy growth calendar and number of families cultivating opium poppy in the country.

3.1. OPIUM POPPY CULTIVATION

The remote sensing approach developed in 2002 to assess poppy cultivation in the main opium growing areas of Afghanistan was expanded in 2003, from 23 pairs of high-resolution satellite image (IKONOS) to 43 pairs, covering a total of 89,200 ha of agricultural land (or 15% of the total agricultural land in these areas). Satellite images offer a reliable and objective way of estimating opium poppy cultivation and the acquisition of images is independent of field security conditions.

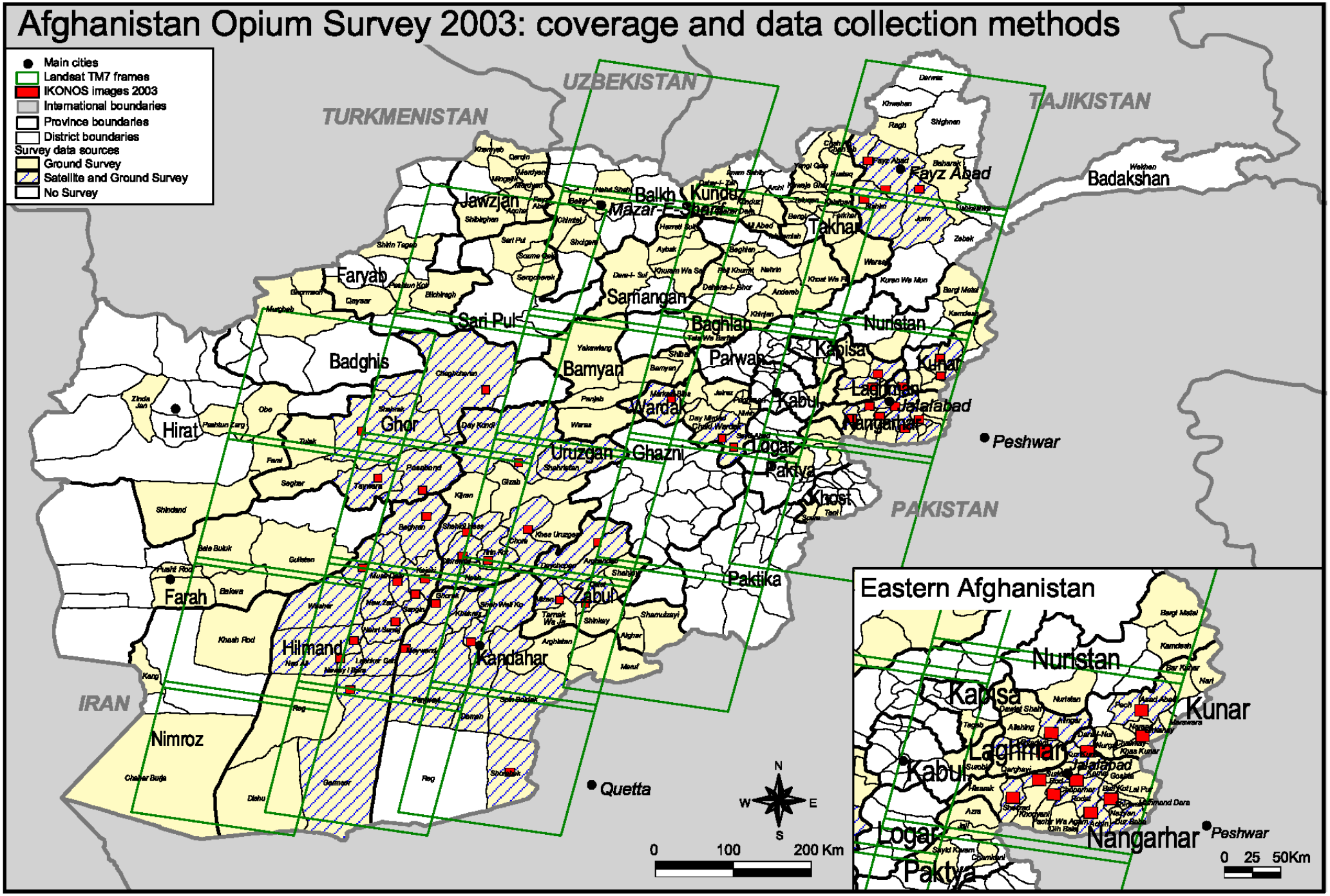
At the same time, a sample of villages was surveyed, on the ground, throughout the country to collect opium yield and socio-economic data, as well as opium poppy cultivation data in areas not covered by satellite images.

Establishment of the sampling frame

To assess poppy cultivation in the main opium growing areas, Landsat 7 images from 2002 and 2003 were used to delineate the sampling frame. The sampling frame represents the maximum extent of arable land in the area of interest. While the 30 metre ground resolution of the satellite does not allow for the identification of individual poppy fields, the total amount of land available for cultivation can be estimated. The sampling frame was derived by visually interpreting agricultural land, both irrigated and rain-fed, directly from the imagery. Essentially, the Landsat imagery were displayed and an analyst digitized the extent of agriculture. The same approach was also used in 2002 where the 1993 FAO land cover map was updated by UNODC using Landsat imagery from 1999 to 2001.

In total, 23 Landsat 7 images[1] were used to derive the extent of agricultural land in 2003. Such land cover updates help account for climatic stresses such as drought, which have affected Afghanistan for the past several years. Current land cover data gives greater confidence in subsequent estimates of poppy cultivation.

[1] See annex for list of images processed and acquisition dates.



Source: CND - UNODC Afghanistan Opium Survey 2003
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The administrative boundaries have been downloaded from Afghanistan Information Management Service, United Nations (www.aims.org.af).

Stratification of districts

Within a province, some districts may not have the same level of poppy cultivation. For example, in 2002 the districts of Dara-i-Nur and Achin did not grow the same amount of poppy, for a number of physical and socio-economic reasons. For this reason, it is best to divide the districts into two strata:

Stratum 1: High potential for poppy cultivation in the sampling frame
Stratum 2: Low potential for poppy cultivation in the sampling frame

The definition of the strata was made from the 2002 Landsat 7 land cover and the UNODC 2002 opium poppy survey data. Districts were stratified by comparing the average district cultivation area to the average provincial cultivation area. The provincial average is a ratio of the total poppy cultivation to the total area of the sampling frame in the province. The district average is a ratio of total poppy cultivation to the total area of the sampling frame in the district. For example, in Wardak where no cultivation data from previous years existed, all districts were treated in the same way (i.e. the districts were not stratified). Stratification of the districts was defined as follows:

Equation 1 – Average provincial cultivation level for 2002

$$P_{AVG} = PC_{2002} / LC_{2002}$$

Where,
P_{AVG} = Average 2002 poppy cultivation (%) over agriculture/land cover for province
PC_{2002} = Total poppy cultivation for entire province in 2002
LC_{2002} = Total sampling frame of entire province (2002 land cover data)

Equation 2 – Average district cultivation level for 2002

$$D_{AVG} = PCD_{2002} / LCD_{2002}$$

Where,
D_{AVG} = Average poppy cultivation (%) over agriculture/land cover for district
PCD_{2002} = Total poppy cultivation for entire district in 2002
LCD_{2002} = Total sampling frame of entire district (2002 land cover data)

Therefore,
If $D_{AVG} \geq P_{AVG}$, then district stratum is High Potential
If $D_{AVG} < P_{AVG}$, then district stratum is Low Potential

The purpose of stratification is to reduce the variance of the variable under study in each stratum so as to obtain a lower variance over the entire study area, or to obtain the same variance as that of a non-stratified sample using a smaller sample[2].

[2] *Deneufchatel & Porchier, 1993*

Sample selection

The sample, over which opium poppy cultivation was determined, was defined as pairs of high-resolution multi-spectral IKONOS images, each image covering a 10 kmx10 km area on the ground. Each pair is comprised of two scenes, corresponding to a pre-harvest and a post-harvest date. By accurately targeting the pre and post harvest dates of opium poppy, confusion between poppy and wheat, for example, can be minimized.

The ideal image acquisition dates for each pair were determined based on the knowledge accumulated from previous opium surveys of the opium poppy calendar and the findings of the Rapid Assessment survey conducted in February 2003. The actual acquisition dates depended on the availability of the satellite and the weather conditions around the ideal acquisition dates. The complete list of IKONOS images acquired in 2003 and their actual acquisition dates is summarized in annex.

The arable land covered by the sample amounted to 89,200 hectares, which represents a sample size of 15% of the total arable land of the districts of the ten provinces where the satellite survey was conducted. The sample size varied, however, depending on the number of IKONOS images and the extent of arable land in a province.

The locations of each pair of images, which were spatially distributed (see map), were identified using a systematic random sampling technique and then selected according to stratification criteria. Due to budgetary constraints and field security conditions, IKONOS pairs were chosen to maximize area of coverage in poppy growing areas, as well as to account for the varying opium poppy harvest dates throughout the country. Essentially, a 10km grid was superimposed over agricultural areas in a district and the IKONOS image was selected using a systematic random selection process.

Table 1. Agricultural land sampled by province

Province	Total agricultural land in the area of interest (ha)	Sampled agricultural land (ha)	Sampling rate
Nangarhar	64,066	19,928	31%
Wardak	17,036	4,346	26%
Laghman	10,896	2,573	24%
Hilmand	158,494	31,765	20%
Kunar	6,392	1,138	18%
Uruzgan	46,112	6,559	14%
Zabul	31,183	4,202	13%
Badakhshan	66,728	8,945	13%
Kandahar	134,291	7,476	6%
Ghor	43,203	2,284	5%
Rounded Total	578,400	89,200	15%

Figure 1: Image processing steps

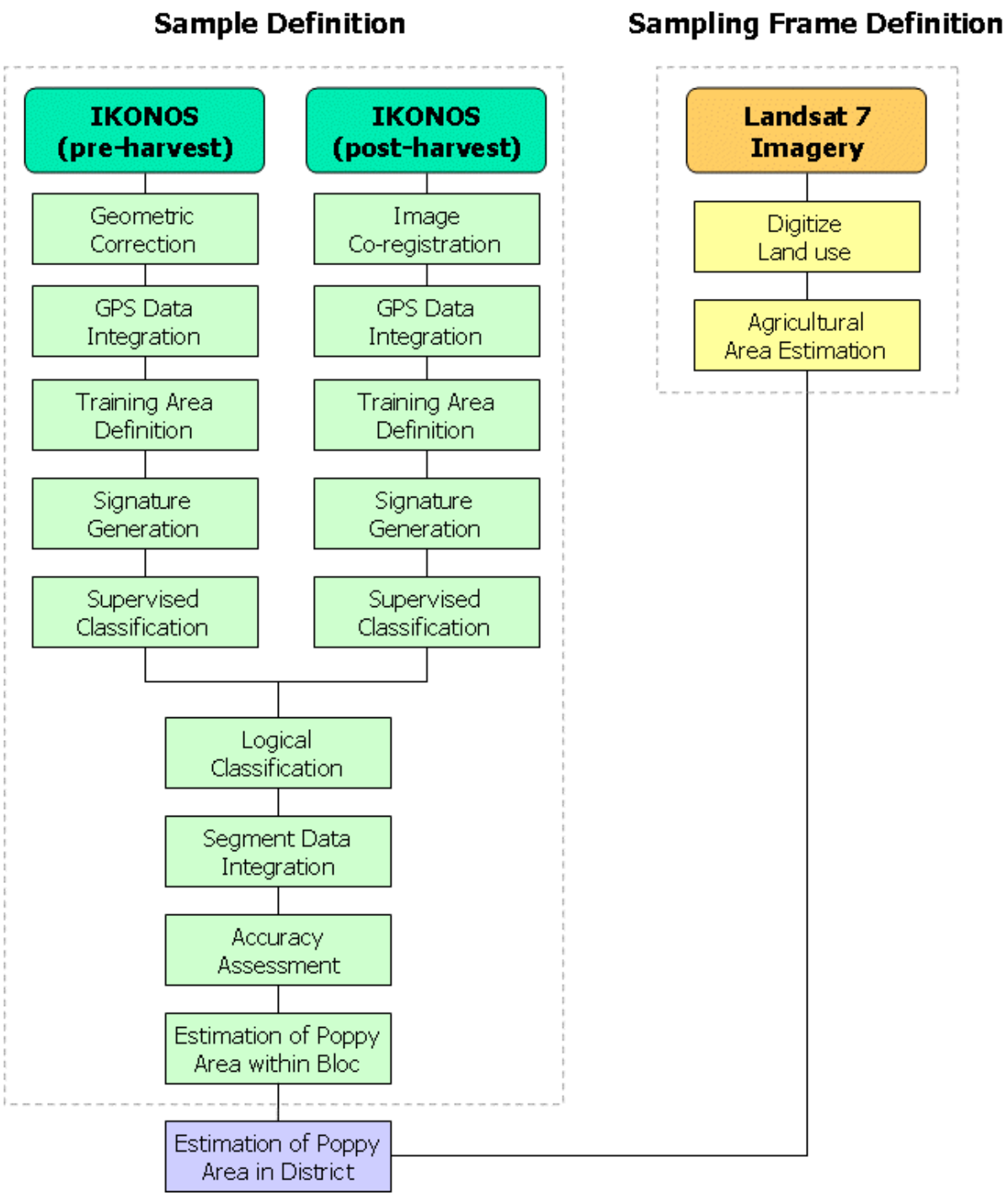


Image Processing Steps

The image processing steps can be summarized as follows:

- Visual delineation of agricultural land (i.e. the sampling frame) from Landsat 7 imagery.
- Geometric correction of the images to allow for change detection between pre- and post-harvest images.
- Identification of training areas of the various land cover types, in particular poppy and wheat/barley, to be classified from the imagery.
- Signature generation of different land cover.
- Supervised classification of the land use features.
- Logical classification comparing pre- and post-harvest poppy classifications, thus reducing the confusion between classes in the respective images.
- Summarize thematic information (i.e. the sample) showing opium poppy cultivation for each district covered by satellite imagery.
- Assess the accuracy of the classification process using field data (GPS and image segments)

Geometric correction

All remote sensing imagery is inherently subject to geometric distortions. These distortions can be minimized by employing a variety of image correction techniques to transform raw imagery to a geometrically correct base. This base can be a paper map, vector data, GPS data or another image.

Rectification is the process of transforming the data from one grid system (i.e. raw image) into another grid system (i.e. orthorectified image) using a geometric transformation, and often a suitable elevation model. Pixels in the uncorrected image do not typically match the pixels of the corrected base, thus the pixels must be re-sampled. Re-sampling is the process of extrapolating data values from the raw image to match the coordinate system of the corrected base, essentially using neighbouring pixels to fill in the “holes” created by the transformation. Co-registration is simply the mapping of one image to that of a second image.

