UNITED NATIONS
*Office on Drugs and Crime*

**Central Committee for Drug Abuse Control**

# MYANMAR

## Opium Survey 2004

October 2004

## Abbreviations

| | |
|---|---|
| ASEAN: | Association of Southeast Asian Nations |
| CCDAC: | Central Committee for Drug Abuse Control |
| JICA: | Japan International Cooperation Agency |
| INGO: | International Non Governmental Organizations |
| ICMP: | Illicit Crop Monitoring Programme |
| GoUM: | Government of the Union of Myanmar |
| SR: | Special Region |
| USG: | US Government |
| UNODC: | United Nations Office on Drugs and Crime |
| WADP: | UNODC Wa Alternative Development Programme |

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| | |
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# Foreword

Today, Myanmar, located in the heart of the "Golden Triangle," is the main opium producer in Southeast Asia. However, despite its reputation as a leading producer, during the last decade, Myanmar has demonstrated a steady and remarkable reduction in opium poppy cultivation. While the number of hectares devoted to opium cultivation was estimated at 160,000 in the mid-1990s, by early 2004, opium poppy cultivation stood at 44,200 hectares -- a reduction of 73% from the peak in 1996.

Together with the parallel decline in opium cultivation in Laos, this trend, if sustained, signals a potential end to more than a century of opium production in the Golden Triangle, a fitting close to one of the most tragic chapters in the history of narcotic drugs.

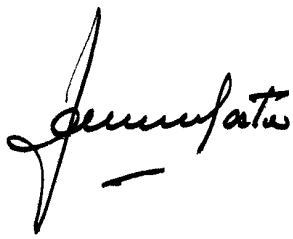
However, as history has proved in other countries, often with tragic consequences, Myanmar now faces a critical, two-fold challenge. First, the country needs to support the decline in its opium supply. Second, Myanmar must strive to prevent the humanitarian disaster threatening opium-growing families who at present live on, or below, the poverty line.

These two processes must be implemented simultaneously. Supply control will bring more stability to a country that has been plagued by ethnic tensions, tensions that have often been exacerbated by narco-trafficking. At the same time, without provisions designed to ensure that the basic needs of affected families are met, without the necessary human rights guarantees, the current opium reduction programme may prove unsustainable.

Democratization and national reconciliation in Myanmar, as well as a national commitment to drug control, are goals the United Nations has re-affirmed on several occasions. I would thus encourage the Government of Myanmar to adopt the steps recommended by the Secretary-General in his report on the human rights situation in Myanmar, along with the reduction of opium cultivation. The international donor community also carries a responsibility to support this process by providing alternative sources of income to those families in Myanmar whose livelihoods are affected by the loss of opium-generated revenue.

The world has watched as various countries have struggled to eliminate the cultivation of opium. Some states have succeeded – others have failed. Those who were able to realize a reduction in poppy cultivation brought both stability and progress to their nations and their citizens. Those who failed at curtailing the production of opium also failed at providing the security the citizens of these nations need and deserve, both within and beyond national their national borders.

While the United Nations welcomes any significant progress in opium reduction, we are very much aware that, in Myanmar, there remains a very fine line between success and failure. We continue to believe, however, that the proposed compact between the Myanmar government and the international community is a powerful alternative to failure, and that this compact has both the potential and the support to turn the current crop reduction effort in Myanmar into a sustainable and successful process.



Antonio Maria Costa
Executive Director

# TABLE OF CONTENTS

# FACT SHEET - MYANMAR OPIUM SURVEY 2004

| | 2004 | Variation on 2003 |
|---|---|---|
| Opium poppy planted area in the whole of the Union of Myanmar (including the Shan State) | **44,200 ha** | **- 29 %** |
| Opium poppy planted area in the Shan State | **41,000 ha** | **- 28 %** |
| Average opium yield | **8 kg/ha** | **- 38%** |
| Potential production of opium in the whole of the Union of Myanmar (including the Shan State) | **370 mt** | **- 54%** |
| Opium poppy eradication in the Union of Myanmar[1] | **2,820 ha** | **+ 342 %** |
| Average farmgate price of opium | **US$ 234/kg** | **+ 80%** |
| Total potential value of opium production: | **US$ 87 millions** | **- 17%** |
| Addiction prevalence rate (Population aged 15 and above) | **0.61%** | **- 3%** |
| Estimated number of opium addicts in the Shan State | **17,000** | **n.a.** |
| Estimated number of households involved in opium poppy cultivation in Myanmar | **260,000** | **n.a.** |
| Estimated number of households involved in opium poppy cultivation in the Shan State | **240,000** | **- 31%** |
| Household average yearly income in opium poppy producing household (Shan State) | **US$ 214** | **- 8%** |
| of which from opium sale | **US$ 133 (or 62%)** | |
| Household average yearly income in non-opium poppy producing household (Shan State) | **US$ 276** | **n.a.** |

[1] Official CCDAC statistics

# EXECUTIVE SUMMARY

The 2004 Opium Poppy Survey in Myanmar was conducted jointly by the Myanmar Government and the UNODC.

An extensive survey, combining the use of satellite images and ground verification, was conducted in the Shan State where more than 90% of opium poppy cultivation takes place. In addition, rapid assessment surveys were carried out for the first time in the Sagaing Division, Kachin, and Chin States to assess the level of opium poppy cultivation in these areas and an Opium Free Certification Survey was conducted in the Special Region No 4.

***Opium Poppy Cultivation***

The total area under opium poppy cultivation in Myanmar, for the 2004 season, was estimated to be **44,200 ha** (ranging between 38,500 and 49,600 ha), representing a reduction of 29% from 2003.

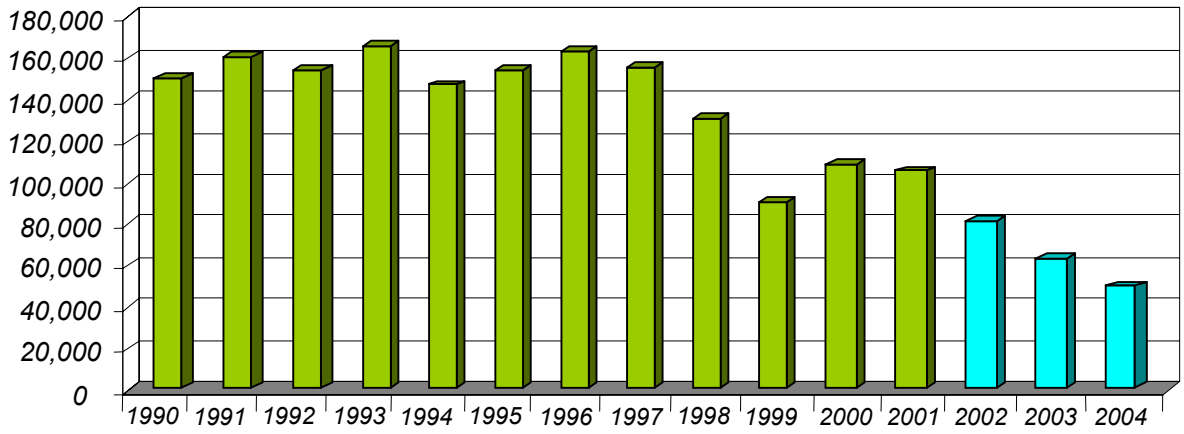
This value also represented a reduction of 73% compared to the peak opium cultivation estimate of 1996 (163,000 ha).

In 2004, the total area under opium poppy cultivation in the Shan State was estimated to be 41,000 ha, a reduction of 28% from 2003. The biggest decline was in the North Shan with -69%.

Outside the Shan State, no opium cultivation was found on the sample points that were analysed. The surveyors, however, observed the presence of poppy and could confirm that opium cultivation, though marginal, remains a reality. It is mainly used for medicinal purposes and personal consumption. A total of 3,200 ha of opium poppy cultivation was roughly estimated for the Kayah, Kachin States and the Sagaing Division, a decline of 36% compared to last year.

Opium cultivation was reported in 21% of the sample villages. Half of these are located in the Special Region No. 2 of the Wa, where 95% of the villages reported cultivating opium poppy.

*Opium poppy cultivation in Myanmar 1990-2004 (in ha)*




*Sources: 1990-2001: US Government, 2002-2004:UNODC-Government of Myanmar*

***Opium Poppy Free Certification Survey in the Special Region No. 4***

A Rapid Assessment Survey was conducted in the Special Region No. 4. The assessment verified the opium free status declared in 1997. No opium poppy was found on any of the surveyed sites, nor was it observed by surveyors in the course of their itinerary across the region.

***Yield and Production***

In 2004 the North Shan experienced a severe drought. The maximum potential yield was estimated at 8 kg/ha, ranging between 7 kg/ha in the South Shan and 11 kg/ha in the East Shan.

The average estimated opium production for the year 2004 thus amounted to **370 metric tons**, a decline of 54% from 2003 and a decline of 72% from 1998.

***Opium Prices and Cash Income***

The average farmgate sale price of opium in 2004 was estimated to be 200,310 Kyats (US$ 234[2]) per kilogram. This corresponds to an increase of 80%, in US$ terms, compared with the farmgate price of US$130 reported in the 2003 survey.

With an estimated potential of 370 metric tons, the total farmgate value of opium production amounted to **US$ 87 million** in 2004, equivalent to 1-2% of the country's GDP.

The farmgate value of opium production declined by 17% compared to 2003. Assuming an average opium field size per household of 0.17 ha, based on last year's survey results, an estimated 260,000 households were involved in opium poppy cultivation in Myanmar in 2004, of which 240,000 households in the Shan State, down from 350,000 households in 2003.

The average household income for opium producers was 207,000 Kyats per year (214 US$) and 266,680 Kyats (US $ 276)[3] for non-opium producers; an average of 56 % of household production was sold or bartered, 26% was destined for personal consumption and 23% was left over. For opium producing farmers, the sale of opium represented 62% (or US$133) of their annual cash income.

***Addiction***

Opium addiction in the Shan State affected 0.6% of the adult population in 2004 (equivalent to about 17,000 addicts).