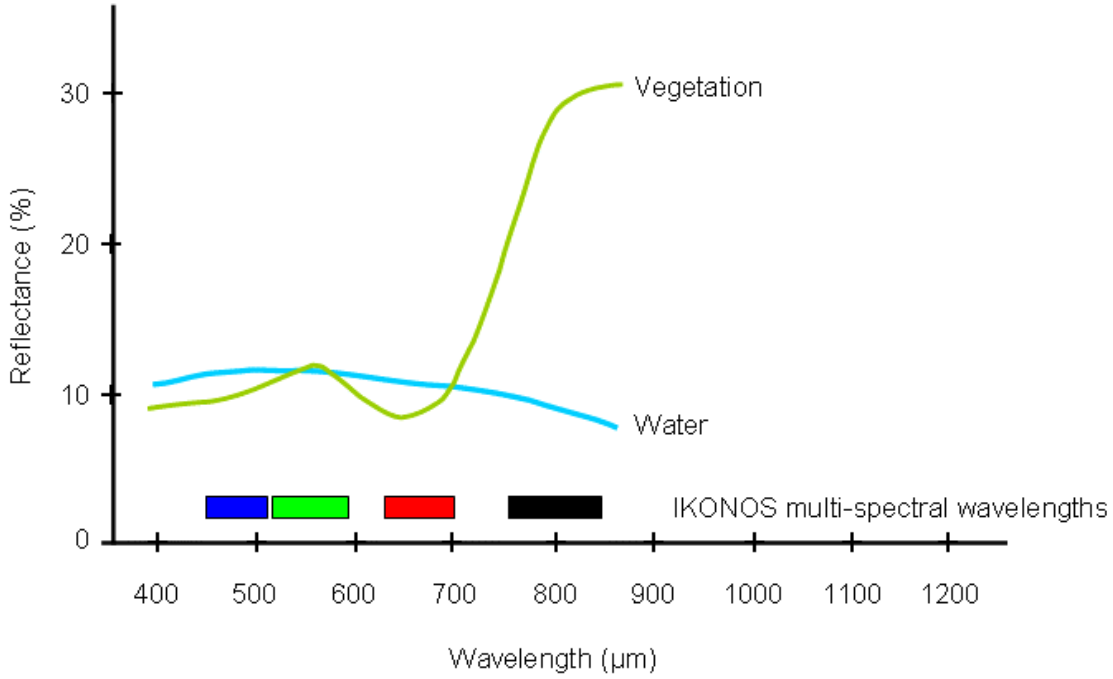
Orthorectified Landsat 7 imagery[3] acquired and processed in 2002 was used as a base to which the pre-harvest IKONOS imagery was registered[4]. Due to the lack of suitable elevation data, the IKONOS imagery could not be orthorectified; however this image-to-image geometric transformation proved suitable to allow the overlay of GPS field data. The post-harvest imagery was then co-registered to the pre-harvest imagery. It is crucial that the pre- and post-harvest imagery be extremely well co-registered to allow for logical classification (explained later in this chapter) and extraction of reliable opium poppy cultivation estimates.

[3] Courtesy of USG-CNC.
[4] With PCI software, courtesy of PCI Geometrics

Image classification overview

Satellite sensors collect information about the earth by recording reflected or radiated electromagnetic energy from a target. The relative intensity of the response from a target of a satellite sensor compared to the wavelength of incident electromagnetic radiation is referred to as spectral response. Different land cover classes will reflect electromagnetic energy with varying intensities. For example, the electromagnetic energy reflected from a poppy field will appear very different than the energy reflected from a body of water, but it may appear similar to a wheat field. Healthy vegetation reflects strongly in the green and infrared portions of the spectrum. The figure below shows an example of spectral response curves (i.e. the percentage of incident energy that is reflected from a target versus wavelength) for two typical feature classes. Confusion between the feature classes occurs where the curves are close, but where the curves diverge, features can easily be identified.

Figure 2: Spectral response curve



The primary objective of classification is to exploit the spectral differences between various targets and break the image down into discrete features or themes. For the 2003 poppy survey, the main task was to classify poppy fields, differentiating them from non-poppy fields, with as little confusion between feature classes as possible. The result from this step constitues be an input into the estimation of total opium poppy cultivation for a district. An accuracy assessment step will determine the confidence in the final classification results.

The feature classes used vary depending on the combination of image acquisition dates, but include the following:

Opium poppy ("typical" cultivation)

In most provinces in Afghanistan, opium poppy is planted and harvested according to a typical calendar. Factors that affect this calendar are temperature, availability of water, spring versus fall planting, availability of soil nutrients, labour to cultivate, etc. Knowledge of these factors helps to cue the satellite acquisitions such that the information in the pre-harvest and harvest imagery allows for optimum discrimination between opium poppy and other landcover features.

Figure 3: Poppy ("typical" cultivation)

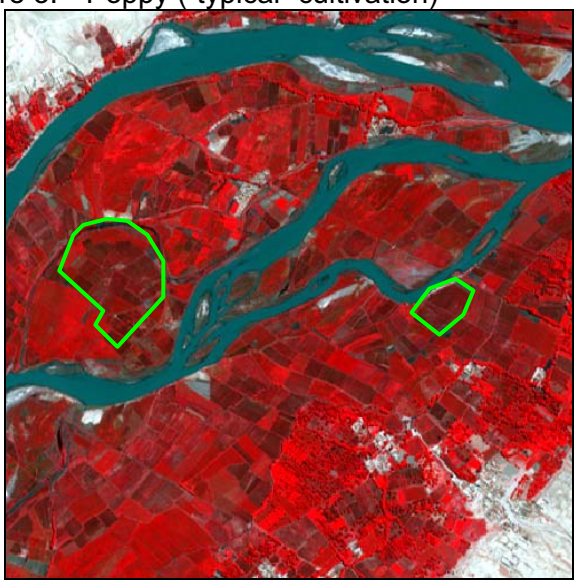


Image: IKONOS 4m multi-spectral
Band Combination: 432

Province: Uruzgan
District: Shahidi Hassas
Image Date: May 19, 2003
Feature Class: Poppy

Note:
The dark red fields in this scene are opium poppy fields, as the two areas outlined in green.

Poppy (late or staggered planting)

Within a given district, all poppy is not necessarily planted at the same time and subsequently the fields are not harvested at the same time. This means that within a given district opium poppy fields can be at several different growth stages, from gum collection to completely harvested fields. The challenge in such cases is to use the information content in both images (i.e. the pre-harvest and harvest stage), as well as detailed ground truth data to better distinguish poppy fields from other land cover types. The ground truth data is critical in helping to identify such differences.

Figure 4: **Poppy** (late or staggered planting)

Image: IKONOS 4m multi-spectral
Band Combination: 432

Province: Badakhshan
District: Fayz Abad
Image Date: June 9, 2003
Feature Class: Poppy (late planting)

Note:
The two areas outlined in green are both poppy fields. Note the different spectral signatures for each. These fields can be differentiated by incorporating ground truth information into the final classification.

Bare soil

Sloughed fields will have no vegetation, or plant residue. Bare soil has a pale grey appearance. Also included in this class are barren or rocky areas.

Figure 5: Bare soil

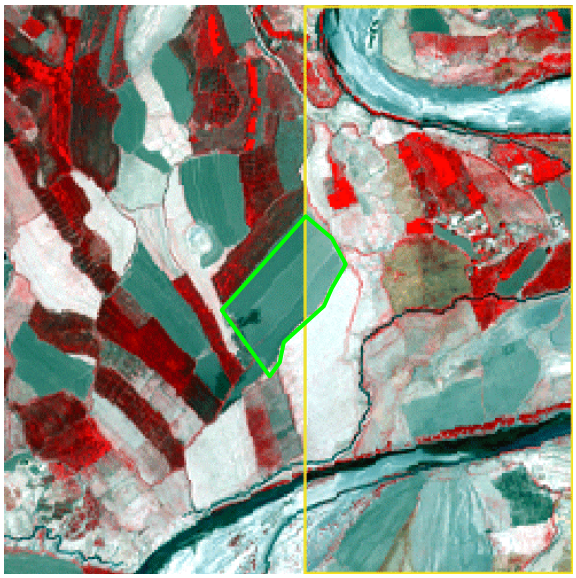


Image: IKONOS 4m multi-spectral
Band Combination: **432**

Province: Zabul
District: Qalat
Image Dates:
May 5, 2003 (left)
June 17, 2003 (right)
Feature Class: Bare soil

Note:
The area outlined in green is the bare soil feature class. Note that the spectral signature does not change between the two image dates. Such features area easily separable from poppy or wheat.

Cereals (primarily wheat and barley)

Grains, or cereal crops, are spectrally similar to poppy during the maturation stage (i.e. pre-harvest) and can cause confusion during the image classification. However, poppy and wheat ripen differently, resulting in different spectral signatures. That is, a fully ripened poppy field appears dark brown in colour, whereas a senesced wheat field is pale yellow in colour. These spectral differences can be differentiated with satellite imagery. Harvested wheat fields also typically have very bright piles of wheat residue, which is a by-product of the threshing process.

Figure 6: Cereal, harvested wheat

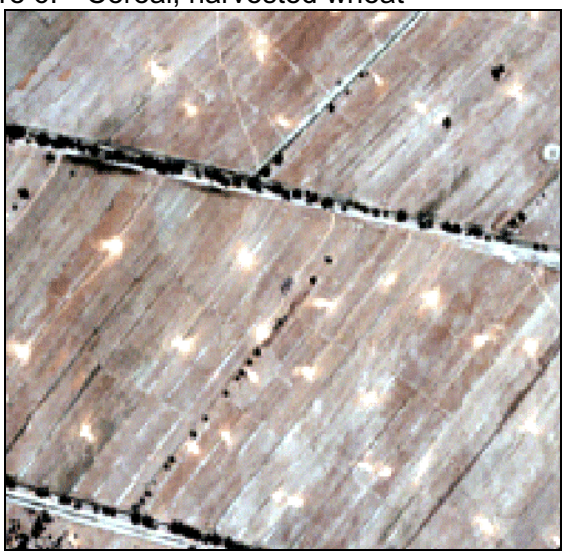


Image: IKONOS 4m multi-spectral
Band Combination: **321**

Province: Nangarhar
District: Bati Kot
Image Date: May 20, 2003
Feature Class: Harvested wheat

Note:
The bright yellow patches in the image are piles of threshed wheat. The wheat residue has a very high reflectance. Such features are easily identifiable, which aids in image classification.

Water bodies

Water bodies include canals, ponds, lakes or even flooded fields. These features have very distinctive spectral characteristics (i.e. water appears very dark in the infra-red portion of the electromagnetic spectrum).

Figure 7: Water bodies

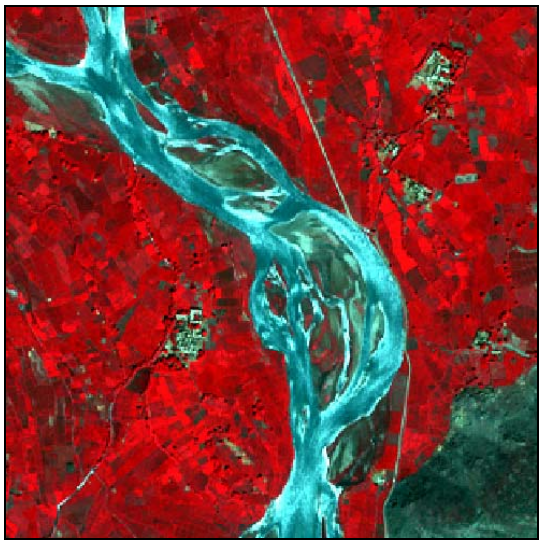


Image: IKONOS 4m multi-spectral
Band Combination: **432**

Province: Laghman
District: Mihtarlam

Image Date: April 28, 2003
Feature Class: Water

Note:
The bright feature in the centre of the image is a river. It is distinctive and easy to differentiate from agricultural land.

Urban areas & transportation corridors

This class includes villages, roads & trails, bridges, etc. These features typically have high reflectances and appear very bright in all image bands. Also, such features will not change between image dates.

Figure 8: Urban area

Image: IKONOS 4m multi-spectral
Band Combination: **432**

Province: Hilmand
District: Sangin
Image Date: May 8, 2003
Feature Class: Urban

Note:
The area outlined in green is the urban feature class. Note small patches of vegetation (red) within this area that are likely family gardens.

Pasture, grassland & fallow

These features have low biomass and therefore appear dark in the infra-red band, but are brighter in the green image band. This difference can be separated from high biomass areas, such as cropland or forested areas.

Figure 9: Pasture

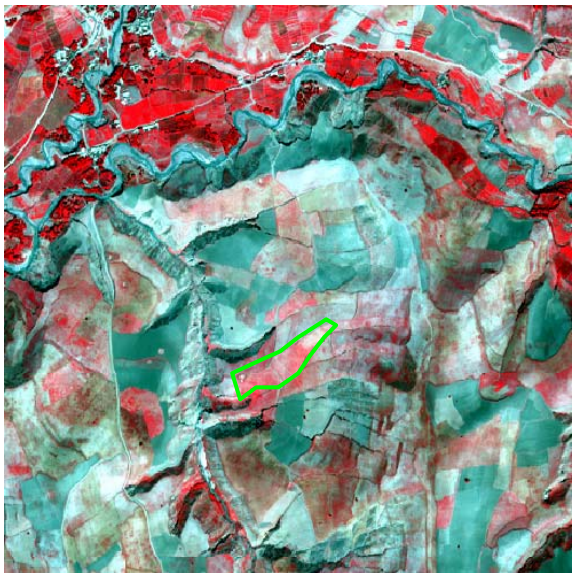


Image: IKONOS 4m multi-spectral
Band Combination: **432**

Province: Badakhshan
District: Fayz Abad
Image Date: June 9, 2003
Feature Class: Pasture

Note:
The area outlined in green is the pasture feature class. Note the patchy, pale red appearance (indicating sparse vegetation), in contrast to the intense red vegetation in the cultivated areas at the top of the image.

Forest or trees

Forested areas, hedges, and tree stands are characterized by bright signatures, particularly in the infrared portion of the spectrum, but the reflectance does not change appreciably between image dates. Tree shadows are also noticeable on IKONOS imagery.

Figure 10: Forest and trees

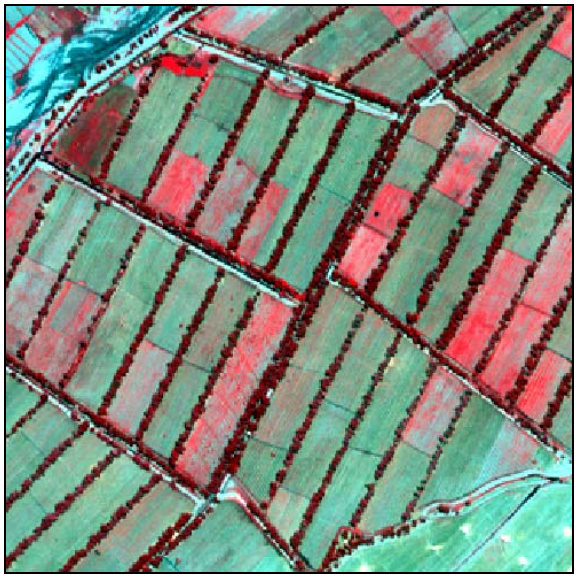


Image: IKONOS 4m multi-spectral
Band Combination: **432**

Province: Nangarhar
District: Bati Kot
Image Date: May 22, 2003
Feature Class: Forest

Note:
The agricultural fields in this scene are lined with trees. Note that they are easily identifiable, compared to the agricultural areas.

Digital image classification uses the spectral information represented by the digital numbers in one or more spectral bands of an image, and attempts to classify each individual pixel based on this information. The purpose is to assign all pixels in the image to user-defined features (i.e. water, cereals, poppy etc.). The resulting classified thematic image is comprised of pixels each of which belongs to a particular land cover or feature class. From this classification, the number of pixels in a given theme can provide valuable summary statistics about that theme or class, such as area. For example, given the area covered by a pixel, and the number of pixels classified according to a theme, the total area of that theme (i.e. wheat or poppy) can be determined.

There are two common image classification techniques: supervised and unsupervised. Unsupervised classification relies on a clustering algorithm to extract a number of themes from the input imagery. This procedure is often used to explore data to see how a classification might perform. Conversely, supervised classification relies on input from an analyst, who has prior knowledge (typically from data collected in the field) of the information content of the imagery.

Ground truth data collection

The field data collected is termed "ground truth" as it represents the situation in the real world. The ground truth data can be used to define training areas and also be used for accuracy assessment. Ground truth data collected included GPS data and image segment data.

Training area definition

GPS data were collected for a selection of fields with the intention of using these data for the definition of training areas, as well as the accuracy assessment of the final results. Five GPS locations were taken for each field corresponding to the four corners, and the middle, of a given field. The 5 points offered greater confidence in the definition of the actual field boundaries, given that GPS points can vary spatially by 40 metres or more. Surveyors were given a randomly selected list of villages and were instructed to collect data for 5 poppy fields, 3 cereal fields and 2 other crops, such as corn, rice, alfalfa, etc. If there were insufficient fields in a village, data was not collected.

Figure 11: Collection of GPS points in Badakhshan (June 2003)

Ancillary data was recorded for each field, which included: village code, village name, date of data collection, latitude and longitude, elevation, district, province and comments that would assist with the identification and classification of poppy fields. From these GPS data, training areas were drawn.

Training areas are polygons drawn by an analyst over homogeneous areas that are representative of that feature's spectral characteristics. Training areas should include only pixels from a single class, and should be selected from the centre of a field, avoiding "contaminated" edge pixels. That is, a training area for a poppy field should not contain any wheat pixels, or forest, or roads, or any feature that is not poppy. In addition, if there are two

poppy fields at different growth stages, they should be treated as separate features, as they will have different spectral characteristics. Ideally, a training area should have a representative spectral signature with a small variance. If training areas are chosen poorly (i.e. non-representative or heterogeneous pixels) then the variance will increase and the classification results will be poor. Training area selection is similar to stratification in that the intention is to maintain homogeneity within a feature (or stratum), while emphasizing heterogeneity between feature classes or strata).

Thus, the analyst "trains" the computer software to recognize a sample of characteristic features (i.e. water, cereals, poppy etc.) based on their spectral information. The computer software uses these training areas to recognize similar features elsewhere in the image. It is possible that some features, such as pasture and fallow, will be so spectrally similar that it may be impossible to separate the two classes.

GPS data collected in the field were used to orient the analyst, which assisted in the identification of the various feature classes, and thus trained the computer to recognize the same features. 55% of the GPS points were used for training areas, and 45% were used to assess the accuracy of the final classification, together with the segment data (see section on accuracy assessment). The training area data are excluded from the accuracy assessment, as they would bias the final accuracy results.

Table 2. Distribution of GPS field coordinates

Cover type	Fields used for training	Fields used for accuracy assessment	Total Fields used
Poppy	157	130	287
Cereal	132	98	230
Other	73	75	148
Total	362	303	665

Feature class signature generation

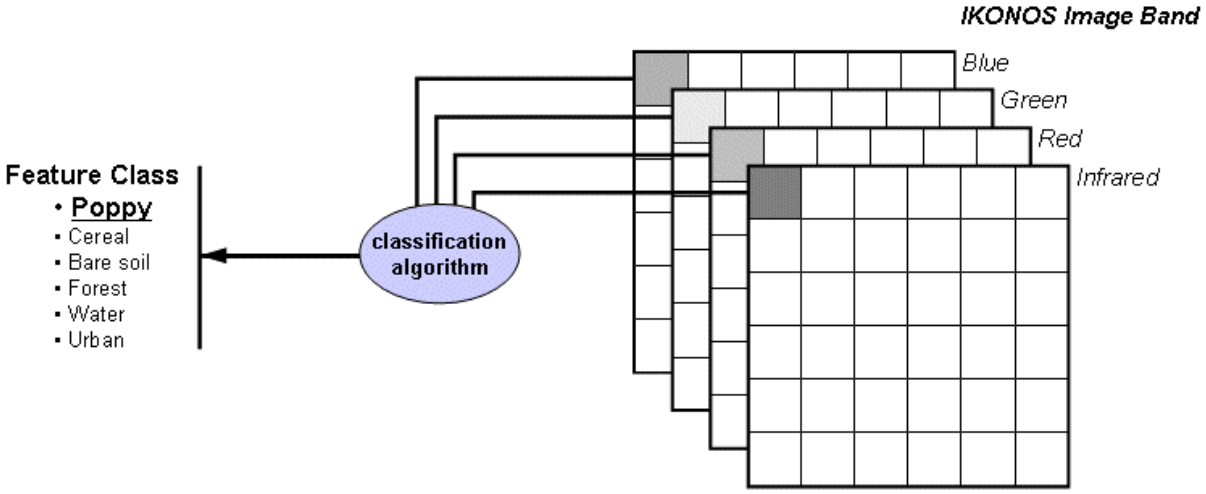
Once the training areas have been created, signatures are generated. Spectral signatures are representative pixel values, one per input image channel (see figure below), that the computer software uses as a "thumbprint" to identify other pixels.

For each feature class defined there is an associated mean and standard deviation (i.e. spectral signature) that are extracted from the imagery. These signatures are analysed by the classification algorithm and each pixel is assigned to the most appropriate feature class.

Supervised classification

The Maximum Likelihood algorithm was used to classify all IKONOS images. The Maximum Likelihood classifier uses probabilities to decide to which class a given pixel should belong. For example, the more similar a pixel value is to a class signature, the more likely it is to be assigned to that class. By the end of the classification process, all pixels are assigned to a feature class. If there is confusion between the feature classes, the chance for classification errors (i.e. omission and commission) increases. Thus the selection of representative training areas is crucial.

Figure 12: Classification process

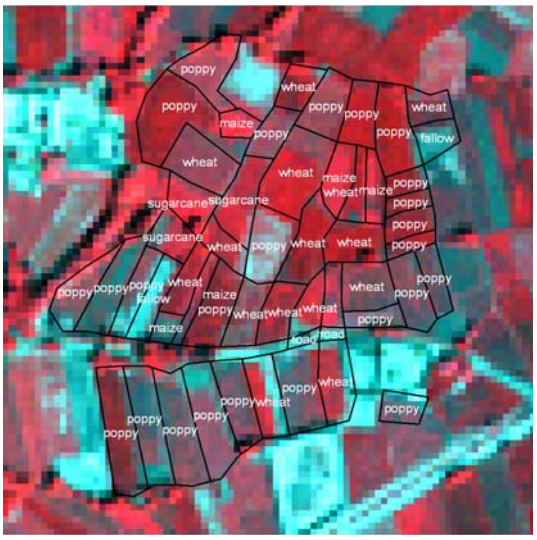


Logical classification

To reduce the risk of confusion between opium poppy and cereals fields, two images were acquired over the same ground area: a first image during the main opium growing period, and a second image after the main opium harvest. As the spectral signature of the cereals and poppy fields evolve differently, the combination of the information from the two images enabled a clearer distinction between the two crops. Poppy fields are typically harvested before wheat fields because of the economic value of the poppy crop[5], in addition to which senesced poppy fields have a distinct spectral signature compared to wheat. Lastly, when wheat is harvested the grain is threshed. This process leaves a residue in the field that is clearly evident in the satellite imagery.

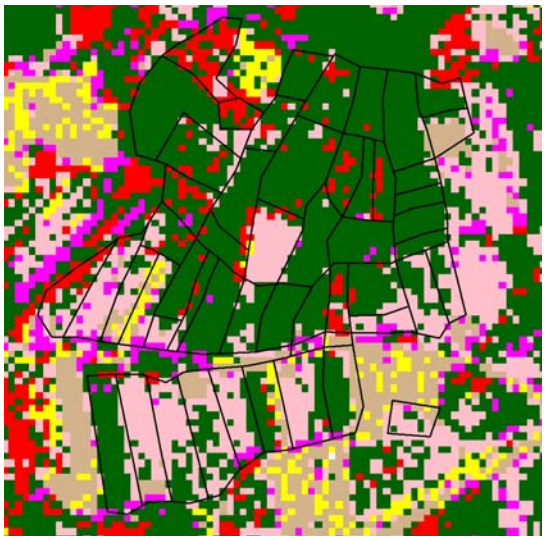
[5] Based on field observations by UNODC team.

Figure 13: Example of logical classification process (Nangahar province, Bati Kot district)

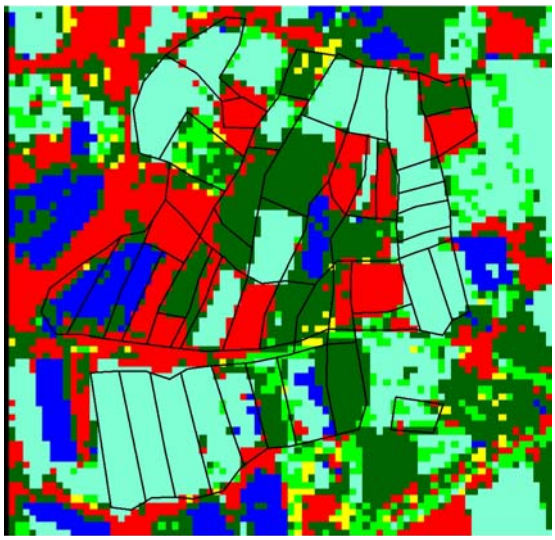


Pre-harvest image: April 12, 2003

Post-harvest image: May 20, 2003



Pre-harvest image classified



Post-harvest image classified

Final classification

Feature Classes:

- Poppy (red)
- Cereal (green)
- Other (pink)

Maps scale: 1/6,200

Once each image has been classified, the results have to be resolved, using a look-up table, into a final classification result. The look-up table (see below) provides a correspondence between the two classification results. For example, if a pixel is classified as "healthy vegetation" in the first image, the classification result from the second (post-harvest) image determines which feature class it belongs to. Ground truth data (GPS data and image segments) help resolve conflicts in the assignment of the output pixels. The look-up tables are region-specific to adapt to local environmental conditions, image acquisition dates and the poppy calendar.

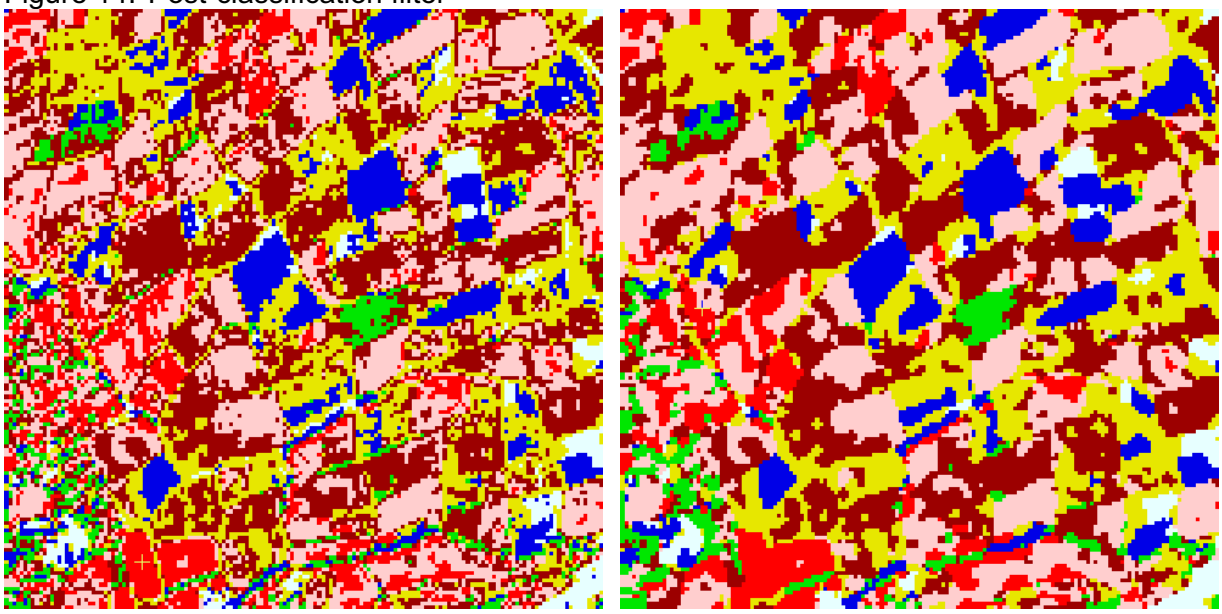
Table 3. Example of logical classification look-up table (Nangarhar province, Bati Kot district)

		Class (post-harvest)						
		Red	**Dark Green**	**Yellow**	**Cyan**	**Blue**	**Light Green**	**White**
Class (pre-harvest)	**Red**	Other	Cereal	Cereal	Poppy	Poppy	Cereal	Cereal
	Pink	Other	Cereal	Cereal	Poppy	Poppy	Cereal	Cereal
	Green	Other	Cereal	Cereal	Poppy	Poppy	Cereal	Cereal
	Purple	Other	Cereal	Cereal	Poppy	Poppy	Cereal	Other
	Yellow	Other	Other	Other	Other	Cereal	Other	Other
	Brown	Other	Other	Other	Other	Cereal	Other	Other
	White	Other	Other	Other	Other	Cereal	Other	Other

Prior to extracting the final cultivation area from the classification, the thematic image was simplified using a low-pass mode filter. A mode filter (3x3 window size) is commonly used to remove outliers from a classification, while maintaining the integrity of the classification. Filters work by calculating local statistics within a filter window and then applying the result to the centre pixel. This is repeated for every pixel in the image. For a mode filter, the more frequently occurring pixel values are maintained, while the less frequently occurring values are removed. Large filter windows (i.e. larger than 3x3) tend to modify the classification too much thus skewing the final result. The following figure shows the effects of a post-classification filter.[6]

[6] Each arbitrary colour in the classification represents a discrete feature class, such as poppy or cereals

Figure 14: Post-classification filter



Logical classification (unfiltered) Filtered classification (mode, 3x3 window)

The result of the logical classification provided, for each sample area, a ratio of opium poppy to non-poppy cultivation, which was then extrapolated to the total arable land area (i.e. sampling frame). For the districts where sample areas (i.e. IKONOS imagery) were acquired, the average cultivation area was extrapolated to the district level.

Poppy area estimation from satellite imagery

The following section describes the statistical procedure to estimate opium poppy cultivation from the satellite imagery.

$$N = \sum_{s} N_s$$

Where,

N_1 = Area of high potential for poppy cultivation in the sampling frame

N_2 = Area of low potential for poppy cultivation in the sampling frame

S = Stratum number

The total potential agricultural land in one sample area covered over a pair of IKONOS images is:

$$n = \sum n_s$$

Where,

n_s = Area of potential for poppy cultivation in strata (s) in one pair of IKONOS images

The poppy area (x) resulting from the classification of one pair of IKONOS images is described by:

$$x = \sum x_s$$

Where,

x_s = Opium poppy area resulting from the classification in strata (s) of one pair of IKONOS images

The proportion of opium poppy cultivation in each stratum (p_s) within one pair of IKONOS images was calculated as follow:

$$p_s = \frac{x_s}{n_s}$$

The extrapolation of opium poppy cultivation to the strata of the sampling frame (X_s) derived from the following formula:

$$X_s = \sum p_s N_s$$

And the total district opium poppy cultivation estimate was given by:

$$X = \sum X_s$$

The standard error of p was calculated using the following equation:

$$s_p = \sqrt{\frac{1}{N^2} \sum_s N_s (N_s - n_s) \left(\frac{p_s (1 - p_s)}{n_s - 1} \right)}$$

The approximate 95% confidence interval (CI) of the population proportion was given by:

$$95\%(CI) = (p_s \pm Z_{.025} S p_s) N_s$$

The results of these formula are presented in annex.

Accuracy assessment

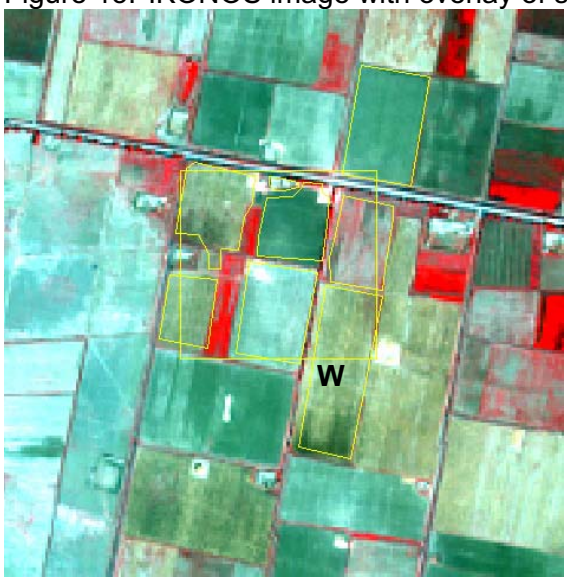
All image classifications have errors and accuracy assessment allows an analyst to evaluate the performance of image classification, using field data as a reference. For the survey, image segments and GPS data were used as reference data for this comparison.