In villages where opium cultivation took place in 2004, the average level of addiction was 2.2% and thus significantly higher than in non-producing villages where the average level of opium addiction amounted to just 0.2%.

***Eradication***

In 2004 a total of 2,820 ha cultivated with opium poppy were officially reported to have been eradicated. This represents an increase of more than 300% over the 638 ha eradicated in 2003.

[2] At an average exchange rate of 856 Kyats per US$ from December 2003 to March 2004
[3] US$ 55 p/p per year

# INTRODUCTION

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

In Myanmar, policies by both the central Government and local authorities continue to promote a rapid reduction in opium cultivation, in line with a national action plan to eradicate it by the year 2014, one year before the deadline established by ASEAN.

In the mean time, the Kokang Region gave up cultivating poppy in 2003 and the Wa Region has declared its intention to be opium-free by 2005. The Myanmar Government is relying on law enforcement, including eradication, as well as crop substitution to achieve this goal.

The main body dealing with the narcotics problems is the Central Committee of Drug Abuse Control (CCDAC) with a three-fold approach of controlling the production, the trafficking and the demand. In 2004, the CCDAC reported eradicating 2,820 hectares under opium cultivation nationwide. A remarkable decrease in poppy cultivation has been achieved in North Shan State, which was the main area of poppy cultivation until 2002. In 2003, the authorities seized 1,481 kgs of opium, 568 kgs of heroin and arrested 3,850 people for drug-related offences.

The opium bans in the Special Regions, however, have also highlighted the humanitarian consequences of drug control policies for farming communities. The present survey estimates that about 260,000 households were involved in opium poppy cultivation. Most of them reside in remote, mountainous and isolated areas. In early 2004, an assessment mission conducted in the Kokang Region, by the Japanese aid agency JICA, identified that, without sufficient alternatives, most opium farmers would loose their primary source of income. In the Kokang Region, many households left the area in search of income and food, and from an estimated total population of 200,000 in the year 2000, only 140,000 remained in 2004. Two out of three private Chinese clinics and pharmacies have closed and more than one in three community-schools stopped operating. About 6,000 children left school, effectively halving the enrolment rate compared to the previous year.

In view of this, an effective alternative development programme is essential for the sustainable elimination of poppy cultivation. A number of assistance organizations increased their activities in the Kokang and Wa Regions in response to the urgent humanitarian needs, and the World Food Programme began rice distribution in cooperation with the UNODC and NGOs. The UN agencies present in Myanmar have recognized the humanitarian consequences of rapid opium reduction and the threat they ultimately pose to the sustainability of these reductions. The UN Country Team (UNCT) drafted a new strategic framework outlining the principles and priorities that govern its activities in the country. "*Creating conditions for the sustainable reduction of illicit drugs*" became a key component of its strategy. As opium poppy cultivation continues to decline, the challenge for the future is to identify alternative sources of income for the farmers who are losing their livelihood, for both humanitarian reasons, as well as to ensure the long-term viability of opium reduction in Myanmar.

# 1 FINDINGS

## *1.1 Opium Poppy Cultivation*

Based on a remote sensing approach, the total area under opium poppy cultivation in the **Shan State** was estimated to be **41,000 ha** in 2004 (range: 37,000-45,000 ha) (see Table 1). This corresponds to an overall reduction of 28%, from the 57,200 ha estimated in 2003 (See Table 2).

*Table 1: Opium planted area estimate in the Shan State in 2004*

| Region | Total Opium Poppy (ha) | Lower Limit (ha) | Upper Limit (ha) |
|---|---|---|---|
| North Shan | 6,026 | 5,570 | 6,480 |
| South Shan | 10,512 | 10,169 | 10,856 |
| East Shan | 7,765 | 6,031 | 9,498 |
| Special Region No. 2 (Wa) | 16,745 | 14,968 | 18,523 |
| Total | 41,048 | 36,738 | 45,357 |

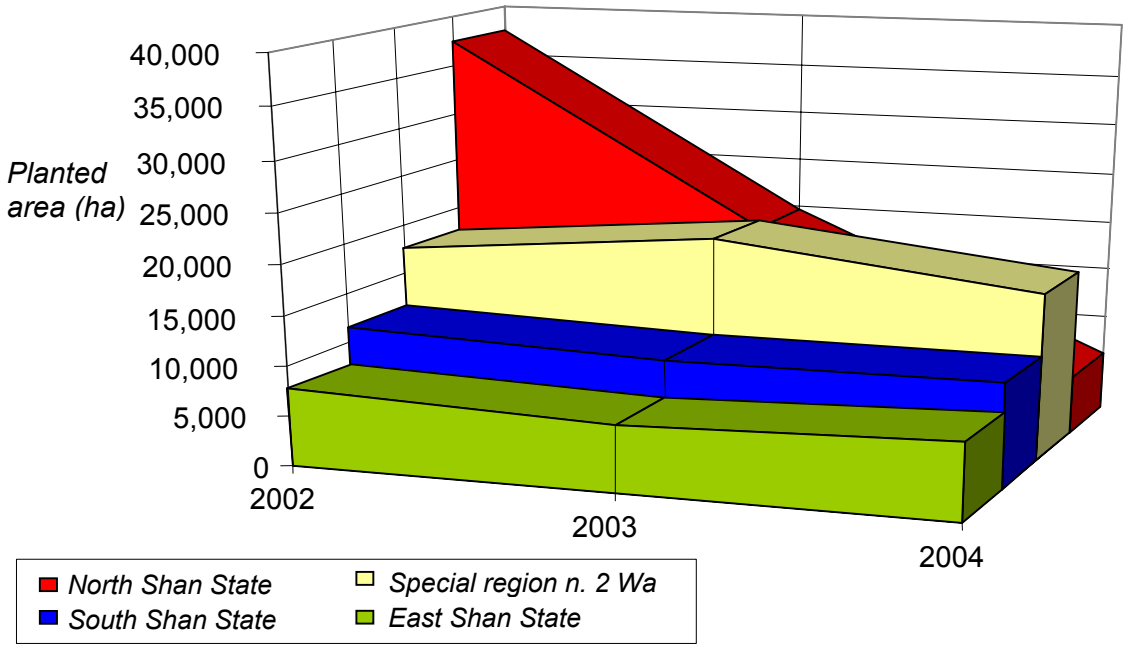
*Table 2: Opium Poppy Planted Area Estimate in the Shan State in 2003 and 2004*

| Administrative Region | 2003 Planted Surface Estimate (ha) | 2004 Planted Surface Estimate (ha) | Variation (%) |
|---|---|---|---|
| North Shan | 19,600 | 6,000 | -69% |
| South Shan | 10,500 | 10,500 | 0% |
| East Shan | 6,700 | 7,750 | 16% |
| Special Region No. 2 (Wa) | 20,400 | 16,750 | -18% |
| Total | 57,200 | 41,000 | -28% |

The decline in planted surface was not homogeneous across the whole State but had two significant peaks in the North Shan (-69 %) and in the Special Region No. 2 of the Wa (-18%). In the South Shan, the planted area was estimated to have remained unchanged, while an increase of more than a 1,000 ha (+16%) was reported for the East Shan.

In the Wa, the reduction offsets an increase of 21% experienced from 2002 to 2003, while the North Shan continues the dramatic downturn begun in 2003, when the planted area declined 48% with respect to 2002.

*Figure 1: Variation in Opium Poppy Planted Area, 2002–2004*



As opium poppy cultivation continues to decline, the challenge for the future is to find alternative sources of income for the farmers who are losing their livelihood, both on humanitarian grounds, as well as to ensure the long-term viability of opium reduction in Myanmar.

In order to assess the presence of opium poppy cultivation outside the traditional production areas of the Shan State, rapid assessment surveys were conducted across the Kachin and Chin States and in the Sagaing Division. These territories are characterized by environmental conditions favourable to the cultivation of opium poppy and the survey was intended to support, with objective observations, an adjustment to the Shan State estimate. Ancillary information was also acquired to produce an estimate for the Kayah State. The objective of these activities was to generate a national figure for the opium poppy planted area in Myanmar.

Probably due to the very low sampling rate, the results of these surveys were not straightforward. No opium cultivation was reported on the sample points that were analysed. The surveyors, however, moving across the territory, observed the presence of poppy and could confirm that opium cultivation, though marginal, remains a reality. It is mainly used for medicinal purposes and personal consumption. There were no indications of any inter-regional trafficking of the opium produced in these areas.

From local sources and from CCDAC officials, the survey teams acquired ancillary information on the importance of the cultivation in the three States and on the basis of this information estimates could be produced.

Two sets of estimates were produced: one was derived from eradication, assuming that there is a fixed ratio between opium poppy cultivation and areas eradicated; the second was derived from consumption estimates, assuming that production served to meet these consumption requirements and that opium production was not geared to supply markets outside the region. The average of the two estimates, wherever available, was used as the best estimates for the areas under cultivation outside the Shan State.

In the **Sagaing Division**, opium poppy cultivation is mostly located in the North (Lahe and NanYun Te Townships). Information was received that local people are opium smokers for traditional and therapeutic reasons but that there is scarce external trade in opium. Based on the average opium requirement of 1.4 kg/ha per addict (see UNODC-LCDC Lao Opium Survey 2003) and an estimated addict population of 1,500 individuals, the total local consumption of opium would be around 2,400 kg. At an average yield of 8 kg/ha, this would represent 300 ha of opium poppy cultivation. On the other hand, applying the ratio of eradication/cultivation of 6% found in the Shan State, to the official eradication figures of 74 ha in the Sagaing Division, opium poppy cultivation could be about 1,200 ha. Taking the average of these two estimates, opium poppy cultivation in 2004 in the Sagaing Division was estimated at around **800 ha**.

In the **Kachin**, the presence of opium poppy was assessed between the Putao and Tanai Townships and in the Sadon area. Traditionally this region has not been receptive to opium production and use, as the rural population has had access to rich natural resources that form the basis of some alternative sources of income. Official eradication figures account for 126 ha, which would point to an actual cultivated area of over 2,100 ha (applying the Shan State ratio). However, no indications of such a significant surface were detected during the rapid assessment survey. Considering an estimated addict population of 1,200, the estimate would indicate a planted area of around 250 ha. Again taking the average of these two estimates, opium poppy cultivation in the Kachin State was estimated at about **1,100 ha**.