There are two types of errors associated with image classification: errors of commission and errors of omission. Errors of commission refer to those pixels incorrectly assigned to a feature class that actually belong to another class, for instance, wheat pixels assigned to poppy class. Errors of omission refer to those pixels incorrectly excluded from a particular class, for instance, a poppy pixel excluded from the poppy class. It is important to minimize these errors where possible by selecting good training areas. These errors are evaluated in the accuracy assessment.

Segments are defined as image chips 200m x 200m in size. Paper reference maps were given to the surveyors, who then visited each segment and collected ground truth data. The following figure shows a segment (200m x 200m square block) inside which detailed ground data is collected. These data included GPS locations of the fields, crop type, growth stage, irrigation type, crop uniformity and field photos. The segment data were selected as spatially distributed, representative samples of typical land use within an IKONOS bloc.

Surveyors visited between 3 and 5, depending on the location of the segments, randomly selected sites within IKONOS blocs where 1 metre resolution panchromatic imagery was acquired. When conducting field data collection exercises using remotely sensed imagery, it is important to be able to identify ground features. In some cases, where panchromatic imagery was not available, 4 metre resolution multi-spectral imagery was used.

Figure 15: IKONOS image with overlay of segment data



Segment ID02

Province: Hilmand
District: Nad-e-Ali
Date: June 25, 2003

Each segment was assigned a code in order to differentiate it from other segments.

Within each segment, the fields were arbitrarily assigned a unique number.

Note the piles of threshed wheat visible as a bright spots on the image.

Figure 16: Field photo recorded during ground segment data collection

This photo was taken on June 12, 2003 and shows a field (indicated as **W** in the previous illustration) of harvested wheat, corresponding to post-harvest imagery.

The purpose of accuracy assessment is to identify errors in the image classification. Validation of the classification results was accomplished by comparing the poppy cultivation estimate with GPS and segment data. Each classified pixel is compared to a reference value.

The following table shows the resulting error matrix for all the ground truthing data (58 segment and 303 GPS) collected during the survey.

Table 4. Error matrix example

		Classification (ha)					
		Poppy	**Cereal**	**Other**	**Non-Agri**	**Total (ha)**	**Accuracy**
Ground Truth (ha)	**Poppy**	**21.7**	2.75	0.30	0.00	24.75	**87.7%**
	Cereal	2.42	**91.16**	4.32	4.89	102.79	**88.7%**
	Other	0.39	6.55	**37.2**	0.00	44.14	**84.3%**
	Non-Agri	0.30	0.78	0.00	**1.74**	2.82	
	Total (ha)	24.81	101.24	41.82	6.63	**174.50**	
	Accuracy	**87.5%**	**90.0%**	**88.9%**			**87.0%**

Data in the columns corresponds to the classification result, whereas the data in the rows show the ground truth data. The values in the cells represent the number of pixels assigned to that specific feature class. The values in the diagonal cells represent correctly classified pixels (represented in hectares: area of pixel x number of pixels) for a given feature class. Classification accuracies for each of the feature classes are computed by taking a ratio of correctly classified value to the total value in that class. The overall classification accuracy is computed as a ratio of the sum of the diagonal values to the total number of classified values.

The accuracy assessment was performed for 5 IKONOS images over which GPS and segment data was collected. Overall, 58 segments (200m x 200m) and 303 GPS field coordinates were used in the accuracy assessment.

Ground Survey

A sample of 1,800 villages was surveyed throughout the country to collect opium yield and socio-economic data. In 973 villages of this sample, data were also collected on the extent of opium poppy cultivation for districts not covered by satellite images. In total, 61 UNODC field surveyors visited 179 districts of 28 provinces.

Surveyors were recruited based on their previous survey experience with UNODC, their familiarity with local customs, educational background (engineers and those with agricultural experience being preferred), and physical endurance (as many of the villages are located in remote areas). Security generally proved to be problematic for the surveyors, but despite this the survey was completed according to schedule. Security problems ranged from respondents refusing to answer questions, threats of regional instability (particularly in the Eastern and South-western zones), and even physical violence and theft.

Training for the surveyors began in April 2003, in eastern Afghanistan, and then in the other zones before they were deployed to the field. Five days of formal training was given to the surveyors and included instruction in quantitative field measurements, use of GPS, and practical fieldwork. In previous years, the survey was conducted entirely by UNODC surveyors. However it should be mentioned that in 2003 a number of the surveyors were seconded from the Afghanistan Counter Narcotics Directorate's (CND) regional offices. The purpose of this was to familiarize CND staff with survey logistics, to share the workload, and for the CND surveyors to gain valuable field experience.

Establishment of the sampling frame for the ground survey

In 2003, the sampling frame for the estimation of poppy cultivation from ground survey data was the complete list of all villages in Afghanistan. Two village databases were used to establish the sampling frame: one from UNDP's Afghanistan Information Management System (AIMS) and the other village database that UNODC has maintained as part of the annual survey. Both village databases complemented each other.

The selection of the sample size was a trade-off between budgetary concerns and precision. Considering the unstable security situation in many parts of the country, and also the fact that surveying so many villages would be costly in terms of time and money, a sample survey was preferred to a census survey.

Village selection methodology

From the sampling frame, villages were selected using a stratified simple random sampling approach. Within each province, districts were divided into three groups according to poppy cultivation statistics from the 2002 poppy survey. For each district, the mean cultivation area was computed from all of the village data. In addition, the sampled villages were spatially distributed to ensure that villages were not clustered in one geographic area, which could skew further analysis. Based on the 2002 survey, a general sampling rate of 10% was adopted for village selection.

The definition of the village strata was made as follow:

If $V_{CULT} < D_{AVG}$ then high poppy cultivation potential (stratum 1)
If $V_{CULT} > D_{AVG}$ then low poppy cultivation potential (stratum 2)
If $V_{CULT} = 0$ village cultivation status is unknown (stratum 3)

Where,

D_{AVG} = Average poppy cultivation (%) over agriculture/land cover for district
V_{CULT} = Poppy cultivation area for a village reported in 2002[7]

Table 5. A priori sampling rate for villages surveyed in each stratum

	Sampling rate
Stratum 1	10%
Stratum 2	10%
Stratum 3	5%
Stratum 3	15% [8]

Blind-test

An important element in the collection and validation of ground data was the blind test. This was, in essence, a mini-survey where randomly selected villages were re-visited by different surveyors. The villages selected for the blind test was a subset of the ground sampling survey villages. The blind-test surveyors were sent out without prior knowledge of the original surveyor's data or even the identity of the surveyor, and selected villages were surveyed using the same questionnaire. The results were used for the accuracy assessment of ground survey data and showed that the ground survey was conducted properly.

[7] UNODC 2002 Afghanistan Poppy Survey
[8] For villages where UNODC had no background information about poppy cultivation levels, all villages were assumed to be in stratum 3, but were sampled with a 15% rate.

A total of 133 villages were randomly selected for the blind test. The average opium poppy cultivation area per village obtained for these villages was compared to the average opium poppy area per village obtained from the initial ground survey as follow:

Gavg = Average opium poppy cultivation from the ground survey for the villages considered for the blind test

Bavg = Average opium poppy cultivation for the villages selected for the blind test.

The hypotheses were described as follow:

- Null hypothesis: there is no difference between the results of the ground survey and the results of the blind test survey. The two samples are from the same population, or in other words, the surveyors from both surveys performed equally.

Ho : $\mu_d = 0$: Gavg – Bavg = 0

- Alternative hypothesis: there is a difference between the results of the ground survey and the results of the blind test survey. The two samples are from different populations, or in other words, the surveyors from both surveys did not perform equally.

Ha : $\mu_d \neq 0$: Gavg- Bavg <> 0

And the following formula was used : $t = \dfrac{\bar{d} - \mu_d}{\dfrac{s_d}{\sqrt{n}}}$

where

$$\bar{d} = \frac{\sum d_i}{n}$$

$d_i = GAvg_i - BAvg_i$ (i = province level)

$$s_d = \sqrt{\frac{\sum (d_i - \bar{d})^2}{n-1}}$$

The calculated t value was –1.37, which falls between the reference values of –1.96 and 1.96 (for $\alpha = 0.05$). There is therefore not enough evidence to reject the null hypothesis, and we can say that there is no significant differences between the results of the ground survey and the results of the blind test.

International supervision

In order to assist with the ground survey, international observers visited the field to participate in field data collection and validation of these data. The supervision involved interviewing the surveyors and reviewing their data collection forms. The goal was to identify possible inconsistencies in the data collection, to get an early idea of how the survey

progressed, to make note of field security concerns and to collect anecdotal information not found on the survey form. This supervision verified that the data were being collected in a correct and consistent manner.

Figure 17: Afghan surveyor and international supervisor collecting GPS coordinates of an opium poppy field in Achin District, Nangarhar Province (May 2003)

The main conclusions from the International supervision were that the surveyors were well trained and their data collection techniques were good. Supervisors heard reports of eradication by Government authorities and found that there was no appreciable poppy cultivation in or near urban areas, or along major transportation corridors. It should be noted that UN security regulations limited access to several districts. Fortunately, in those districts where International staff members were prohibited from visiting, national staff members were able to conduct the work.

Table 6. International supervision timeline

Locations visited	Date
Kandahar province (training of surveyors)	April 7 – 9, 2003
Mazar (debriefing of the surveyors)	May 6 – 10, 2003
Nangarhar & Laghman provinces: Behsud, Kama, Goshta, Bati Kot, Shinwar, Achin, Rodat, & Dih Bala districts	May 16 to 28, 2003
Badakhshan province: Fayz Abad, Kishim &Jurm districts	July 16 to 25, 2003

Area estimation

The mean poppy cultivation area, at village level, was calculated for each stratum within a district. The poppy cultivation contributions for each stratum were then summed to get the area estimate for the district. It should be noted that poppy cultivation estimates were made only for surveyed districts, and no provincial or national estimates were extrapolated from the district level. The formula used to extrapolate from the village to the district level is given as follows:

$$p_s = \sum_s \left(\frac{\mathrm{N}_s}{\mathrm{N}} \right) \overline{p_s}$$

Where,

p_s Total estimated poppy cultivation for district in stratum s
s Stratum number
$\overline{p}_s$ Mean village poppy cultivation estimate for stratum, s
N_s Number of villages in stratum, s
N Total number of villages ($N_1 + N_2 + N_3$)

For stratified simple random sampling, the formula for estimating the standard error of the mean is given by:

$$s_p = \sqrt{\frac{1}{N^2}\sum_s N_s(N_s - n_s)\left(\frac{p_s(1-p_s)}{n_s - 1}\right)}$$

Where,

s_p Standard error of the mean poppy cultivation estimate
N_s Number of villages in stratum (s)
N Total number of villages ($N_1 + N_2 + N_3$)
n_s Area of potential poppy cultivation in stratum (s)
p_s Mean village poppy cultivation estimate for stratum (s)

The results of these formula are presented in annex.

3.2. OPIUM YIELD AND PRODUCTION ESTIMATES

Data on yield were collected for both irrigated and rain-fed poppy cultivation through interviews of three farmers in each village surveyed. Data were obtained from 3,714 farmers either for yield on irrigated land or for yield on rain-fed land or for both.

The average opium yield on irrigated and rain-fed poppy land for each survey region was calculated by averaging the yields reported by the farmers. Because irrigated land produces higher yields, these statistics are computed separately.

Table 7. Number of farmers interviewed for yield

	Number of answers for irrigated fields	Number of answers for rain-fed fields
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	570	-
Northeastern (Badakhshan, Baghlan, Kunduz, Takhar)	423	228
Northwestern (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	333	108
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	870	108
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	1,293	9
Total	3,489	453

It should be noted that farmers were interviewed either just before or during the opium harvest. The data they provided therefore reflected more the expected opium yield than the actual opium yield that in most cases was yet unknown at the time of the survey.

To calculate production, average regional yield estimates were multiplied by the regional area estimates. Lower and upper production estimates were obtained by multiplying the average yield with the lower and upper area estimates.

The yield assessment methodology used in Afghanistan is dependent on farmers' reports. A more objective methodology to assess opium yield and relying on opium capsules volume and density was conducted in addition to the farmers interviews. It is intended to pursue this exercise in future surveys and eventually use this methodology to establish the average opium yield. However, in 2003, the results from this exercise were not all consistent. The reasons could be that this year's weather was more rainy than in the previous years when the formula correlating capsule volume to yield was established and/or that some surveyors also took into account opium capsules that eventually did not yield any opium gum, thereby flawing the results from the formula[9]. It was therefore decided to continue relying on farmers' estimates in 2003.

In parallel, a yield method development exercise was conducted to continue the determination of the specific correlation for Afghanistan between the opium poppy capsules volume and the opium yield. Twelve trial opium poppy fields were selected from Nangarhar (4 fields), Hilmand (4 fields), Balkh (2 fields) and Badakhshan (2 fields). Compared to the results obtained from a similar exercise in 2000, the results for 2003 tended to indicate higher opium yields. This year's results will contribute to the establishment of a more robust correlation between opium poppy capsules volume and the opium yield for Afghanistan.

3.3. OPIUM PRICES ESTIMATES

Between April and August 2003, the surveyors of the ground survey obtained data on the price of fresh opium from 2,769 farmers and data on the price of dry opium from 3,612 farmers.

The average regional values for price of fresh opium was used to estimate the total value opium production in Afghanistan in 2003.

[9] For more details on the method see "*Guidelines for yield assessment of opium gum and coca leaf from brief field visits*", UNODC, 2001.

Table 8. Number of farmers answers for opium prices

Region	Fresh opium	Dry opium
Central (Bamyan, Ghor, Kabul, Kapisa, Wardak)	546	954
Northeastern (Badakhshan, Baghlan, Kunduz, Takhar)	480	300
Northwestern (Baghis, Balkh, Faryab, Jawzjan, Samangan, Sari Pul)	243	168
Eastern (Khost, Kunar, Laghman, Nangarhar, Nuristan, Paktya)	558	984
Southern (Farah, Hilmand, Hirat, Kandahar, Nimroz, Uruzgan, Zabul)	942	1,206
Country total	**2,769**	**3,612**

Since November 2002, prices for fresh and dry opium have also been collected every other week in the provinces of Nangarhar, Hilmand and Kandahar. The sample of persons interviewed was smaller then during the ground survey, varying from 5 to 47 per period, but provided a continuous monitoring of opium market conditions in Afghanistan. Opium prices were also obtained from both farmers and traders, whereas during the ground survey, prices were only obtained from farmers.

3.4. OPIUM GROWING FAMILIES ESTIMATES

During the sample ground survey, the surveyors collected data on the number of families growing opium poppy per village within each of the three district strata.

The estimates of the number of families growing opium poppy in Afghanistan was obtained as follows:

$\bar{x}_s =$ Average number of families cultivating opium poppy per district of strata s

$N_s =$ Total number of villages per district of strata s

$n_s =$ number of villages surveyed per district of strata s

$X = \sum_s (N_s / n_s) * \bar{x}_s$ = Total number of families cultivating opium

The results were established at regional level.