In the **Chin State**, very small areas of opium poppy cultivation were observed essentially in the northeast corner, near Bokkan villages of the Sagaing Division, but no further information is available for establishing an estimate.

Opium poppy cultivation was also reported in the **Kayah State.** No survey was conducted by UNODC in that area. However, on the basis of eradication figures provided by the CCDAC, the opium poppy planted surface can be estimated in the order of **1,300 ha**. This area, like the southern portions of the Shan State, enjoys conditions favourable for the cultivation of opium poppy; leading to the possibility of double crops, with the first lancing (opium harvest) potentially taking place as early as October, immediately after the end of the monsoon season.

On the basis of these considerations the overall national surface planted with opium poppy is estimated to total **44,200 ha** (range: 38,850 to 40,600 ha)**,** indicating a reduction of **29%** with respect to the overall 62,200 ha estimated in 2003. The overall area under poppy cultivation outside the Shan state was estimated to amount to some 3,200 ha in 2004. This is about 7% of the total estimated area under poppy cultivation in Myanmar, down from 5,000 ha in 2003.

*Table 3: Opium Poppy Planted Area Estimate in the Union of Myanmar in 2004*

| Administrative Region | 2004 Planted Surface Estimate (Ha) | Lower Limit (ha) | Upper Limit (ha) |
|---|---|---|---|
| Shan State | 41,000 | 37,000 | 45,000 |
| Kachin State | 1,100 | 250 | 2,100 |
| Sagaing Division | 800 | 300 | 1,200 |
| Kayah State | 1,300 | 1.300 | 1,300 |
| Total | 44,200 | 38,850 | 49,600 |

*Table 4: Opium Poppy Planted Area Estimate in the Union of Myanmar in 2003 and 2004*

| Administrative Region | 2004 Planted Surface Estimate (ha) | 2003 Planted Surface Estimate (ha) | Variation (%) |
|---|---|---|---|
| Shan State | 41,000 | 57,200 | -28% |
| Kachin State | 1,100 | | |
| Sagaing Division | 800 | | |
| Kayah State | 1,300 | | |
| Total | 44,200 | 62,200 | -29% |

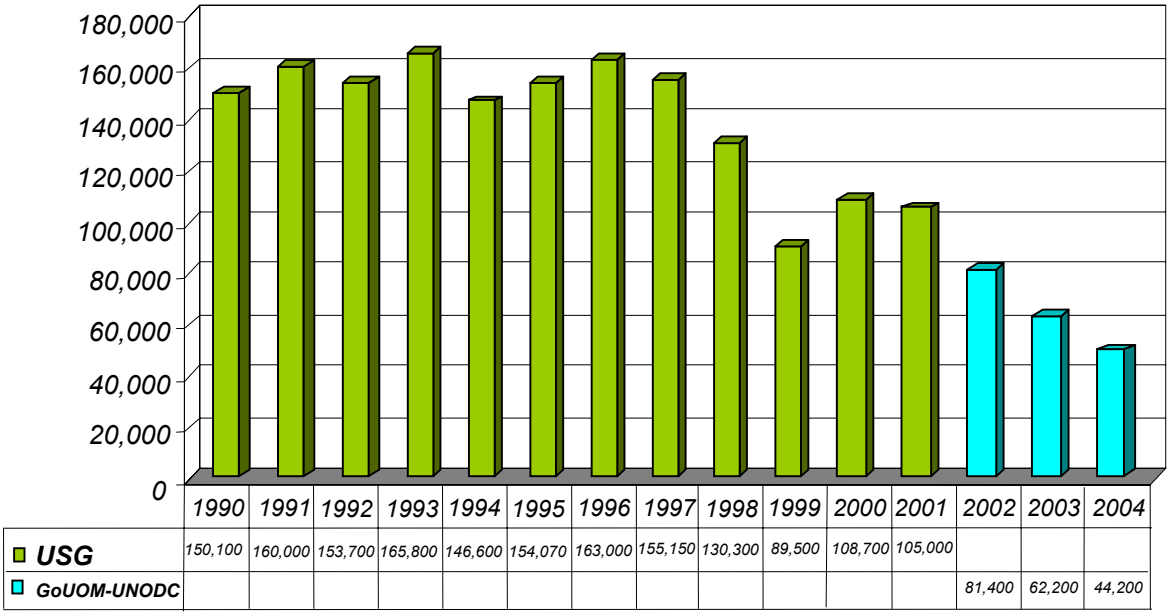
Even though data before and after 2002 are not fully comparable (for methodological reasons), it can be safely argued that cultivation has declined substantially since the mid-1990s (see Figure 2). Available data suggest that the overall decrease amounted to 66% between 1998 and 2004, and even 73% since the peak estimate for the year 1996 (163,000 ha) when the tribal warlord, Khun Sa, leader of the Mong Tai Army (who was in control of much of the opium trade) was forced to surrender.

The decline illustrates the progress made by the authorities in curtailing cultivation over the last few years and shows that the country is well on track to eliminate opium poppy cultivation completely in the foreseeable future.

The declines, however, also highlight the need for external assistance to cope with the strong shortfall in the income of farming communities in order to make the elimination sustainable.

Assuming an average opium field size per household of 0.17 ha, based on last year's survey results, an estimated 260,000 households were involved in opium poppy cultivation in Myanmar in 2004, of which 240,000 households in the Shan State, down from 350,000 households in 2003.

*Figure 2: Opium poppy cultivation in Myanmar 1990-2004*




Despite the strong decline in recent years, a substantial number of villages remain involved in opium production.

Among the 1,597 villages across the Shan State, opium cultivation was reported in 20% of the sample (320 villages). Almost half of which (155) were located in the Special Region No. 2 (Wa) where 95% of the villages reported cultivating opium poppy in 2004.

*Table 5: Estimate of opium producing villages 2004 in the Shan State*

| | North Shan | South Shan | East Shan | S. R. 2 (Wa) | Total |
|---|---|---|---|---|---|
| Villages not growing poppy | 95 % | 92 % | 79 % | 5 % | 80% |
| Villages growing poppy | 5 % | 8 % | 21 % | 95 % | 20% |

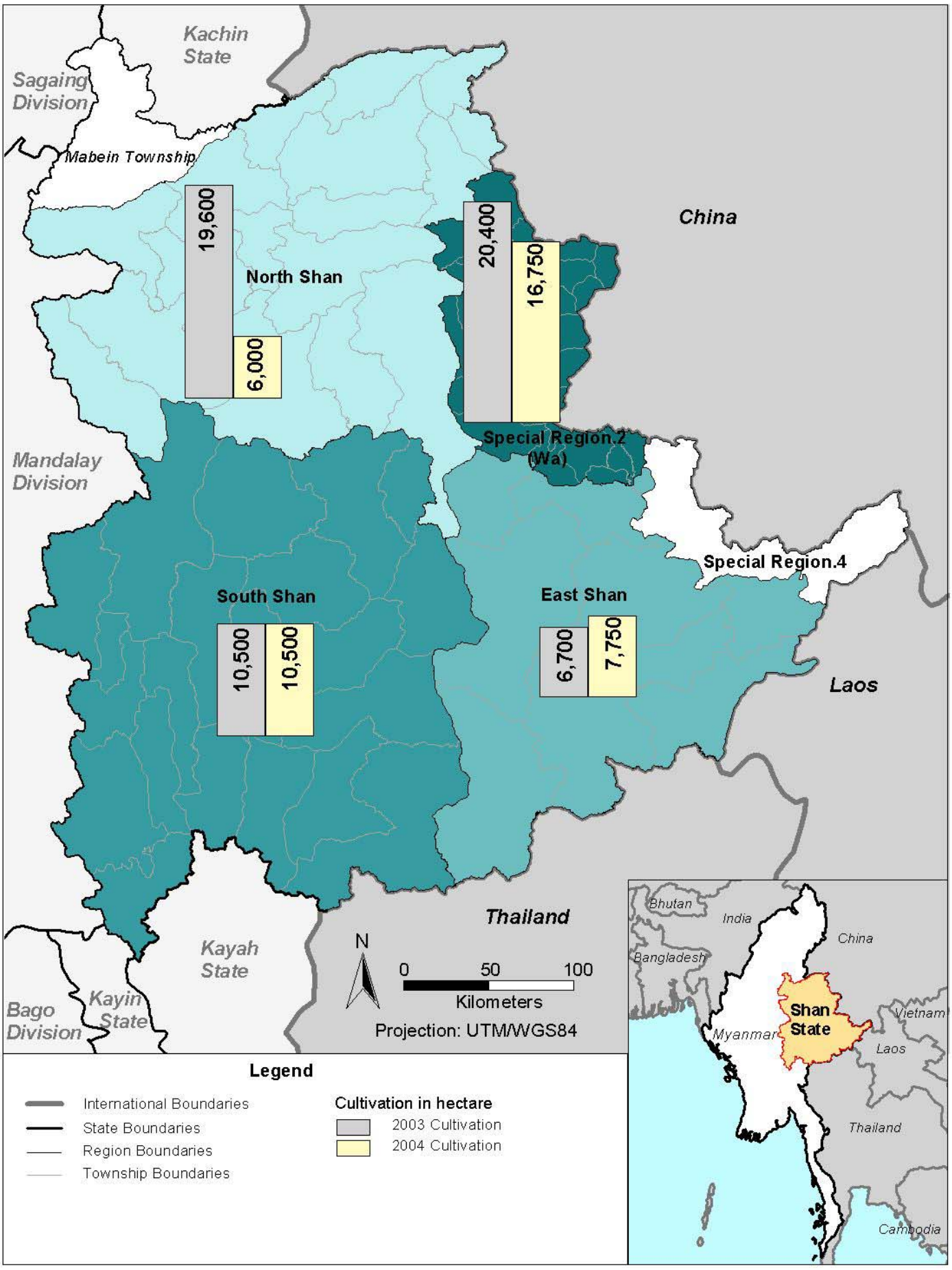
The household interviews (over 15,000) largely confirmed this pattern with 19% of the sample throughout the Shan State engaged in opium cultivation, but as much as 93% of households in the Wa region.