Annex 1
List of satellite images and acquisition dates

IKONOS images (each 10 km x 10km)

ID	Province	District	Pre-harvest acquisition date	Image Type	Post-harvest acquisition date	Image Type
1	Helmand	Sangin	08/05/2003	4MS	6/10/2003	4MS
2	Helmand	Nadali	16/05/2003	4MS	6/25/2003	4MS
3	Nangarhar	Rodat	15/04/2003	4MS	5/28/2003	4MS
4	Uruzgan	Chora	19/05/2003	4MS	6/23/2003	4MS
5	Uruzgan	Tirin Kot	29/05/2003	1P+4MS	6/26/2003	4MS
6	Uruzgan	Dihraud	21/05/2003	4MS	6/23/2003	4MS
7	Nangarhar	Surkh Rod	21/04/2003	1P+4MS	5/21/2003	4MS
8	Nangarhar	Bati Kot	15/04/2003	1P+4MS	5/22/2003	4MS
9	Nangarhar	Sherzad	15/04/2003	4MS	5/23/2003	4MS
10	Laghman	Mihtarlam	28/04/2003	1P+4MS	5/23/2003	4MS
11	Kandahar	Arghandab	14/05/2003	4MS	6/13/2003	4MS
12	Kandahar	Maywand	08/05/2003	1P+4MS	6/21/2003	4MS
13	Helmand	Garmser	16/05/2003	1P+4MS	6/10/2003	4MS
14	Helmand	Baghran	16/05/2003	4MS	6/21/2003	4MS
15	Helmand	Kajaki	14/05/2003	4MS	6/23/2003	4MS
16	Helmand	Musa Qala	15/05/2003	4MS	6/25/2003	4MS
17	Helmand	Nawzad	21/05/2003	4MS	6/26/2003	4MS
18	Badakshan	Jurm	10/06/2003	4MS	7/16/2003	4MS
19	Badakshan	Fayz Abad	09/06/2003	4MS	7/18/2003	4MS
20	Badakshan	Kishim	09/06/2003	4MS	7/17/2003	4MS
21	Kunar	Sirkanay	17/04/2003	1P+4MS	5/21/2003	4MS
22	Nangarhar	Kuzkunar	15/04/2003	4MS	5/21/2003	4MS
23	Nangarhar	Achin	15/04/2003	4MS	5/16/2003	4MS
24	Nangarhar	Chaparhar	15/04/2003	4MS	5/16/2003	4MS
25	Kunar	Asad Abad	28/04/2003	4MS	5/22/2003	4MS
26	Laghman	Alingar	28/04/2003	4MS	5/24/2003	4MS
27	Helmand	Nahri Saraj	14/05/2003	4MS	6/10/2003	4MS
28	Helmand	Naway-i-Barakzayi	14/05/2003	4MS	6/13/2003	4MS
29	Kandahar	Shorabak	19/05/2003	4MS	6/10/2003	4MS
30	Kandahar	Ghorak	14/05/2003	4MS	6/10/2003	4MS
31	Uruzgan	Shadi Hassass	19/05/2003	4MS	6/21/2003	4MS
32	Badakshan	Shahri Buzurg	10/06/2003	4MS	7/18/2003	4MS
33	Ghor	Chackhcharan	10/06/2003	4MS	7/29/2003	4MS
34	Ghor	Sharak	03/06/2003	4MS	7/28/2003	4MS
35	Wardak	Sayd Abad	09/06/2003	4MS	7/20/2003	4MS
36	Wardak	Chaki Wardak	09/06/2003	4MS	7/20/2003	4MS
37	Zabul	Daychopan	28/05/2003	4MS	6/17/2003	4MS
38	Zabul	Mizan	19/05/2003	4MS	6/13/2003	4MS
39	Ghor	Pasaband	21/05/2003	4MS	7/28/2003	4MS
40	Zabul	Qalat	20/05/2003	4MS	6/17/2003	4MS
41	Wardak	Gardan	28/05/2003	4MS	6/26/2003	4MS
42	Ghor	Taywara	21/05/2003	4MS	7/3/2003	4MS
43	Uruzgan	Daykundi	28/05/2003	4MS	6/25/2003	4MS

4MS= Four meter resolution multispectral image

1P+4MS = One meter panchromatic + four meter multi-spectral image (also refered to as "bundle" product)

Landsat 7 TM+

Path	Row	Acquisition date (dd/mm/yy)
152	34	5/20/2003
152	35	5/20/2003
152	36	5/4/2003
152	37	5/4/2003
153	35	5/22/2003
153	36	4/9/2003
153	37	4/9/2003
153	38	4/9/2003
154	34	7/18/2002
154	35	7/18/2002
154	36	7/18/2002

Path	Row	Acquisition date (dd/mm/yy)
154	37	5/18/2003
154	38	5/18/2003
154	39	5/18/2003
155	35	7/25/2002
155	36	7/25/2002
155	37	7/25/2002
155	38	5/25/2003
155	39	5/25/2003
156	36	5/16/2003
156	37	5/16/2003
156	38	4/30/2003
156	39	4/30/2003

Annex 2

Calculation of opium poppy cultivation estimates from satellite images

Province	District	District agricultural land N	Agric land in sample n	% of poppy cultivation in the sample p	District poppy cultivation on irrigated land	District poppy cultivation on rain-fed land	District poppy cultivation X	95% Confidence interval (+/-)
Badakhshan	Fayz Abad	6,526	1,373	47%	2,791	318	3,109	152
Badakhshan	Jurm	12,235	1,587	37%	4,502	0	4,502	271
Badakhshan	Kishim	7,967	1,689	54%	4,278	252	4,530	168
Badakhshan	Shahri Buzurg	40,000	4,296	1%	307	308	615	99
Ghor	Chaghcharan	17,172	668	7%	1,189		1,189	324
Ghor	Pasaband	4,188	428	19%	805		805	148
Ghor	Shahrak	15,252	571	4%	640		640	166
Ghor	Taywara	6,591	617	12%	808		808	162
Hilmand	Baghran	6,134	943	38%	2,309		2,309	175
Hilmand	Garmser	21,235	3,770	2%	462		462	90
Hilmand	Kajaki	13,747	4,997	10%	1,392		1,392	92
Hilmand	Lashkar Gah	10,926	no sample	6%	605		605	26
Hilmand	Musa Qala	13,188	2,659	19%	2,455		2,455	175
Hilmand	Nad Ali	24,079	6,945	4%	870		870	89
Hilmand	Nahri Sarraj	19,739	4,500	8%	1,575		1,575	138
Hilmand	Naw Zad	10,572	502	29%	3,096		3,096	411
Hilmand	Naway i Barakzayi	29,117	6,269	4%	1,240		1,240	129
Hilmand	Sangin	6,946	1,180	11%	777		777	114
Hilmand	Washer	2,811	no sample	21%	590		590	29
Kandahar	Arghandab	8,136	4,915	2%	139		139	19
Kandahar	Daman	20,980	no sample	2%	357		357	48
Kandahar	Ghorak	2,129	615	8%	166		166	38
Kandahar	Kandahar	17,209	no sample	2%	293		293	39
Kandahar	Khakrez	4,517	no sample	7%	312		312	29
Kandahar	Maywand	6,497	846	5%	353		353	93
Kandahar	Panjwayi	28,331	no sample	2%	482		482	64
Kandahar	Shah Wali Ko	28,814	no sample	2%	489		489	66
Kandahar	Spin Boldak	16,278	no sample	2%	277		277	37
Kandahar	Shorabak	1,400	1,100	8%	111		111	11
Kunar	Asad Abad	2,243	255	18%	396		396	99
Kunar	Pech	2,500	157	12%	310		310	125
Kunar	Sirkanay	1,649	726	9%	141		141	25
Laghman	Alingar	5,222	1,224	7%	354		354	65
Laghman	Mihtarlam	5,674	1,349	6%	366		366	66
Nangarhar	Achin	4,053	637	53%	2,131		2,131	144
Nangarhar	Bati Kot	11,925	5,136	17%	1,994		1,994	93
Nangarhar	Chaparhar	3,577	2,317	33%	1,169		1,169	41
Nangarhar	Dara-I-Nur	2,013	618	1%	24		24	15
Nangarhar	Dur Baba	325	no sample	9%	31		31	2
Nangarhar	Kama	5,934	no sample	9%	558		558	29
Nangarhar	Kuz Kunar	2,655	1,115	4%	102		102	23
Nangarhar	Rodat	14,000	882	24%	3,313		3,313	381
Nangarhar	Sherzad	6,254	4,364	26%	1,641		1,641	45
Nangarhar	Shinwar	5,662	2,203	29%	1,616		1,616	84
Nangarhar	Surkh Rod	7,668	2,656	2%	118		118	29
Uruzgan	Chora	7,001	420	14%	975		975	225
Uruzgan	Day Kundi	12,963	1,054	6%	836		836	184
Uruzgan	Dihrawud	8,275	2,389	15%	1,282		1,282	101
Uruzgan	Nesh	921	no sample	6%	59		59	13
Uruzgan	Shahidi Hass	6,532	1,352	20%	1,333		1,333	125
Uruzgan	Shahristan	6,532	no sample	6%	415		415	92
Uruzgan	Tirin Kot	3,888	1,344	12%	469		469	55
Wardak	Chaki Wardak	2,066	740	10%	211		211	36
Wardak	Markazi Bihs	10,005	1,568	5%	472		472	97
Wardak	Sayd Abad	4,965	2,038	4%	192		192	32
Zabul	Arghandab	7,015	no sample	4%	302		302	53
Zabul	Daychopan	15,000	2,369	4%	646		646	113
Zabul	Mizan	2,068	195	15%	309		309	99
Zabul	Qalat	7,100	1,638	10%	689		689	88

Annex 3 (page 1 of 2)
Calculation of opium poppy cultivation estimates from ground survey

Province	District	Number of villages in the district strata	Number of village surveyed in the district	District poppy cultivation on irrigated land	District poppy cultivation on rain-fed land	District poppy cultivation	95% confidence interval (+/-)
Badghis	Ghormach	3	1	44	57	101	31
Badghis	Murghab	6	3	26	44	69	32
Baghlan	Andarab	70	7	301	0	301	8
Baghlan	Baghlan	50	5	16	0	16	4
Baghlan	Dahana-I- Ghori	50	5	0	37	37	1
Baghlan	Khinjan	48	7	9	0	9	1
Baghlan	Khost Wa Firing	97	13	19	2	21	2
Baghlan	Nahrin	86	14	22	41	63	2
Baghlan	Puli Khumri	92	4	37	0	37	5
Baghlan	Tala Wa Barfak	76	10	95	18	113	6
Balkh	Balkh	41	7	332	0	332	68
Balkh	Chahar Bolak	36	5	68	0	68	4
Balkh	Chimtal	80	13	569	47	617	86
Balkh	Dihdadi	19	5	26	8	35	10
Balkh	Nahri Shahi	20	6	30	0	30	2
Balkh	Sholgara	29	2	18	10	28	2
Bamyan	Bamyan	143	22	20	0	20	1
Bamyan	Panjab	439	66	250	0	250	1
Bamyan	Shibar	107	17	36	0	36	2
Bamyan	Waras	611	85	191	0	191	1
Bamyan	Yakawlang	243	38	112	0	112	2
Farah	Bala Buluk	31	4	380	133	513	106
Farah	Gulistan	54	9	1,187	0	1,187	133
Faryab	Bilchiragh	11	4	114	118	232	52
Faryab	Pashtun Kot	28	3	113	168	281	7
Faryab	Qaysar	11	3	78	72	150	30
Faryab	Shirin Tagab	5	2	54	49	103	75
Ghor	Saghar	108	12	256	0	256	14
Ghor	Tulak	197	12	84	0	84	2
Hilmand	Dishu	80	2				0
Hirat	Farsi	120	6	134	0	134	7
Hirat	Obe	60	3	0	0	0	0
Hirat	Pashtun Zarghun	130	10	0	0	0	0
Hirat	Shindand	130	10	0	0	0	0
Hirat	Zinda Jan	60	3	0	0	0	0
Jawzjan	Aqcha	47	6	171	0	171	36
Jawzjan	Fayz Abad	34	5	280	0	280	42
Jawzjan	Khamyab	13	1	51	0	51	15
Jawzjan	Mardyan	21	4	228	0	228	36
Jawzjan	Mingajik	28	5	64	0	64	8
Jawzjan	Qarqin	20	7	58	0	58	9
Jawzjan	Shibirghan	16	4	36	0	36	16
Kabul	Surobi	140	13	152	85	237	10
Kandahar	Arghistan	213	14	14	0	14	5
Kandahar	Maruf	167	11	63	0	63	6
Kapisa	Tagab	120	10	326	0	326	27
Khost	Spera	49	4	118	0	118	20
Khost	Tani	30	2	170	87	257	68
Kunar	Bar Kunar	51	12	108	55	163	13
Kunar	Chawkay	31	6	83	0	83	56
Kunar	Khas Kunar	33	5	0	0	0	0
Kunar	Marawara	27	5	345	0	345	20
Kunar	Narang	31	7	141	32	173	3
Kunar	Nari	30	6	60	0	60	8
Kunar	Nurgal	33	6	353	0	353	81
Kunduz	Ali Abad	50	5	3	2	5	2
Kunduz	Chahar Dara	70	7	15	0	15	6
Kunduz	Khan Abad	44	6	11	0	11	3

Annex 3 (page 2 of 2)
Calculation of opium poppy cultivation estimates from ground survey

Province	District	Number of villages in the district strata	Number of village surveyed in the district	District poppy cultivation on irrigated land	District poppy cultivation on rain-fed land	District poppy cultivation	95% confidence interval (+/-)
Kunduz	Kunduz	54	7	9	0	9	5
Kunduz	Qalay-I- Zal	70	7	8	0	8	1
Laghman	Alishing	55	9	145	3	148	31
Laghman	Dawlat Shah	56	5	571	0	571	24
Laghman	Qarghayi	81	12	468	0	468	39
Nangarhar	Dih Bala	67	9	927	0	927	80
Nangarhar	Goshta	37	7	13	1	13	5
Nangarhar	Hisarak	79	14	1,016	0	1,016	53
Nangarhar	Jalal Abad	71	9	4	0	4	1
Nangarhar	Khogyani	98	13	2,986	0	2,986	103
Nangarhar	Lal Pur	41	6	1	0	1	0
Nangarhar	Muhmand Dara	43	6	19	0	19	4
Nangarhar	Nazyan	30	4	96	2	98	12
Nangarhar	Pachir Wa Agam	68	9	1,142	0	1,142	44
Nimroz	Chahar Burjak	60	3	0	0	0	0
Nimroz	Kang	40	2	0	0	0	0
Nimroz	Khash Rod	28	4	26	0	26	4
Nuristan	Bargi Matal	19	2	0	0	0	0
Nuristan	Kamdesh	24	2	203	7	210	53
Nuristan	Nuristan	40	4	148	290	438	33
Paktya	Azra	120	7	419	0	419	39
Paktya	Chamkani	37	6	76	0	76	5
Paktya	Jaji	60	10	185	0	185	7
Paktya	Sayid Karam	36	6	41	0	41	1
Samangan	Aybak	80	6	6	7	14	4
Samangan	Dara-I- Suf	20	2	0	34	34	0
Samangan	Hazrati Sultan	46	6	8	21	29	1
Samangan	Khuram Wa Sarba	46	3	10	14	24	4
Sari Pul	Sangcharak	100	6	260	193	453	11
Sari Pul	Sari Pul	50	8	595	0	595	75
Sari Pul	Sozma Qala	10	2	380	0	380	161
Takhar	Bangi	13	1	20	0	20	4
Takhar	Chah Ab	13	2	0	4	4	1
Takhar	Farkhar	13	2	4	39	43	2
Takhar	Ishkamish	13	1	8	69	77	5
Takhar	Kalafgan	13	4	0	77	77	7
Takhar	Khwaja Ghar	27	6	13	13	26	2
Takhar	Rustaq	13	4	17	17	34	8
Takhar	Taluqan	13	6	14	0	14	2
Takhar	Warsaj	13	2	14	0	14	8
Takhar	Yangi Qala	27	4	45	26	71	12
Uruzgan	Gizab	200	10	776	0	776	10
Uruzgan	Khas Uruzgan	87	7	580	0	580	215
Uruzgan	Kijran	106	14	395	23	418	11
Wardak	Day Mirdad	121	5				0
Wardak	Hisa-I- Awali Bihsu	174	27	22	0	22	1
Wardak	Jalrez	92	15	531	0	531	11
Wardak	Maydan Shahr	50	6	527	0	527	32
Wardak	Nirkh	130	18	780	0	780	10
Zabul	Atghar	129	12	188	0	188	4
Zabul	Shahjoy	148	21	178	0	178	4
Zabul	Shamulzayi	194	27	65	0	65	1
Zabul	Shinkay	103	14	164	0	164	4