*Table 6: Sample number of households cultivating opium poppy in the Shan State*

| | North Shan | | South Shan | | East Shan | | S. R. 2 (Wa) | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | # | % | # | % | # | % | # | % | # | % |
| Not cultivating | 2,602 | 98 | 5,464 | 97 | 2,528 | 86 | 144 | 7 | 10,740 | 81 |
| Cultivating | 49 | 2 | 178 | 3 | 420 | 14 | 1,794 | 93 | 2,441 | 19 |
| Total | 3,304 | | 6,610 | | 3,823 | | 1,969 | | 15,709 | |

The planted surface estimate in the Shan State was based on the use of 69 IKONOS satellite images. The location of the images was randomly selected over the portions of the territory characterized as more susceptible to opium cultivation. The use of this "stratification" potentially increased the efficiency of the survey and the probability of finding opium poppy fields, and acted as expansion area for the sample estimates.

Map 1: Myanmar Opium Survey 2004 - Shan State: Opium Poppy Cultivation by Regions




Source: CCDAC - UNODC Myanmar Opium Survey 2004

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

Map 2: Myanmar Opium Survey 2004 – Union of Myanmar: Opium Poppy Planted Surface


Source: CCDAC - UNODC Myanmar Opium Survey 2004

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

### 1.2 Opium Poppy Free Certification Survey in the Special Region No. 4

In 2004 a "Rapid Assessment Survey" to verify the opium free status was conducted in the Special Region No. 4 by UNODC with the cooperation of the CCDAC and the local Regional Authorities. Opium poppy was not found on any of the surveyed sites, nor was it observed by the surveyors in the course of their route across the region.

### 1.3 Yield and Production

In 2004 the climatic development of the opium-growing season caused considerable reduction in the potential opium yield compared to last year's harvest.

The estimates for the potential opium yield in 2004 ranged between 7 kg/ha in the South Shan and 11 kg/ha in the East Shan, with an average of **8 kg/ha** for the whole Shan State. Based on the regional estimate of area planted and regional opium yield estimate, the estimated potential production of opium for the year 2004 amounts to **370 metric tons (**range: 320 to 420 metric tons). This corresponds to an overall reduction of over 440 metric tons with respect to 2003 (810 m/t). The assessment of this impressive decrease of over 54 %, should take into account that yields in 2003 had been particularly good due to high winter rainfall.

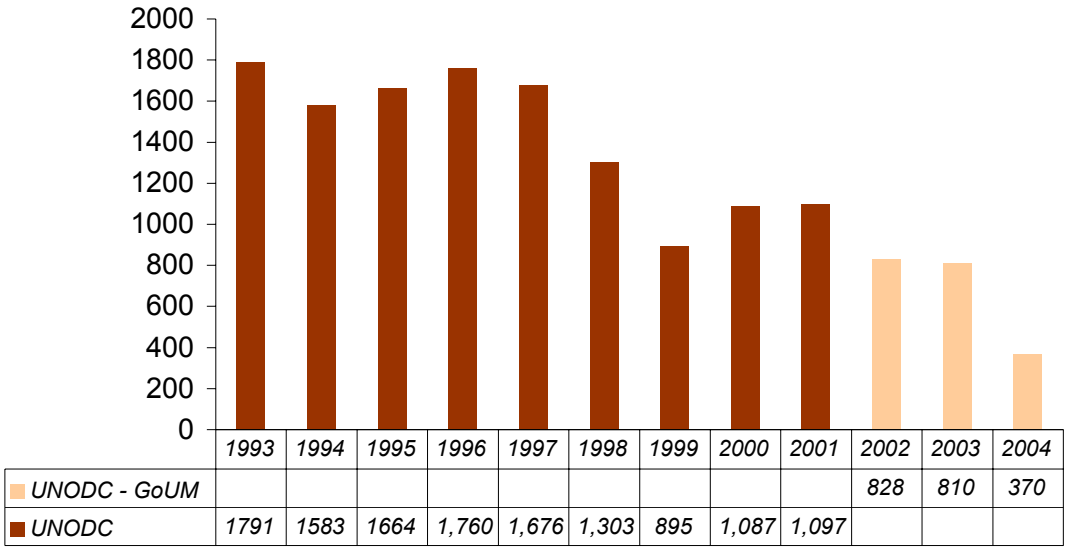
For the Kachin, Chin and Kayah States and for the Sagaing Division, where no formal yield measurements were made, the average yields measured in the Shan State regions were used in calculating the production potential (See Table 7).

*Table 7: Potential 2004 Opium Yield and Production in the Union of Myanmar*

| Administrative Unit | Potential Yield (Kg/ha) | Production (metric tons) |
|---|---|---|
| North Shan | 8 | 48 |
| South Shan | 7 | 74 |
| East Shan | 11 | 85 |
| Special Region 2 (Wa) | 8 | 134 |
| **Total Shan State** | 8 | 341 |
| Kachin State | 8 | 9 |
| Sagaing Division | 8 | 6 |
| Kayah State | 8 | 10 |
| Rounded National Total | | 370 |

Since the mid-nineties opium production has declined considerably in Myanmar. Even bearing in mind the change in the sources and method of calculation for production introduced as of 2002, opium production declined sharply, by about 80%, since the peak opium production years of 1993 and 1996.

*Figure 3: Opium Production 1996-2004 (in metric tons)*




| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNODC - GoUM | | | | | | | | | | 828 | 810 | 370 |
| UNODC | 1791 | 1583 | 1664 | 1,760 | 1,676 | 1,303 | 895 | 1,087 | 1,097 | | | |

***Seasonal Climate***

The weather, throughout this year's poppy growing season was not favourable for opium production. Notably the North Shan experienced a severe drought. The South Shan and the East Shan, in contrast, saw rather normal weather conditions.

Even within the territory of the Special Region No. 2 of the Wa, the climatic conditions were quite different between the North and the South (See Map 4). In 2003 the annual monsoon came late and was not of its usual duration and intensity; in some areas the rain stopped at the end of September 2003 causing widespread soil moisture deficit.

Precipitation experienced a drop of almost 100 % (see Table 8) during the critical period of planting and germination between October and November.

*Table 8: Average precipitation July -December, 1993 – 2003*

| Month | Avg. precipitation 2003 (*) (mm) | Avg. precipitation 1993 – 2003 (*) (mm) | Variation from Average (%) |
|---|---|---|---|
| July | 230.5 | 264.1 | -12.73 |
| August | 189.4 | 272.7 | -30.53 |
| September | 159.4 | 213.0 | -25.17 |
| October | 82.0 | 127.0 | -35.42 |
| November | 0.0 | 48.0 | -100.00 |
| December | 6.6 | 7.5 | -12.32 |

*(*) Source: Myanmar National Agricultural Services*

While farmers were able to prepare the ground, the soil was so dry in many opium-growing areas that the growers experienced serious germination problems and many opium plants died at a very early vegetative stage. This early crop failure and replanting, especially in the North Shan and the north portion of the Wa Region, impacted negatively on the final yield. Moreover, there were no supplemental rains during January and February 2004, which inhibited both growth and capsule formation. The overall weather

conditions for this growing season thus explain the strong reduction in opium yield in Myanmar. (Strong declines in opium yield were also reported from neighbouring Laos, where the opium growing areas were affected by similar unfavourable weather conditions).

### *Cultivation Season*

In the South Shan State, most of the opium poppy cultivation started in September, earlier than in the other 3 survey zones. There is information that poppy cultivation started as early as July in the Pinglaung and Sisaing townships. This unusually early cultivation might indicate that opium growers are testing a change in the time of sowing so as to avoid eradication from Government authorities.

Harvest started as early as the end of December in the South Shan and extended to the end February in the Wa Region (See Table 9). In the other survey zones, the overall opium calendar appeared to be normal, in line with previous years.

*Table 9: Opium poppy crop calendar for the 2003 –2004 season*

| Administrative Region | Field Preparation | | Sowing | | Harvest | |
|---|---|---|---|---|---|---|
| | Start date | End date | Start date | End date | Start date | End date |
| North Shan | 3-Sep-03 | 14-Sep-03 | 4-Oct-03 | 7-Oct-03 | 10-Jan-04 | 13-Feb-04 |
| South Shan | 12-Aug-03 | 23-Aug-03 | 4-Sep-03 | 10-Sep-03 | 24-Dec-03 | 24-Jan-04 |
| East Shan | 2-Sep-03 | 18-Sep-03 | 1-Oct-03 | 4-Oct-03 | 19-Jan-04 | 8-Feb-04 |
| S. R. 2 (Wa) | 21-Aug-03 | 20-Sep-03 | 24-Sep-03 | 6-Oct-03 | 21-Jan-04 | 28-Feb-04 |

Another change observed in the course of this year was that some poppy growers appear to be moving to very remote areas for their cultivations and that they are positioning their poppy fields very far away from the villages. Opium growers are also moving from sloping land towards alluvial areas, near to riverbeds, where the soils are more fertile and a source of supplemental irrigation water is readily available. Furthermore, they are changing the cultivation methods, using mix cropping instead of the traditionally practised single cropping system. Opium poppy growing with other crops such as Chinese bean, mustard, onion and other annual crops was frequently observed.

*Figure 4: Aspect of failed opium fields in the Long Tan area (Wa) in late January 2004*

The effect of climatic conditions on the 2004 opium poppy yield is also supported by a number of observations on the visited sample sites. Although the average number of capsules per square meter remains in the range of what was recorded in 2002 and 2003, the average volume of the capsules per square meter was 52% lower than the average volume recorded in 2003 (See Table 10). Further to this, observation of the moisture conditions of the surveyed fields revealed that over 45 % of these were “dry” and in diminished condition.