Annex 4 (page 1 of 5)

Afghanistan opium poppy cultivation estimates (ha), 2003

Province	District	Previous UNODC survey estimates									2003	CI (+/-)
		1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*		
Badakhshan	Baharak	*111*	*64*	*116*	*9*	*202*	*23*	*86*	*345*	*180*		
	Fayz Abad	*77*	*2,344*	*1,592*	*1,634*	*1,282*	*906*	*1,073*	*868*	*2,370*	3,109	*152*
	Ishkashim	*0*	*0*	*3*	*0*	*0*	*0*	*0*	*0*			
	Jurm	*433*	*555*	*1,326*	*1,051*	*1,198*	*1,249*	*773*	*2,897*	*2,690*	4,502	*271*
	Khwahan								*0*			
	Kishim	*1,093*	*3*	*177*	*62*	*62*	*385*	*507*	*2,191*	*2,840*	4,530	*168*
	Kuran Wa Munjan											
	Ragh	*0*	*0*	*8*	*31*	*2*	*8*	*0*	*0*			
	Shahri Buzurg	*0*	*0*	*0*	*0*	*71*	*113*	*19*	*41*	*170*	615	*99*
	Zebak	*0*	*4*	*8*	*115*	*0*	*0*	*0*				
Badakhshan Total		***1,714***	***2,966***	***3,230***	***2,902***	***2,817***	***2,684***	***2,458***	***6,342***	***8,250***	***12,756***	***689***
Badghis	Ghormach							*20*	*0*	*4*	101	*31*
	Murghab							*21*	*0*	*22*	69	*32*
Badghis Total		***0***	***0***	***0***	***0***	***0***	***0***	***41***	***0***	***26***	***170***	***63***
Baghlan	Andarab								*81*	*31*	301	*8*
	Baghlan							*152*	*0*	*120*	16	*4*
	Dahana-I- Ghori				*328*	*929*	*967*	*27*	*0*	*0*	37	*1*
	Khinjan										9	*1*
	Khost Wa Firing										21	*2*
	Nahrin								*1*		63	*2*
	Puli Khumri						*38*	*20*	*0*	*1*	37	*5*
	Tala Wa Barfak										113	*6*
Baghlan Total		***0***	***0***	***0***	***328***	***929***	***1,005***	***199***	***82***	***152***	**597**	***28***
Balkh	Balkh				*13*	*29*	*29*	*82*	*1*	*22*	332	*68*
	Chahar Bolak				*165*	*530*	*2,600*	*53*	*0*	*0*	68	*4*
	Chimtal			*1,065*	*532*	*485*	*1,428*	*2,451*	*0*	*153*	617	*86*
	Dawlat Abad								*3*	-		
	Dihdadi							*22*	*0*	*8*	35	*10*
	Nahri Shahi							*33*	*0*	*14*	30	*2*
	Sholgara							*28*	*0*	*19*	28	*2*
Balkh Total		***0***	***0***	***1,065***	***710***	***1,044***	***4,057***	***2,669***	***4***	***217***	**1,108**	***171***
Bamyan	Bamyan										20	*1*
	Panjab										250	*1*
	Shibar										36	*2*
	Waras										191	*1*
	Yakawlang										112	*2*
Bamyan Total											**610**	***7***
Farah	Bakwa		*1*	*13*	*129*	*31*	*129*	*259*	*0*			
	Bala Buluk		*8*	*19*	*169*	*36*	*186*	*183*	*0*		513	*106*
	Farah			*18*	*18*	*10*	*44*	*73*	*0*			
	Gulistan			*581*	*252*	*94*	*428*	*849*	*0*		1,187	*133*
	Pusht Rod											
Farah Total		***0***	***9***	***631***	***568***	***171***	***787***	***1,364***	***0***	***500***	**1,700**	***239***
Faryab	Almar											
	Bilchiragh							*6*	*0*	*26*	232	*52*
	Maymana							*1*	*0*	*0*		
	Pashtun Kot							*11*	*0*	*1*	281	*7*
	Qaysar							*16*	*0*	-	150	*30*
	Shirin Tagab							*3*	*0*	-	103	*75*
Faryab Total		***0***	***0***	***0***	***0***	***0***	***0***	***36***	***0***	***28***	**766**	***164***
Ghazni	Ajristan	*313*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	-		
Ghazni Total		***313***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***		
Ghor	Chaghcharan									*700*	1,189	*324*

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Afghanistan opium poppy cultivation estimates (ha), 2003

Province	District	Previous UNODC survey estimates									2003	CI (+/-)
		1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*		
	Lal Wa Sarja											
	Pasaband									*700*	805	*148*
	Saghar									*300*	256	*14*
	Shahrak										640	*166*
	Taywara									*500*	808	*162*
	Tulak										84	*2*
Ghor Total										***2,200***	**3,782**	***816***
Hilmand	Baghran		*2,519*	*1,267*	*2,754*	*2,910*	*2,794*	*2,653*	*0*	*1,800*	2,309	*175*
	Dishu								*0*	-	0	*0*
	Garmser	*786*	*725*	*942*	*1,993*	*1,205*	*2,643*	*2,765*	*0*	*2,020*	462	*90*
	Kajaki	*979*	*4,087*	*2,814*	*3,904*	*3,959*	*5,746*	*4,625*	*0*	*2,640*	1,392	*92*
	Lashkar Gah	*2,256*	*885*	*1,054*	*1,325*	*1,869*	*2,528*	*3,145*	*0*	*1,140*	605	*26*
	Musa Qala	*1,154*	*5,137*	*3,924*	*4,360*	*5,574*	*7,013*	*5,686*	*0*	*3,690*	2,455	*175*
	Nad Ali	*12,529*	*5,983*	*4,035*	*5,102*	*5,156*	*8,667*	*8,323*	*0*	*5,880*	870	*89*
	Nahri Sarraj	*590*	*4,716*	*4,309*	*4,807*	*2,426*	*4,041*	*4,378*	*0*	*1,850*	1,575	*138*
	Naw Zad	*2,345*	*2,799*	*3,596*	*1,585*	*3,605*	*4,424*	*5,085*	*0*	*2,650*	3,096	*411*
	Naway i Barakzayi	*6,074*	*1,254*	*505*	*722*	*1,150*	*2,581*	*3,246*	*0*	*2,730*	1,240	*129*
	Reg							*222*	*0*	*1,940*		
	Sangin	*2,866*	*973*	*1,909*	*1,971*	*1,734*	*2,646*	*1,711*	*0*	*2,810*	777	*114*
	Washer		*676*	*555*	*877*	*1,084*	*1,469*	*1,014*	*0*	*800*	590	*29*
Hilmand Total		***29,579***	***29,754***	***24,910***	***29,400***	***30,672***	***44,552***	***42,853***	***0***	***29,950***	**15,371**	***1,465***
Hirat	Farsi										134	*7*
	Obe										0	*0*
	Pashtun Zarghun	*0*	*0*	*0*	*38*	*0*	*0*	*38*	*0*		0	*0*
	Shindand							*146*	*0*		0	*0*
	Zinda Jan								*0*		0	*0*
Hirat Total		***0***	***0***	***0***	***38***	***0***	***0***	***184***	***0***	***50***	**134**	***7***
Jawzjan	Aqcha						*532*	*208*	*0*	*47*	171	*36*
	Fayz Abad						*43*	*105*	*0*	*24*	280	*42*
	Khamyab							*6*		*30*	51	*15*
	Mardyan						*43*	*111*	*0*	*4*	228	*36*
	Mingajik						*1,789*	*141*	*0*	*7*	64	*8*
	Qarqin						*186*	*10*	*0*	*24*	58	*9*
	Shibirghan							*19*	*0*	*1*	36	*16*
Jawzjan Total		***0***	***0***	***0***	***0***	***0***	***2,593***	***600***	***0***	***137***	**888**	***161***
Kabul	Surobi						*132*	*340*	*29*	*58*	237	*10*
Kabul Total		***0***	***0***	***0***	***0***	***0***	***132***	***340***	***29***	***58***	**237**	***10***
Kandahar	Arghandab	*211*	*87*	*331*	*561*	*399*	*750*	*459*	*0*	*330*	139	*19*
	Arghistan						*38*	*13*	*0*	*80*	14	*5*
	Daman						*110*	*50*	*0*	*190*	357	*48*
	Ghorak	*347*	*803*	*692*	*1,503*	*1,126*	*1,109*	*574*	*0*	*380*	166	*38*
	Kandahar	*320*	*53*	*234*	*21*	*73*	*227*	*156*	*0*	*640*	293	*39*
	Khakrez	*362*	*274*	*627*	*286*	*518*	*632*	*320*	*0*	*560*	312	*29*
	Maruf	*30*	*16*	*1*	*0*	*3*	*5*	*17*	*0*	-	63	*6*
	Maywand	*256*	*333*	*618*	*1,278*	*2,497*	*2,022*	*995*	*0*	*1,090*	353	*93*
	Panjwayi	*250*	*357*	*266*	*255*	*134*	*132*	*184*	*0*	*150*	482	*64*
	Shah Wali Ko	*678*	*97*	*94*	*127*	*162*	*236*	*238*	*0*	*260*	489	*66*
	Spin Boldak	*1,170*	*107*	*194*	*91*	*317*	*261*	*26*	*0*	*290*	277	*37*
	Shorabak										111	*11*
Kandahar Total		***3,624***	***2,127***	***3,057***	***4,122***	***5,229***	***5,522***	***3,034***	***0***	***3,970***	**3,055**	***441***
Kapisa	Tagab						*5*	*104*	*0*	*207*	326	*27*
Kapisa Total		***0***	***0***	***0***	***0***	***0***	***5***	***104***	***0***	***207***	**326**	***27***
Khost	Jaji Maydan											

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Afghanistan opium poppy cultivation estimates (ha), 2003

Province	District	Previous UNODC survey estimates									2003	CI (+/-)
		1994	1995	1996	1997	1998	1999	2000	2001	2002		
	Spera								0	-	118	20
	Tani								6	-	257	68
Khost Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**375**	**88**
Kunar	Asad Abad						73	239	1	140	396	99
	Bar Kunar						47	72	31	40	163	13
	Chawkay	13	11	0	0	8	9	50	8	140	83	56
	Dangam								4	49		
	Khas Kunar	75	82	10	0	12	50	173	0	70	0	0
	Marawara										345	20
	Narang		15	1	0	13	27	84	10	100	173	3
	Nari								1	-	60	8
	Nurgal	27	19	5	0	8	28	98	9	70	353	81
	Pech								11	263	310	125
	Sirkanay		25	2	0	34	54	71	8	100	141	25
Kunar Total		**115**	**152**	**18**	**0**	**75**	**288**	**786**	**82**	**972**	**2,025**	**431**
Kunduz	Ali Abad						5	51	0	3	5	2
	Chahar Dara						8	30	0	6	15	6
	Imam Sahib						3	0		-		
	Khan Abad						2	36	0	-	11	3
	Kunduz						9	51	0	3	9	5
	Qalay-I- Zal						11	321	0	5	8	1
Kunduz Total		**0**	**0**	**0**	**0**	**0**	**38**	**489**	**0**	**16**	**49**	**17**
Laghman	Alingar	0	0	0	0	2	71	131	3	146	354	65
	Alishing	0	0	0	0	3	26	88	0	104	148	31
	Dawlat Shah								12	-	571	24
	Mihtarlam	0	0	0	0	14	72	190	0	240	366	66
	Qarghayi	0	0	0	0	58	128	298	0	460	468	39
Laghman Total		**0**	**0**	**0**	**0**	**77**	**297**	**707**	**15**	**950**	**1,907**	**223**
Nangarhar	Achin	5,354	2,187	2,315	1,640	1,693	2,209	1,317	1	940	2,131	144
	Bati Kot	3,797	529	392	1,013	2,034	603	535	0	2,390	1,994	93
	Chaparhar	1,089	1,377	1,750	1,234	1,365	977	832	2	990	1,169	41
	Dara-I-Nur	1,302	392	199	73	199	734	421	0	380	24	15
	Dih Bala	307	646	354	569	511	468	439	11	650	927	80
	Dur Baba	29	78	38	39	56	50	33	0	40	31	2
	Goshta	1,249	467	116	77	122	240	238	99	150	13	5
	Hisarak	202	453	253	370	436	741	541	2	620	1,016	53
	Jalal Abad	458	31	51	123	397	979	1,021	0	90	4	1
	Kama	0	18	0	0	198	389	589	0	1,120	558	29
	Khogyani	4,347	2,577	2,628	3,385	3,808	5,338	4,913	3	2,640	2,986	103
	Kuz Kunar	293	233	115	15	105	236	399	0	500	102	23
	Lal Pur	302	267	79	66	137	270	248	95	250	1	0
	Muhmand Dara	1,630	0	156	83	125	290	255	0	720	19	4
	Nazyan	343	138	251	111	252	184	177	0	150	98	12
	Pachir Wa Agam	768	571	681	400	488	731	630	3	420	1,142	44
	Rodat	1,026	2,038	1,959	1,583	2,147	3,649	2,302	0	2,760	3,313	381
	Sherzad	1,954	2,351	1,646	1,689	1,302	1,741	1,719	2	1,470	1,641	45
	Shinwar	3,884	1,265	2,075	1,478	1,374	1,559	1,300	0	2,060	1,616	84
	Surkh Rod	747	106	587	619	1,072	1,602	1,840	0	1,440	118	29
Nangarhar Total		**29,081**	**15,724**	**15,645**	**14,567**	**17,821**	**22,990**	**19,747**	**218**	**19,780**	**18,904**	**1,185**
Nimroz	Chahar Burjak								0		0	0
	Kang	10	2	1	107	5	2	0	0		0	0
	Khash Rod	672	117	135	535	6	201	219	0		26	4
Nimroz Total		**682**	**119**	**136**	**642**	**11**	**203**	**219**	**0**	**300**	**26**	**4**
Nuristan	Bargi Matal										0	0

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Afghanistan opium poppy cultivation estimates (ha), 2003

Province	District	Previous UNODC survey estimates									2003	CI (+/-)
		1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*		
	Kamdesh										210	*53*
	Nuristan										438	*33*
Nuristan Total											**648**	***86***
Paktya	Azra					*4*	*29*	*46*	*1*	*38*	419	*39*
	Chamkani								*0*	-	76	*5*
	Jaji								*0*	-	185	*7*
	Lija Mangal								*0*	-		
	Sayid Karam								*0*	-	41	*1*
Paktya Total		***0***	***0***	***0***	***0***	***4***	***29***	***46***	***1***	***38***	**721**	***51***
Samangan	Aybak										14	*4*
	Dara-I- Suf								*614*		34	*0*
	Hazrati Sultan										29	*1*
	Khuram Wa Sarbagh							*54*	*0*		24	*4*
Samangan Total		***0***	***0***	***0***	***0***	***0***	***0***	***54***	***614***	***100***	**101**	***9***
Sari Pul	Sangcharak										453	*11*
	Sari Pul										595	*75*
	Sozma Qala	*0*	*0*	*0*	*0*	*0*	*0*	*146*	*0*	*57*	380	*161*
Sari Pul Total								***146***	***0***	***57***	**1,428**	***247***
Takhar	Bangi							*8*	*0*		20	*4*
	Chah Ab						*17*	*45*	*19*		4	*1*
	Chal						*8*	*17*	*20*			
	Farkhar						*6*	*6*	*26*		43	*2*
	Ishkamish							*10*	*19*		77	*5*
	Kalafgan						*101*	*93*	*27*		77	*7*
	Khwaja Ghar						*9*	*57*	*32*		26	*2*
	Rustaq						*10*	*151*	*24*		34	*8*
	Taluqan						*16*	*97*	*16*		14	*2*
	Warsaj						*12*	*9*	*10*		14	*8*
	Yangi Qala						*22*	*154*	*20*		71	*12*
Takhar Total		***0***	***0***	***0***	***0***	***0***	***201***	***647***	***211***	***788***	**380**	***50***
Uruzgan	Chora	*694*	*424*	*1,574*	*233*	*652*	*932*	*1,179*	*0*	*1,330*	975	*225*
	Day Kundi								*0*	-	836	*184*
	Dihrawud	*909*	*938*	*2,923*	*1,870*	*1,033*	*1,243*	*726*	*0*	*1,340*	1,282	*101*
	Gizab	*1,476*	*16*	*8*	*0*	*0*	*0*	*0*	*0*	-	776	*10*
	Khas Uruzgan	*0*	*4*	*0*	*0*	*0*	*0*	*130*	*0*	-	580	*215*
	Kijran								*0*	-	418	*11*
	Nesh	*410*	*334*	*104*	*399*	*373*	*510*	*394*	*0*	*490*	59	*13*
	Shahidi Hass	*1,337*	*12*	*0*	*0*	*1,158*	*1,110*	*802*	*0*	*1,190*	1,333	*125*
	Shahristan								*1*	-	415	*92*
	Tirin Kot	*1,428*	*1,180*	*3,271*	*2,484*	*1,445*	*1,194*	*1,494*	*0*	*750*	469	*55*
Uruzgan Total		***6,254***	***2,908***	***7,880***	***4,986***	***4,661***	***4,989***	***4,725***	***1***	***5,100***	**7,143**	***1,030***
Wardak	Chaki Wardak										211	*36*
	Day Mirdad										0	*0*
	Hisa-I- Awali Bihsud										22	*1*
	Jalrez										531	*11*
	Markazi Bihs										472	*97*
	Maydan Shahr										527	*32*
	Nirkh										780	*10*
	Sayd Abad										192	*32*
Wardak Total											**2,735**	***218***
Zabul	Arghandab	*0*	*0*	*0*	*0*	*0*	*74*	*139*	*0*		302	*53*

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Afghanistan opium poppy cultivation estimates (ha), 2003

Province	District	Previous UNODC survey estimates									2003	CI (+/-)
		1994	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*		
	Atghar										188	*4*
	Daychopan	*0*	*0*	*0*	*0*	*0*	*41*	*114*	*0*		646	*113*
	Mizan	*54*	*0*	*255*	*154*	*160*	*373*	*383*	*0*		309	*99*
	Qalat	*0*	*0*	*0*	*0*	*1*	*46*	*40*	*0*		689	*88*
	Shahjoy								*0*		178	*4*
	Shamulzayi										65	*1*
	Shinkay										164	*4*
	Tarnak Wa Ja	*0*	*0*	*0*	*0*	*0*	*77*	*48*	*1*			
Zabul Total		***54***	***0***	***255***	***154***	***161***	***537***	***585***	***1***	***200***	**2,541**	***364***
TOTAL		*71,416*	*53,759*	*56,827*	*58,417*	*63,672*	*90,909*	*82,033*	*7,606*	*74,045*	80,482	*8,288*
Rounded Total		***71,000***	***54,000***	***57,000***	***58,000***	***64,000***	***91,000***	***82,000***	***8,000***	***74,000***	**80,000**	***8,000***

Annex 5 (page 1 of 3)

Afghanistan farm-gate dry opium prices from March to August 2003 (US$/kg)

Province	District	March		April		May		June		July		August		No month specify		All observations	
		Avg.	n	Avg	n	Avg	n	Avg	n	Avg	n	Avg	n	Avg	n	Avg	n
Badakhshan	Baharak							309	24	312	15					310	39
	Fayz Abad							294	45	285	33					290	78
	Jurm									326	48					326	48
	Kishim							207	30	278	3					214	33
	Ragh																
	Shahri Buzurg							236	15							236	15
Badakhshan Total								**267**	***114***	**309**	***99***					**286**	***213***
Badghis	Ghormach					206	3									206	3
	Murghab					227	6									227	6
Badghis Total						**220**	***9***									**220**	***9***
Baghlan	Andarab																
	Baghlan					261	3									261	3
	Dahana-I-Ghori					414	3									414	3
	Khinjan																
	Khost Wa Firing																
	Nahrin																
	Puli Khumri					244	9									244	9
	Tala Wa Barfak																
Baghlan Total						**282**	***15***									**282**	***15***
Balkh	Balkh					391	21									391	21
	Chahar Bolak							266	18							266	18
	Chimtal							317	36							317	36
	Dihdadi					331	6	304	12							313	18
	Nahri Shahi					331	15									331	15
	Sholgara							299	6							299	6
Balkh Total						**361**	***42***	**301**	***72***							**323**	***114***
Bamyan	Bamyan					251	42	259	18							253	60
	Panjab					248	99	247	72							248	171
	Shibar					260	6	248	39							250	45
	Waras									366	186			366	3	366	189
	Yakawlang					261	72	251	15							259	87
Bamyan Total						**253**	***219***	**249**	***144***	**366**	***186***			**366**	***3***	**291**	***552***
Farah	Bakwa			477	21	500	3									480	24
	Bala Buluk			502	18											502	18
	Farah					480	12							483	3	480	15
	Gulistan					525	27									525	27
	Pusht Rod					482	18									482	18
Farah Total				**488**	***39***	**502**	***60***							**483**	***3***	**496**	***102***
Faryab	Bilchiragh							254	9							254	9
	Pashtun Kot					227	3	223	9							224	12
	Qaysar					229	9									229	9
	Shirin Tagab					247	12									247	12
Faryab Total						**238**	***24***	**239**	***18***							**238**	***42***
Ghor	Chaghcharan							392	63	385	18					391	81
	Saghar							353	24							353	24
	Shahrak					390	6									390	6
	Taywara					388	39	383	9							387	48
Ghor Total						**388**	***45***	**382**	***96***	**385**	***18***					**384**	***159***
Hilmand	Baghran					555	33	518	24			573	3			541	60
	Dishu					579	6									579	6
	Garmser					556	9	568	27							565	36
	Kajaki			473	9	472	45							449	3	471	57
	Lashkar Gah			477	18											477	18
	Musa Qala			561	27	551	12									558	39
	Nad Ali			484	27	521	24	539	12							509	63
	Nahri Sarraj			503	6	535	18									527	24
	Naw Zad					452	21	433	18							443	39
	Naway I Barakzayi			487	9	491	27									490	36
	Reg			580	18											580	18
	Sangin			477	30											477	30
	Washer					545	15	569	6							552	21
Hilmand Total				**508**	***144***	**513**	***210***	**522**	***87***			**573**	***3***	**449**	***3***	**513**	***447***
Jawzjan	Aqcha					259	3									259	3
	Fayz Abad																
	Khamyab																
	Mardyan																
	Mingajik																
	Qarqin							235	6							235	6
	Shibirghan																
Jawzjan Total						**259**	***3***	**235**	***6***							**243**	***9***
Kabul	Surobi	510	6	468	36											474	42
Kabul Total		**510**	***6***	**468**	***36***											**474**	***42***

Annex 5 (page 2 of 3)

Afghanistan farm-gate dry opium prices from March to August 2003 (US$/kg)

Province	District	March		April		May		June		July		August		No month specify		All observations	
		Avg.	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*
Kandahar	Arghandab					590	*12*	576	*12*							583	*24*
	Arghistan					470	*30*	499	*9*							477	*39*
	Daman					453	*12*									453	*12*
	Ghorak			516	*9*											516	*9*
	Kandahar			449	*21*	463	*3*									451	*24*
	Maruf																
	Maywand			485	*3*											485	*3*
	Panjwayi			490	*3*	475	*30*									476	*33*
	Shah Wali Kot					520	*33*									520	*33*
	Spin Boldak																
Kandahar Total				**472**	***36***	**495**	***120***	**543**	***21***							**496**	***177***
Kapisa	Tagab			433	*21*	449	*9*									438	*30*
Kapisa Total				**433**	***21***	**449**	***9***									**438**	***30***
Khost	Spera			459	*12*											459	*12*
	Tani	453	*3*	416	*3*											434	*6*
Khost Total		**453**	***3***	**450**	***15***											**451**	***18***
Kunar	Asad Abad	391	*3*	401	*24*											400	*27*
	Bar Kunar	443	*6*	434	*45*									467	*3*	436	*54*
	Chawkay			386	*6*											386	*6*
	Khas Kunar			571	*18*											571	*18*
	Marawara			453	*15*											453	*15*
	Narang	436	*9*	479	*9*											457	*18*
	Nari			451	*9*	452	*6*									451	*15*
	Nurgal			590	*12*	609	*9*									598	*21*
	Pech			426	*9*											426	*9*
	Sirkanay			474	*21*											474	*21*
Kunar Total		**431**	***18***	**463**	***168***	**546**	***15***							**467**	***3***	**466**	***204***
Kunduz	Ali Abad					203	*9*									203	*9*
	Chahar Dara					183	*12*									183	*12*
	Khan Abad					260	*12*									260	*12*
	Kunduz					274	*9*									274	*9*
	Qalay-I-Zal					186	*18*									186	*18*
Kunduz Total						**216**	***60***									**216**	***60***
Laghman	Alingar	517	*6*	518	*21*	440	*3*									510	*30*
	Alishing			425	*12*											425	*12*
	Dawlat Shah	508	*3*	444	*9*											460	*12*
	Mihtarlam			455	*15*	453	*6*									455	*21*
	Qarghayi	480	*9*	465	*27*											469	*36*
Laghman Total		**497**	***18***	**468**	***84***	**448**	***9***									**471**	***111***
Nangarhar	Achin			519	*30*	512	*18*									517	*48*
	Bati Kot	559	*12*	517	*24*											531	*36*
	Chaparhar			457	*33*											457	*33*
	Dih Bala			438	*3*	535	*6*									502	*9*
	Dur Baba					541	*15*									541	*15*
	Goshta			587	*21*											587	*21*
	Hisarak	416	*12*	400	*30*											405	*42*
	Jalal Abad	436	*18*	437	*15*							417	*3*			435	*36*
	Kama	574	*6*	561	*15*											564	*21*
	Khogyani	385	*9*	372	*33*	366	*3*									374	*45*
	Lal Pur			379	*24*											379	*24*
	Muhmand Dara	386	*6*	361	*15*											368	*21*
	Nazyan					503	*15*									503	*15*
	Pachir Wa Agam					552	*30*									552	*30*
	Rodat	494	*3*	517	*6*											509	*9*
	Sherzad			423	*24*	450	*6*									429	*30*
	Shinwar	512	*6*	513	*12*											512	*18*
	Surkh Rod			406	*30*	402	*18*									405	*48*
Nangarhar Total		**463**	***72***	**451**	***315***	**502**	***111***					**417**	***3***			**464**	***501***
Nimroz	Khash Rod					642	*12*									642	*12*
Nimroz Total						**642**	***12***									**642**	***12***
Nuristan	Kamdesh			423	*3*											423	*3*
	Nuristan					480	*12*									480	*12*
	Wama			347	*3*	536	*3*									441	*6*
Nuristan Total				**385**	***6***	**491**	***15***									**461**	***21***
Paktya	Azra			375	*9*	375	*15*									375	*24*
	Chamkani			608	*33*											608	*33*
	Dand Wa Patan			713	*6*											713	*6*
	Gardez			413	*18*	346	*6*									396	*24*
	Jaji			487	*9*											487	*9*
	Jaji			497	*15*											497	*15*
	Sayid Karam					314	*18*									314	*18*
Paktya Total				**522**	***90***	**342**	***39***									**468**	***129***

Annex 5 (page 3 of 3)

Afghanistan farm-gate dry opium prices from March to August 2003 (US$/kg)

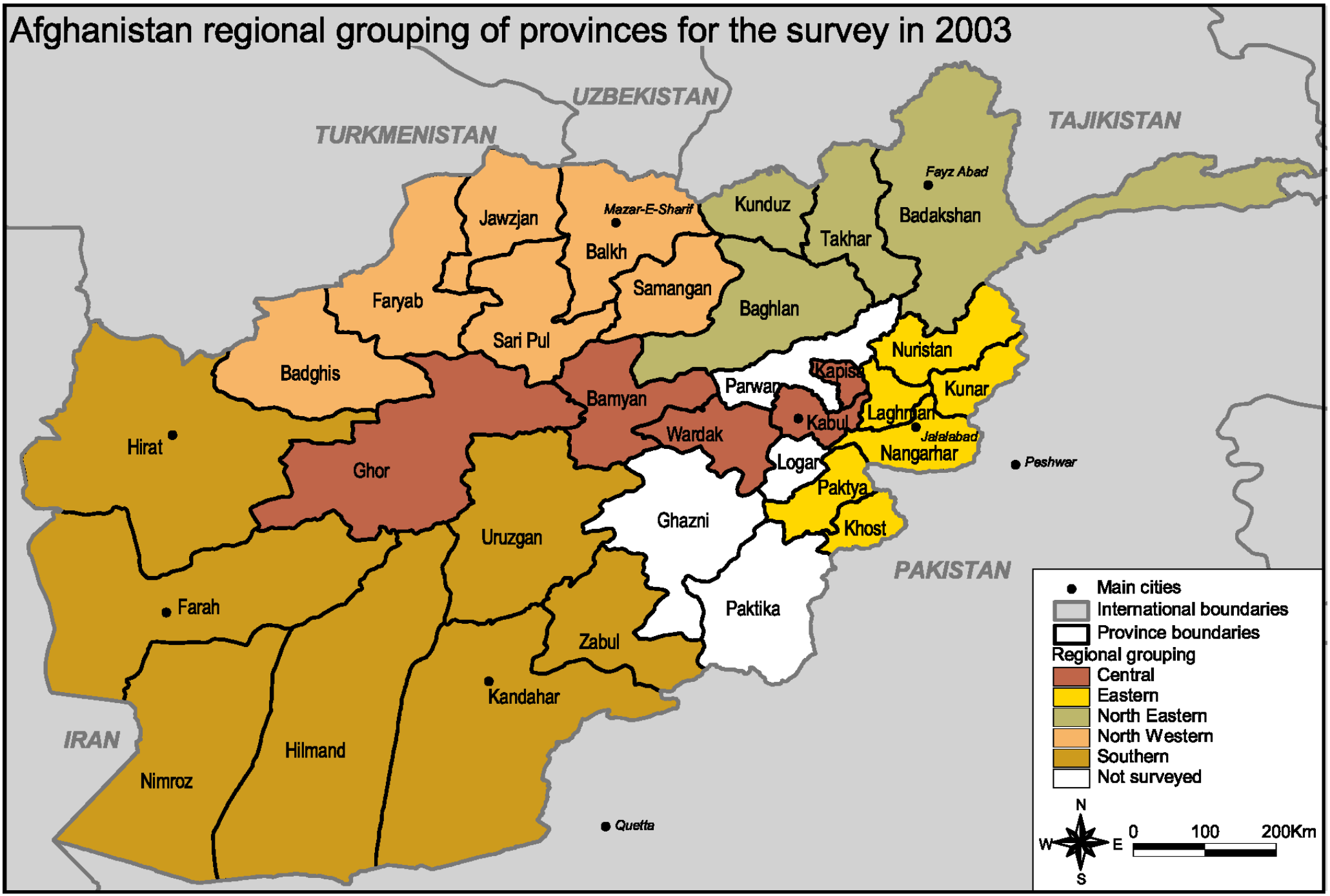
Province	District	March		April		May		June		July		August		No month specify		All observations	
		Avg.	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*	Avg	*n*
Samangan	Aybak																
	Dara-I-Suf																
	Hazrati Sultan																
	Khuram Wa Sarbagh																
Samangan Total																	
Sari Pul	Sangcharak							285	*3*							285	*3*
	Sari Pul																
	Sozma Qala																
Sari Pul Total								**285**	***3***							**285**	***3***
Takhar	Bangi																
	Farkhar																
	Ishkamish																
	Kalafgan							202	*12*							202	*12*
	Rustaq																
	Taluqan																
	Warsaj																
	Yangi Qala																
Takhar Total								**202**	***12***							**202**	***12***
Uruzgan	Chora					453	*12*									453	*12*
	Dihrawud					401	*36*									401	*36*
	Gizab			311	*27*	321	*3*									312	*30*
	Khas Uruzgan			304	*3*	347	*18*									341	*21*
	Kijran					538	*33*	570	*9*							545	*42*
	Nesh			522	*33*											522	*33*
	Shahidi Hassas					403	*33*									403	*33*
	Shahristan			378	*30*	378	*3*									378	*33*
Uruzgan Total				**407**	***93***	**429**	***138***	**570**	***9***							**426**	***240***
Wardak	Jalrez					688	*6*	688	*48*							688	*54*
	Maydan Shahr							688	*24*							688	*24*
	Nirkh					687	*63*									687	*63*
	Saydabad			377	*30*											377	*30*
Wardak Total				**377**	***30***	**687**	***69***	**688**	***72***							**633**	***171***
Zabul	Arghandab					449	*9*	453	*9*							451	*18*
	Atghar							604	*3*							604	*3*
	Daychopan					445	*24*	426	*6*							441	*30*
	Mizan			437	*33*	464	*6*									441	*39*
	Qalat			419	*33*											419	*33*
	Shahjoy			579	*3*											579	*3*
	Shamulzayi																
	Shinkay					524	*30*	530	*12*							526	*42*
	Tarnak Wa Jaldak					438	*51*									438	*51*
Zabul Total				**434**	***69***	**463**	***120***	**494**	***30***							**458**	***219***
Country Average		**465**	**##**	**462**	**###**	**427**	**###**	**380**	***684***	**348**	***303***	**495**	***6***	**441**	***12***	**424**	***3,612***