*Table 10: Number of capsules and capsule volume in 2003 and 2004*

| Year | Avg. number of capsules per $m^2$ | Avg. volume ($cm^3/m^2$) | Avg. sample yield (kg/ha) |
|---|---|---|---|
| 2002 | 16 | 191 | 10 |
| 2003 | 19 | 317 | 13 |
| 2004 | 17 | 153 | 8 |

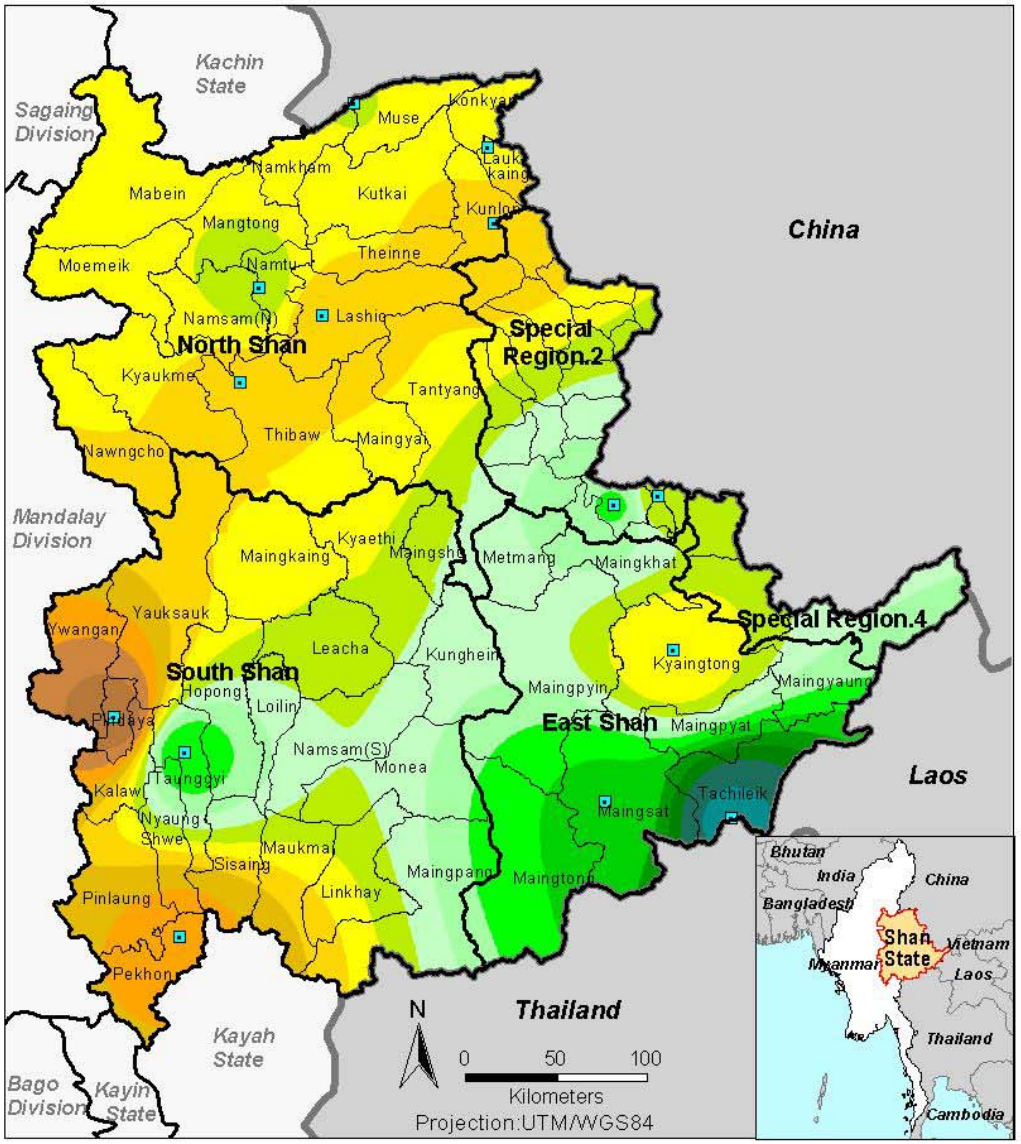
A more detailed analysis of crop conditions shows that the level of crop care differs between the different regions. Irrigation is not practiced across the Shan State but fertilization, almost inexistent in the Wa and the East and in the North Shan, takes place in over half of the sites of the South Shan. In most cases the crop had experienced some damage, especially in the North and South Shan, although the nature of the damage was not clearly specified (See Table 11).

*Table 11: Condition of opium poppy fields in 2004*

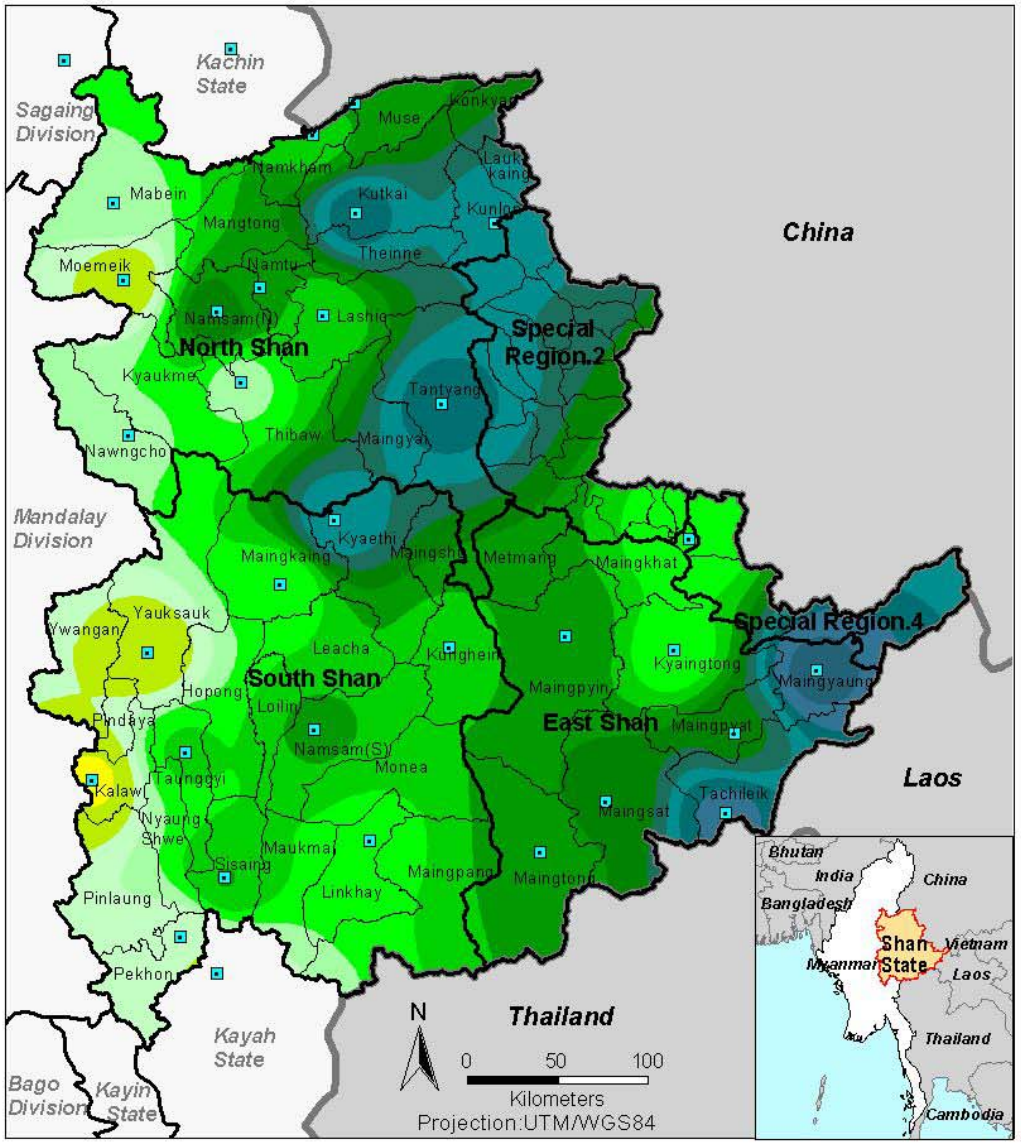
| Field condition | North Shan | | South Shan | | East Shan | | S. R. 2 (Wa) | |
|---|---|---|---|---|---|---|---|---|
| | No | Yes | No | Yes | No | Yes | No | Yes |
| Fertilized | 88% | 13% | 43% | 57% | 100% | 0% | 90% | 10% |
| Irrigated | 100% | 0% | 100% | 0% | 100% | 0% | 99% | 1% |
| Damaged Crop | 20% | 80% | 31% | 69% | 44% | 56% | 50% | 50% |
| Pest Disease | 100% | 0% | 62% | 38% | 94% | 6% | 75% | 25% |
| Water Stress | 100% | 0% | 92% | 8% | 76% | 24% | 93% | 7% |
| Nutrient Stress | 71% | 29% | 92% | 8% | 82% | 18% | 89% | 11% |

Map 3: Myanmar Opium Survey 2004 - July-December average precipitation in 2003 and the 10 year average (1993–2003)

2003




10-year average (1993-2003)




July-December Precipitation (mm)

400 500 600 700 800 900 1000 1100 1200

Meteorological Stations

International Boundaries

State Boundaries

Region Boundaries

Township Boundaries

Source: Myanmar Agricultural Service

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

## 1.4 Opium Prices and Cash Income

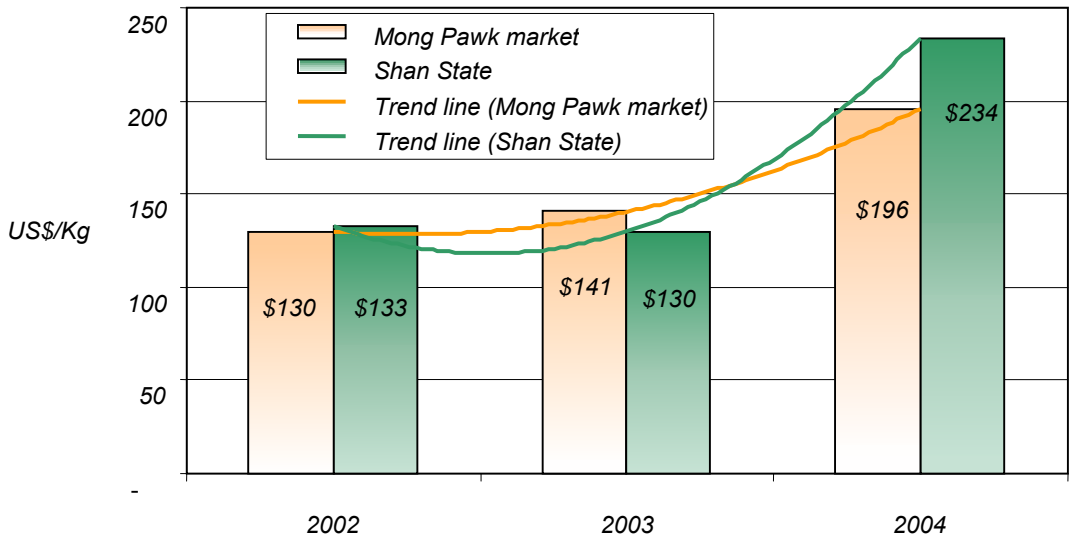
Information on opium prices and income was collected during the village interview campaign. The sources of information were the village headmen and the heads of households.