Annex 6
Afghanistan bi-weekly opium price reports, November 2002 - September 2003 (US$)

Period	Type of Opium	Province Averages															
		Farmers	*n*	Traders	*n*	Farmers	*n*	Traders	*n*	Farmers	*n*	Traders	*n*	Farmers	*n*	Traders	*n*
Mid Sep 2003	Dry	285	*35*	304	*27*	257	*8*	261	*4*	293	*13*	311	*15*	293	*14*	312	*8*
	Fresh	253	*37*	271	*25*	238	*8*	252	*4*	258	*15*	275	*13*	256	*14*	274	*8*
End Aug 2003	Dry	378	*37*	412	*27*	273	*10*	286	*4*	416	*13*	435	*15*	416	*14*	432	*8*
	Fresh	270	*39*	292	*25*	223	*10*	234	*4*	287	*15*	303	*13*	286	*14*	302	*8*
Mid Aug 2003	Dry	334	*37*	360	*27*	264	*10*	272	*4*	361	*13*	376	*15*	359	*14*	375	*8*
	Fresh	290	*39*	313	*25*	237	*10*	255	*4*	308	*15*	323	*13*	307	*14*	325	*8*
End July 2003	Dry	351	*35*	371	*27*	317	*8*	327	*4*	362	*13*	379	*15*	362	*14*	379	*8*
	Fresh	308	*37*	328	*25*	250	*8*	259	*4*	325	*15*	341	*13*	324	*14*	341	*8*
Mid July 2003	Dry	390	*37*	411	*28*	344	*10*	353	*5*	408	*13*	425	*15*	405	*14*	423	*8*
	Fresh	332	*39*	355	*26*	244	*10*	254	*5*	363	*15*	379	*13*	361	*14*	378	*8*
End June 2003	Dry	380	*37*	404	*27*	330	*10*	339	*4*	399	*13*	416	*15*	399	*14*	415	*8*
	Fresh	313	*39*	341	*25*	223	*10*	232	*4*	344	*15*	360	*13*	345	*14*	363	*8*
Mid June 2003	Dry	393	*32*	411	*17*	338	*10*	353	*5*	418	*8*	434	*4*	418	*14*	436	*8*
	Fresh	297	*32*	318	*18*	224	*10*	236	*5*	331	*8*	353	*5*	330	*14*	349	*8*
End May 2003	Dry					405	*10*	416	*5*	NC		NC		NC		NC	
	Fresh					244	*10*	256	*5*	NC		NC		NC		NC	
Mid May 2003	Dry	448	*40*	463	*28*	417	*10*	430	*5*	457	*16*	470	*15*	461	*14*	469	*8*
	Fresh	361	*41*	381	*27*	270	*10*	281	*5*	389	*17*	401	*14*	392	*14*	407	*8*
End Apr 2003	Dry					326	*15*	355	*5*	NC		NC		NC		NC	
	Fresh					147	*10*	167	*4*	NC		NC		NC		NC	
Mid Apr 2003	Dry	348	*42*	370	*28*	286	*12*	299	*5*	372	*16*	386	*15*	375	*14*	386	*8*
	Fresh	304	*31*	322	*22*	-		-		303	*17*	323	*14*	305	*14*	321	*8*
End Mar 2003	Dry					362	*16*	381	*6*	NC		NC		NC		NC	
	Fresh					-		-		NC		NC		NC		NC	
Mid Mar 2003	Dry	466	*44*	496	*29*	413	*14*	445	*6*	491	*14*	509	*17*	491	*16*	509	*6*
	Fresh	436	*33*	451	*22*	-		-		436	*18*	452	*17*	435	*15*	450	*5*
End Feb 2003	Dry	498	*47*	530	*27*	426	*20*	447	*7*	541	*13*	553	*15*	563	*14*	577	*5*
	Fresh	524	*29*	521	*18*	-		-		489	*15*	503	*13*	562	*14*	567	*5*
Mid Feb 2003	Dry	540	*48*	568	*27*	507	*20*	529	*6*	564	*14*	579	*16*	563	*14*	577	*5*
	Fresh	543	*31*	557	*20*	-		-		528	*17*	553	*15*	562	*14*	567	*5*
End Jan 2003	Dry					478	*20*	499	*11*	NC		NC		NC		NC	
	Fresh					-		-		NC		NC		NC		NC	
Mid Jan 2003	Dry	570	*47*	575	*39*	492	*20*	512	*20*	629	*14*	642	*13*	627	*13*	640	*6*
	Fresh	575	*29*	591	*19*	-		-		577	*16*	591	*13*	573	*13*	591	*6*
End Dec 2002	Dry	519	*40*	539	*40*	498	*20*	524	*20*	543	*10*	553	*13*	539	*10*	556	*7*
	Fresh	500	*46*	522	*40*	498	*20*	524	*20*	504	*13*	522	*13*	499	*13*	522	*7*
Mid Dec 2002	Dry	540	*47*	554	*40*	481	*20*	506	*20*	579	*13*	602	*13*	587	*14*	602	*7*
	Fresh	521	*47*	534	*40*	464	*20*	489	*20*	563	*13*	576	*13*	564	*14*	583	*7*
End Nov 2002	Dry	475	*28*	506	*35*	453	*20*	481	*20*	531	*5*	541	*10*	525	*3*	538	*5*
	Fresh	426	*51*	447	*45*	427	*20*	464	*20*	425	*20*	436	*17*	427	*14*	433	*8*

n= number of observations
NC= no data collected during the period considered

Afghanistan regional grouping of provinces for the survey in 2003



Source: CND - UNODC Afghanistan Opium Survey 2003
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The administrative boundaries have been downloaded from Afghanistan Information Management Service, United Nations (www.aims.org.af).

Annex 8 *(page 1 of 2)*

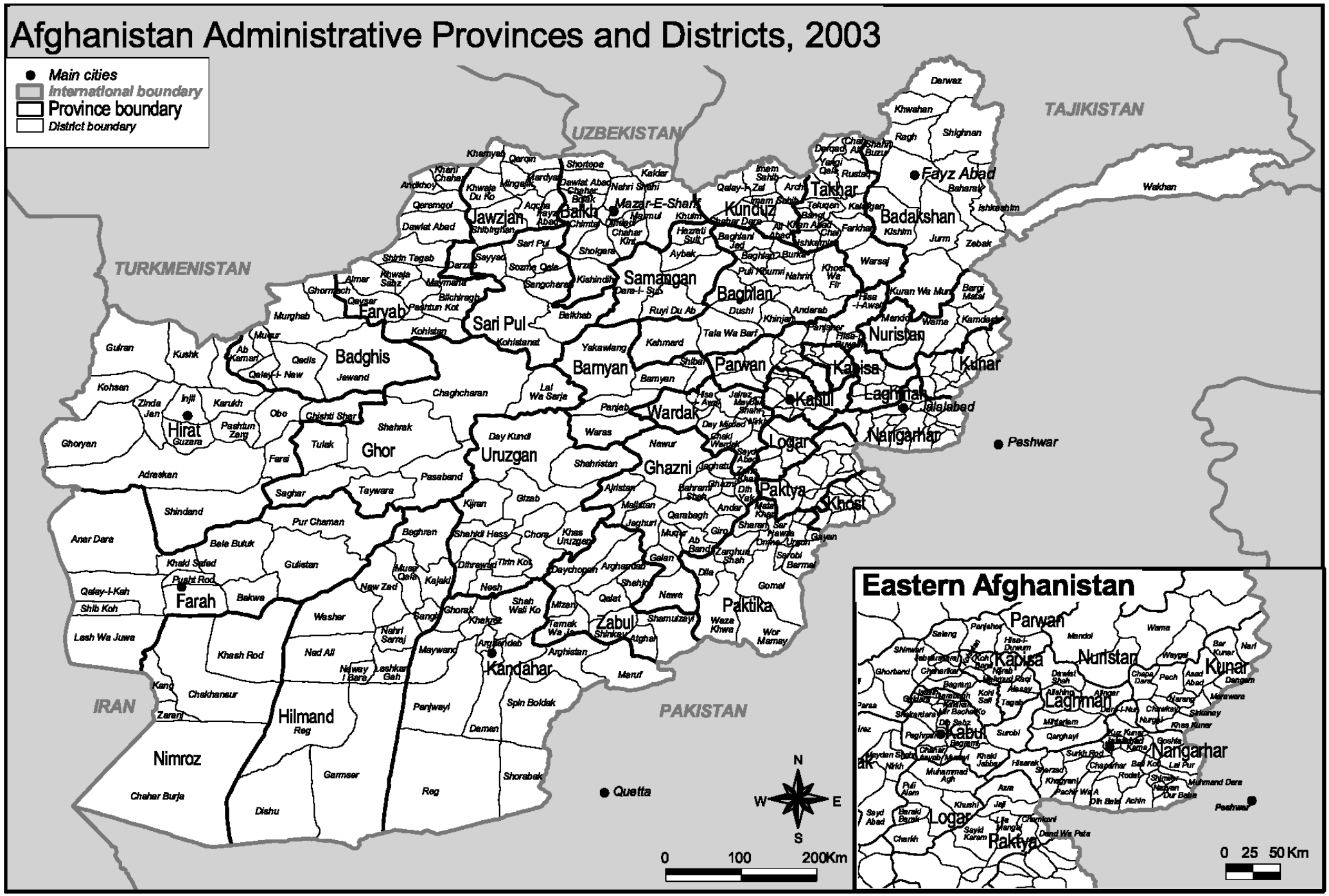
Opium poppy eradication as reported by the Afghan authorities (CND)

Province	District (CND)	Corresponding ODC district names	Start of eradication	End of eradication	Eradication (ha)
Nangarhar	Mohmandara	Muhmand Dara	16/12/2002	23/12/2002	850
	Lal Pura	Lal Pur	18/02/2002	21/12/2002	883
	Bati Kot	Bati Kot	23/11/2002	24/12/2002	880
	Goshta	Goshta	23/11/2002	25/12/2002	509
	Dor Ba Ba	Dur Baba	30/11/2002	20/01/2002	584
	Ghani Khail	(Bati Kot)	18/11/2002	23/12/2002	550
	Chaperhar	Chaparhar	20/11/2002	24/12/2002	500
	Nazian	Nazyan	12/12/2002	25/12/2003	580
	Rodat	Rodat	05/11/2002	24/12/2003	410
	Deh Bala	Dih Bala	22/11/2002	23/11/2003	450
	Achin	Achin	11/12/2002	20/12/2002	290
	Kot	(Bati Kot)	22/11/2002	27/12/2002	890
	Koz Kunar	Kuz Kunar			no poppy cultivation
	Dara-I-Noor	Dara-I-Nur			no poppy cultivation
	Surkhrud	Surkh Rod			no poppy cultivation
	Behsood	Jalal Abad			no poppy cultivation
	Kama	Kama			no poppy cultivation
Total Nangarhar					**7,376**
Kabul	Shakerdara	Shakardara			20
	Char Hasiab	Chahar Asyab			15
	Bagram	Bagrami			8
Total Kabul					**43**
Total Parwan					**80**
Helmand	Nahri-Saraj	Nahri Sarraj			1,100
	Sangin	Sangin			500
	Kajaki	Kajaki			630
	Baghni				553
	Baghran	Baghran			777
	Washer	Washer			650
	Nade-e-Ali	Nad Ali			580
	Naway-e-Barkzayi	Naway I Barakzayi			700
	Sharwali Lasharaga	Lashkar Gah			800
	Maraj	Nad Ali			650
	Garmsir	Garmser			760
	Khanshine				800
Total Helmand					**8,500**
Kandahar	Arghandab	Arghandab			188
	Zeray				181
	Kharkez	Kharkez			200
	Maiwand	Maywand			180
	Daman	Daman			140
	Ghorak	Ghorak			285
	Naish				249
	Maroof	Maruf			264
	Boldak	Spin Boldak			304
	Shahwari Koot	Shah Wali Kot			187
	Panjwai	Panjwayi			168
	Shorabak	Sharobak			186
	Arghastan	Arghistan			187
Kandahar Total					**2,719**
Uruzgan	Khas Orzgan	Khas Uruzgan			400
	Dahrawot	Dihrawud			100
	Dai Kundi	Day Kundi			0
	Dai Zangi				0

Annex 8 ***(page 2 of 2)***

Opium poppy eradication as reported by the Afghan authorities (CND)

Province	District (CND)	Corresponding ODC district names	Start of eradication	End of eradication	Eradication (ha)
	Dai Mardad				0
	Waras				0
	Panjab				0
	Choora				0
	Char Chena	Shahidi Hass			350
	Teren Koth	Tirin Kot			360
	Keezab				300
Uruzgan Total					**1,510**
Zabul	Mazan	Mizan			0
	Khak Afghan				0
	Arghantab	Arghandab			0
	Dai Chopan	Daychopan			0
	Jajoai				1
	Soria				0
	Shinkai	Shinkay			0
	Shomolzai	Shamulzayi			0
	Tagar				0
	Shah-r-Zafa				0
Zabul Total					**1**
Wardak (Maind Shaher)					
	Said Abad	Sayd Abad			3
	Jaghato				0
	Chaak				0
	Jalrez				0
	Behsoot				3
	Hesy Awal Behsoot				0
	Dai Merdad	Day Mirdad			0
	Narkh	Nirkh			3
Wardak Total					**9**
Herat	Shidand	Shindand			0
	Engel				40
	Ghuryan	Ghoryan			60
	Guzra				0
	Pashtun Zarghon				76
	Obaa	Obe			80
	Kashk	Kushk			100
	Karuh	Karukh			84
	Gulraan	Gulran			102
	Kakhsaan	Kohsan (?)			60
	Zenda Jan	Zinda Jan			0
	Adar Sekan	Adraskhan (?)			108
	Kashk Kunaa				90
	Farsee	Farsi			70
	Chesht-e-Shahrif				62
Herat	**Total**				**932**
Nimroz	Kanak				0
	Char Burjak	Chahar Burja			260
	Chakhan soor	Chakhansur			0
	Khasrood	Khash Rod			0
	Delaram				0
Nimroz	**Total**				**260**
Badghis, Ghor, Farah : no eradication					**0**
Country Total					**21,430**



Source: CND - UNODC Afghanistan Opium Survey 2003
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