Opium prices at farmgate level were collected during and after the harvest cycle. This is important to take into account, as prices during this period tend to be lower due to the higher supply of opium. However, most of the farmers' opium sales actually take place during or just after harvest. The information collected in this survey is thus a good reflection of the actual prices that most farmers received for their opium.

The average price of opium for the Shan State was estimated to be **200,300 Kyats per kilogram,** corresponding to **US$ 234**, calculated on an average exchange rate of 856 Kyats to 1 US$ from December 2003 to March 2004. When compared to the farmgate price of US$ 130 reported in the 2003 survey, this corresponds to an increase of 80% in US$ terms, clearly reflecting the strong decline of opium production in 2004 (-54%). The opium prices collected separately by CCDAC in mid 2004 showed even higher levels, of on average 287,000 Kyats per kg (US$335/kg at an average exchange rate of 856 Kyats to 1 US$), suggesting that the price increases continue.

Unless the pressure to prevent opium production is maintained by the authorities, such prices could act as strong incentives for farmers to expand opium production next year.

*Figure 5: Opium price trend in Shan State and Mong Pawk Market, 2002-2004 (US$/kg)*




The overall 2004 price increase in the Shan State is also in line with the results of the weekly opium price collection being implemented through the UNODC Mong Pawk, Wa Alternative Development Project (WADP) (See Table 12 and Figure 6). Opium prices in Mong Pawk increased by about 70% between April 2003 and April 2004, when most of the opium is usually sold.

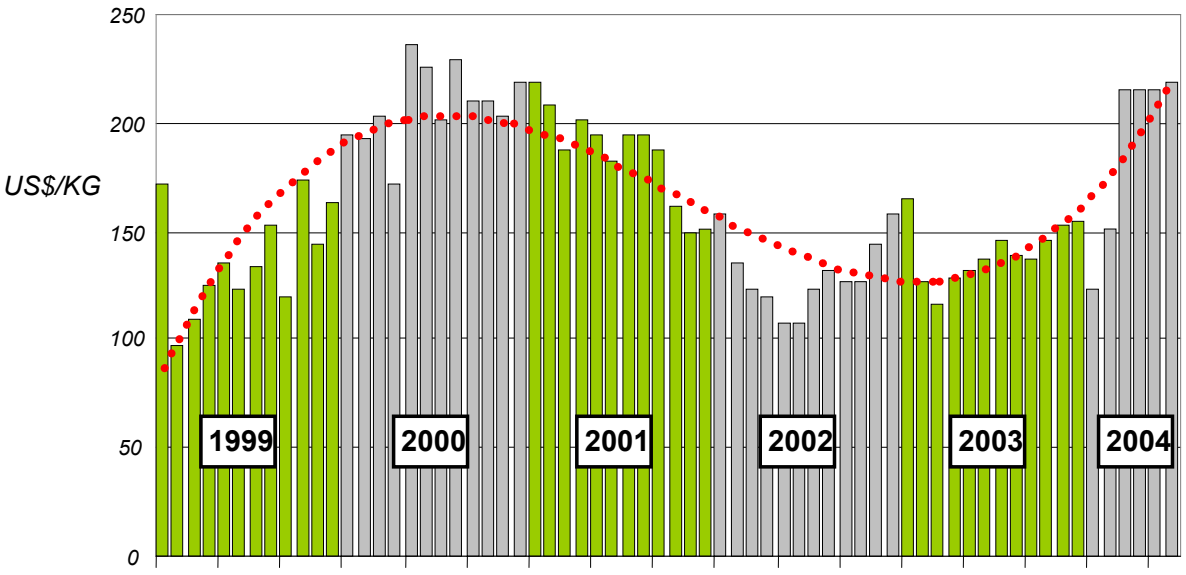
*Table 12: Mong Pawk Opium Price Monitor (US$/kg)*

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | AVG. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | 172.0 | 97.0 | 110.0 | 125.0 | 136.0 | 123.0 | 133.0 | 152.0 | 119.0 | 173.0 | 144.0 | 163.0 | 137.3 |
| 2000 | 195.0 | 193.0 | 203.0 | 172.0 | 236.0 | 226.0 | 202.0 | 230.0 | 210.0 | 210.0 | 203.0 | 218.0 | 208.2 |
| 2001 | 234.0 | 215.9 | 193.9 | 204.7 | 187.3 | 181.6 | 194.9 | 195.0 | 186.1 | 162.2 | 149.7 | 150.6 | 188.0 |
| 2002 | 158.4 | 136.1 | 124.4 | 119.5 | 108.5 | 107.4 | 124.2 | 132.3 | 126.6 | 126.6 | 144.2 | 158.3 | 130.5 |
| 2003 | 165.0 | 126.9 | 117.0 | 128.1 | 132.1 | 138.0 | 146.7 | 139.5 | 137.3 | 146.1 | 152.0 | 155.3 | 140.3 |
| 2004 | 155.0 | 151.1 | 215.7 | 214.8 | 219.2 | 218.8 | | | | | | | 195.8 |

Prices vary across the regions, ranging between 180,000 Kyats (US$ 210) per kg in the East Shan to 243,000 Kyats per kg (US$ 285) in the South Shan State.

It may be interesting to note that the East Shan State, where prices are still relatively low, was the only region where production increased in 2004. Prices are also rather low where supply and competition are strong, such as in Mong Pawk (Wa region).

*Figure 6: Trend line of the Mong Pawk Opium Price Monitor (US$/kg)*




Another determinant for prices is the ease of market access. Prices tend to be depressed in areas where access for illicit drug traders is more difficult and/or where Government pressure is higher. This seems to be the case in the North Shan State where prices are below average.

*Table 13: Opium prices per region in the Shan State in 2004*

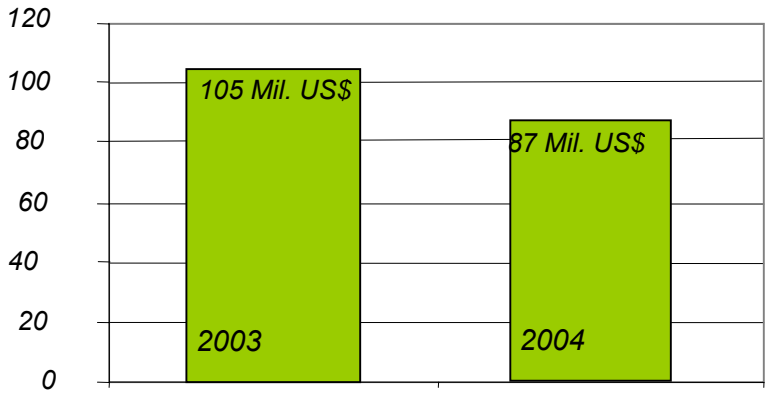
| | North Shan | South Shan | East Shan | S. R. No. 2 (Wa) | Average Shan State |
|---|---|---|---|---|---|
| Opium price in Kyats | 196,556 | 243,684 | 179,741 | 200,012 | 200,310 |
| Opium price in US-dollar | $ 230 | $ 285 | $ 210 | $ 234 | $ 234 |

Based on a potential production of opium of 370 metric tons and an average farmgate price of Kyats 200,310 (or US$ 234/kg), the total **farmgate value of opium production** in Myanmar in 2004 was estimated to be **Kyats 74 billion or US$ 87 million**, equivalent to

about 1-2% of GDP[4] in Myanmar. (For the Shan State, however, the opium related income of farmers clearly exceeds 10% of the local GDP[5]).

The farmers' income represented a decrease of 17% compared to last year's estimated total farmgate value of US$ 105 million. The declines in the area under poppy cultivation and in yields were therefore larger than the increase in farm-gate opium prices.

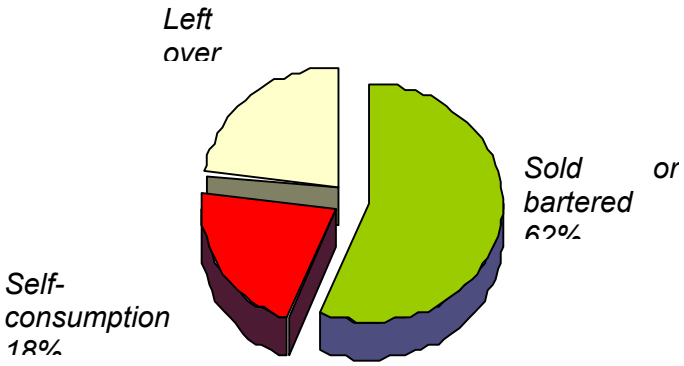
*Figure 7: Opium related income of farmers in Myanmar, 2003 and 2004*




Based on estimates of the number of opium users in the Shan State and an average level of consumption of 1.4 kg per user per year, it can be estimated that only 7% of the total opium production in the Shan State was for personal use in 2004. However, for a 'typical' poppy farmer, who produces only small amounts of opium, the ratio is far higher.

From the interviews it was possible to trace the average destination of the household opium production of a 'typical' opium farmer. The interviews revealed that, on average, 18 % was destined for personal consumption. The bulk of the production (62 %) was traded (sold or bartered). This left an average of around half a kilogram per household, or around 20% of the total, for which the destination was not specified.

*Figure 8: Average destination of household opium production as at harvest 2004*




[4] Based on the latest official data (2001/2002), Myanmar's GDP amounted to Kyats 3,523.5 billion; farmers' income from opium would be equivalent to 2% of GDP. Based on estimates for the year 2003 by the Economist Intelligence Unit, Myanmar's GDP amounted to Kyats 7,685.4 billion or US-$8 billion; based on this estimate the farmers' income from opium would be equivalent to 1% of GDP.

[5] According to the General Administration Department of the Ministry of Home Affairs, slightly less than a tenth of Myanmar's total population lives in the Shan State (9.2%). If the per capita GDP of the Shan State were the same as the average of Myanmar, farmers' income would be equivalent to about 10% of the Shan State's GDP; there are, however, indications that the per capita GDP of the Shan state is below the national average suggesting that the farmers' income from poppy in the Shan state is equivalent to more than 10% of the local GDP of the Shan State.

The situation differs substantially from region to region. The amount of opium kept in the household for self-consumption ranges from 0.2 kg in the North Shan to 0.8 kg in the Wa. While this amount accounts for a substantial 66% of the destination in a North Shan household, it accounts for just 16% in the Wa (See Table 14).

*Table 14: Destination of household opium production as at harvest 2004, per region*

| Opium destination | North Shan | | South Shan | | East Shan | | S. R. No. 2 (Wa) | |
|---|---|---|---|---|---|---|---|---|
| | Kg | % | Kg | % | Kg | % | Kg | % |
| Sold or bartered in 2003–2004 | 0.07 | 22 | 2.59 | 74 | 2.92 | 60 | 1.09 | 50 |
| Opium used for self consumption | 0.22 | 66 | 0.37 | 11 | 0.78 | 16 | 0.60 | 28 |
| Left over | 0.04 | 12 | 0.53 | 15 | 1.18 | 24 | 0.47 | 22 |

These considerations bear witness to the changing situation in the North Shan in terms of opium availability, but also support the overall impression of a substantial stability in the rest of the State. Trade appears to take place essentially within the producer's village, although directed to external buyers or middlemen (See Table 15).

*Table 15: Destination and place of opium trade transactions*

| Administrative region | To Outsiders | To Villagers | Inside the village | Outside the village |
|---|---|---|---|---|
| North Shan | 100% | 0% | 90% | 10% |
| South Shan | 73% | 27% | 86% | 15% |
| East Shan | 73% | 27% | 90% | 9% |
| S. R. 2 (Wa) | 83% | 16% | 61% | 39% |
| Average | 82% | 18% | 82% | 18% |

The timing of transactions differs from region to region. Determinants are linked to the availability of the product, the logistics of sale and the presence of traders.

In the Wa, transactions take place throughout the year in a fairly uniform manner; but the situation is opposite in the North Shan where trade takes place, for the most part, during and after harvest. This is consistent with the overall picture of the strong decline in cultivation in the region (See Table 16).

*Table 16: Average amount of opium sold per period*

| Period of sale | North Shan | South Shan | East Shan | S. R. No. 2 (Wa) |
|---|---|---|---|---|
| Before the harvest | 15% | 0% | 6% | 12% |
| During harvest | 24% | 5% | 57% | 26% |
| Just after harvest | 55% | 32% | 11% | 29% |
| During the last rainy season | 5% | 30% | 5% | 23% |
| Since this dry season | 1% | 33% | 20% | 11% |

The village survey provided a good picture of the household economy and its links with opium production. The average cash income of an opium-producing household[6] was 207,000 Kyats per year (214 US$[7]). The average income of non-opium producing households was 267,000 Kyats (US$ 276)[10], almost 30% higher than that of opium-producing households (see Tables 18 and 19). This difference between opium growers and non-opium growers clearly shows that the cultivation of opium poppy is linked to more marginal economic conditions.

*Table 17: Average cash income per opium producing household in Kyats.*

[6] One household is, on average made up of 5 people, thus a US$ 43 p/p per year
[7] Average exchange rate of 966.5 Kyats per US$ for 2003.

| Source of income | North Shan | South Shan | East Shan | S. R. No. 2 (Wa) | Total Shan State | US-$ | % of total |
|---|---|---|---|---|---|---|---|
| Opium | 8,300 | 127,400 | 26,440 | 169,290 | 128,960 | 133 | 62.3% |
| Livestock | 15,900 | 23,790 | 179,800 | 8,790 | 40,570 | 42 | 19.6% |
| Cereals | 79,000 | 13,100 | 20,250 | | 10,250 | 11 | 5.0% |
| Non-farm Employment | 14,400 | 35,320 | 4,900 | 4,200 | 9,040 | 9 | 4.4% |
| Legume | 25,500 | 5,900 | 2,300 | | 2,800 | 3 | 1.4% |
| Forest Produce | 5,900 | 560 | 8,400 | | 1,900 | 2 | 0.9% |
| Vegetables | 80 | 5,600 | 2,320 | 30 | 1,160 | 1 | 0.6% |
| Fruits | 2,600 | 1770 | 530 | 880 | 1,040 | 1 | 0.5% |
| Other | 6,100 | 47,160 | 5,140 | 6,100 | 11,280 | 12 | 5.4% |
| Total | 157,780 | 255,000 | 250,080 | 189,290 | 207,000 | 214 | 100.0% |
| Opium in % of total income | 5.3% | 50.0% | 10.6% | 89.4% | 62.3% | | |

Where cultivated, opium poppy represents, on average, 62% of the total cash income of farmers. In 2003, cash income from opium was still 69% of the total cash income of opium farmers.

The contribution of opium poppy income to overall income is particularly high in the Wa region (almost 90%) and low in the North Shan state (5%).

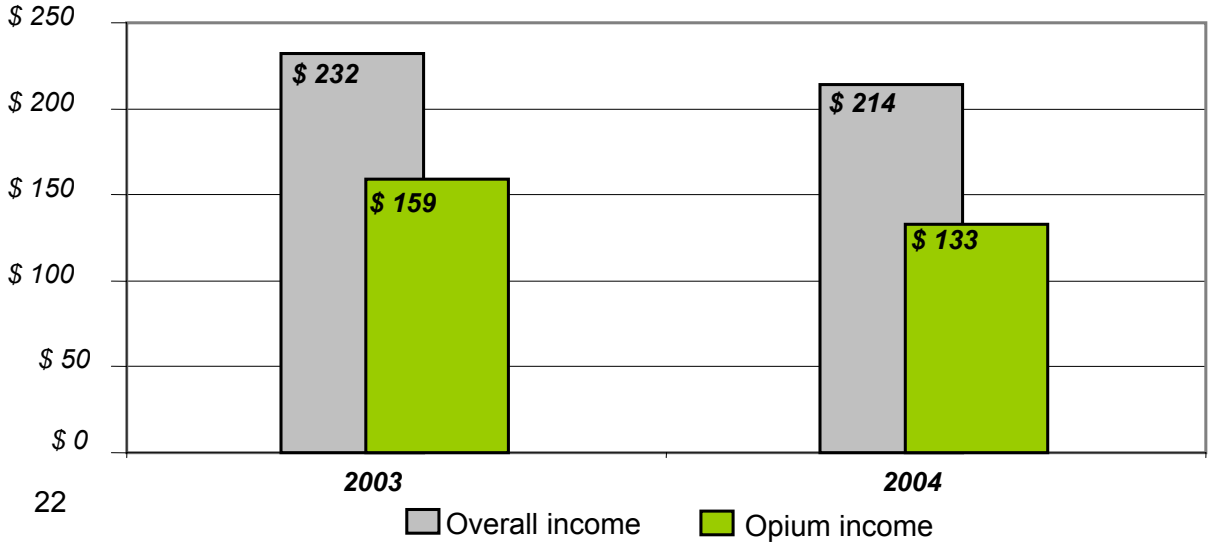
The Wa is, however, also the poorest region. There, the income of opium farmers is more than twice the income of non-opium producers while in all other regions non-poppy farmers are, in general, better off than the opium poppy farmers.

*Table 18: Average cash income per non-opium producing household in Kyats*

| Source of income | North Shan | South Shan | East Shan | S. R. No. 2 (Wa) | Total Shan State | US-$ | % of total |
|---|---|---|---|---|---|---|---|
| Cereals | 75,580 | 43,600 | 128,170 | | 69,540 | 72 | 26.1% |
| Livestock | 26,340 | 13,720 | 182,960 | 69,970 | 50,150 | 52 | 18.8% |
| Non Farm Employment | 17,280 | 29,480 | 71,700 | 6,070 | 33,670 | 35 | 12.6% |
| Vegetables | 1,760 | 40,150 | 10,420 | | 22,400 | 23 | 8.4% |
| Legume | 14,370 | 21,170 | 8,410 | | 16,550 | 17 | 6.2% |
| Fruits | 7,970 | 17,740 | 13,880 | | 13,910 | 14 | 5.2% |
| Forest Produce | 3,870 | 870 | 5,940 | | 2,770 | 3 | 1.0% |
| Other | 67,050 | 68,610 | 15,060 | 6,440 | 57,690 | 60 | 21.6% |
| Total | 214,220 | 235,340 | 436,540 | 82,480 | 266,680 | 276 | 100.0% |

The average **income of a poppy farmer** in the Shan state **declined by 8% in 2004** due to lower income from opium poppy (-16%). Non-poppy income, in contrast, increased by 11%. This increase, however, did not offset opium related income losses.

*Figure 9: Average cash income of an opium poppy farmer in the Shan state in 2003 and 2004*



## 1.5 Addiction

Opium addiction has become a sensitive and important topic in many parts of Myanmar in recent years, including in the Shan State, reflecting the Government's efforts to curb opium production and addiction. Because of this sensitivity, the headmen of only half of the villages sampled were prepared to discuss opium addiction in their village.

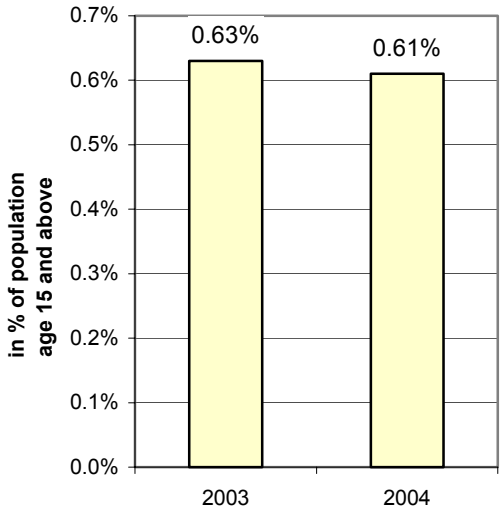
The readiness to provide information was particularly low in the East Shan State (36%) and in the North Shan State (43%). In the Wa region, in contrast, most village headmen (84%) shared their knowledge on this topic with the surveyors.

Only 12% of the headmen interviewed, or 21% of those responding to the question whether *"there were people using opium on a daily basis in the village,"* indicated that there was use on a daily basis.

Based on the information provided by the headmen, 0.61% of the 'adult' population (population age 15 and above), or 0.35% of the total population appears to be addicted to opium in the Shan State. This is about the same as the prevalence rate of opium addiction reported in last year's opium poppy survey (0.63%).

The overall number of opium addicts in the Shan State is thus estimated at slightly more than 17,000 people (out of about 4.8 million people)[8].

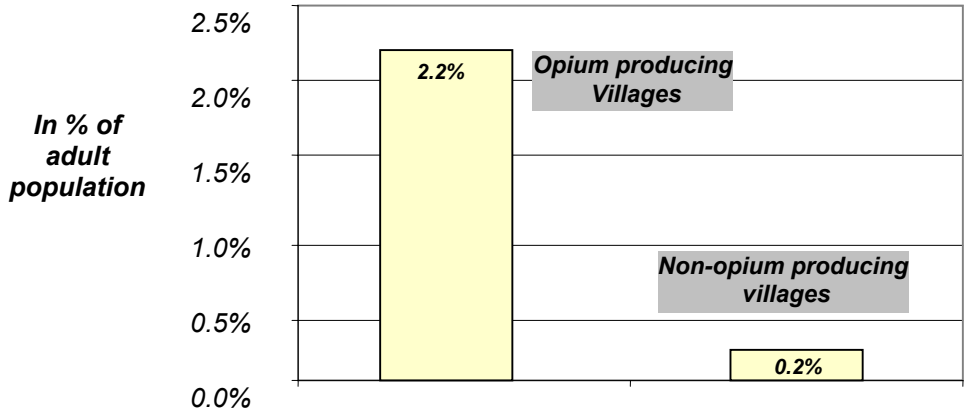
*Figure 10: Opium addiction in the Shan sate; 2003 and 2004, as reported by headmen*




[8] Total population of Myanmar – according to the Government of Myanmar – was 52 million in 2003. The population in the Shan State amounted to 4,793,594 according to the General Administration Department of the Ministry of Home Affairs.

Opium addiction in the Shan state is closely linked to opium production. In villages where opium cultivation took place in 2004, the average level of addiction was 2.2% and thus significantly higher than in non-producing villages where the average level of opium addiction was reported to have amounted to just 0.2% of the adult population.

*Figure 11: Opium addiction in the Shan State in 2004, as reported by headmen – in opium producing versus non-opium producing villages*




Data suggest that villages that suffered higher levels of opium addiction were less likely to stop opium production than villages where opium addiction was less widespread. Thus, in line with an overall decline in the number of opium producing villages in 2004, the remaining opium producing villages had, on average, higher prevalence rates than those surveyed in 2003.

In contrast, opium addiction in non-opium producing villages was slightly lower in 2004 than in 2003.

*Table 19: Opium addiction in opium and non-opium producing villages in the Shan State as reported by headmen in 2003 and 2004*

| | 2003 | | 2004 | | Rate 2003 | Rate 2004 |
|---|---|---|---|---|---|---|
| | Opium addicts | Adult population[9] | Opium addicts | Adult population | | |
| Opium producing villages | 1,018 | 88,660 | 618 | 27,763 | 1.2 % | 2.2 % |
| Non-opium producing villages | 533 | 157.378 | 157 | 99,128 | 0.3% | 0.2% |
| No information provided | - | - | 1 | 1,066 | - | - |
| Total[10] | 1,561 | 246,038 | 776 | 127,957 | 0.6% | 0.6% |

Opium addiction seems to be particularly high in the East Shan State (2.2% of the adult population). These results also confirm last year's survey data that identified the East Shan State, bordering Thailand, Laos and China, to have the highest opium addiction rates. The rates are slightly above average in the Wa region (0.8%) and relatively low in the South Shan State (0.2%) and in the North Shan State (0.3%).

The overall opium addiction rate of 0.6% (18,000 addicts), however, is probably a rather conservative estimate, reflecting the fear of many headmen to openly address the problem of addiction in their village. If the analysis were restricted to the information by headmen who admitted that people were addicted to opium in their village, the average prevalence level of daily opium use would increase to 4.2% of the adult population. The levels of opium use are again higher in opium producing (4.6%) than in non-opium

[9] Population age 15 and above of villages for which headmen provided information on addiction
[10] Village headmen providing information

producing villages (3.1%), though the differences are less significant than they would be if the population of all villages were used as a basis for analysis.

Similarly, the regional differences are less pronounced if only the villages where the headmen admitted the existence of an opium addiction problem are analysed. Above average rates are, again, found in the East Shan State (4.9%) while the lowest rates are found in the North Shan State (3.3%).

*Table 20: Opium addiction data*

| | North Shan | South Shan | East Shan | S. R. n. 2 (Wa) | Total |
|---|---|---|---|---|---|
| No. of villages surveyed | 475 | 362 | 598 | 165 | 1,600 |
| No. of headmen responding to question on addiction | 204 | 253 | 216 | 137 | 810 |
| Population of villages responding | 73,726 | 85,763 | 29,945 | 32,163 | 221,597 |
| Adult population[11] of villages responding | 50,018 | 43,442 | 18,757 | 15,740 | 127,957 |
| No. of headmen reporting addiction in their village | 25 | 16 | 100 | 28 | 169 |
| Adult population of villages reporting addiction | 4,202 | 2,240 | 8,227 | 3,872 | 18,540 |
| No. of opium addicts in sample | 132 | 103 | 421 | 120 | 776 |
| Addicts in % of adult population of villages responding to question of addiction | 0.3% | 0.2% | 2.2% | 0.8% | 0.6% |
| Addicts in % of adult population of villages with opium addiction | 3.3% | 4.2% | 4.9% | 3.5% | 4.2% |

Data also show that opium smoking is still mainly a male phenomenon; on average 83% of opium addicts are male and only 12% female. For the remaining 5% of the cases the headmen provided no gender split and it can be assumed that some of them were also female. The proportion of female addicts thus appears to be rising (10% in 2003).

The proportion of female addicts has been above average in the North Shan State (17%) and in the Wa region (15%).

*Table 21: Gender distribution of opium addiction*

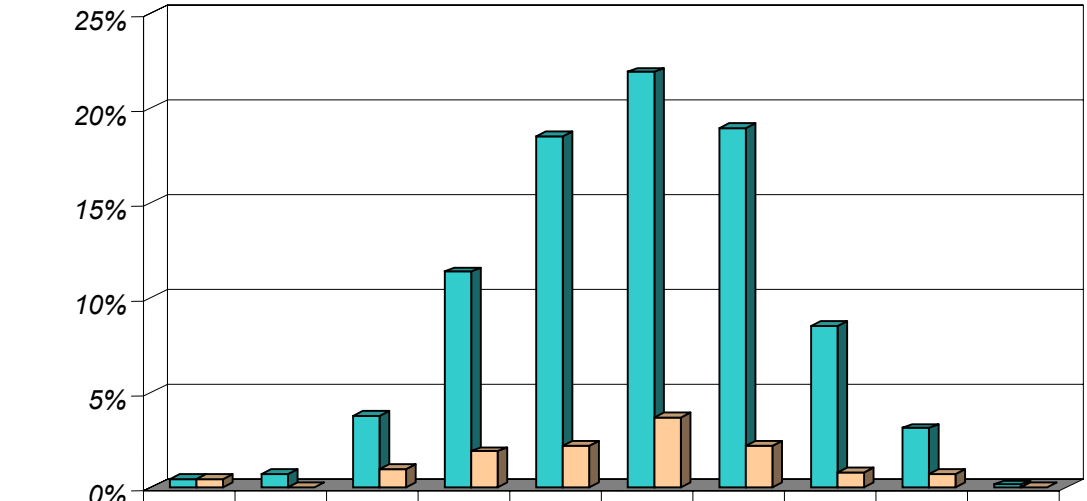
| | North Shan | South Shan | East Shan | S. R. n. 2 (Wa) | Total |
|---|---|---|---|---|---|
| % Male addicts | 76% | 98% | 98% | 82% | 83% |
| % Female addicts | 17% | 2% | 0% | 15% | 12% |
| % No gender data provided | 7% | 0% | 2% | 3% | 5% |
| | 100% | 100% | 100% | 100% | 100% |

In terms of age, data confirm (as shown in previous surveys) that the largest numbers of opium addicts are found in the age group between 51 to 60 years old. This is the case for both men and women. Opium addiction is thus primarily a phenomenon of the older generation. The highest levels of opium addiction in proportional terms (expressed as a percentage of the population of specific age cohorts) are encountered for those aged 61-90 years (2.3%).

The prevalence rate in this age group is higher than for the 51-60 years old (1.7%) and almost four times as high as the overall average among the adult population in the Shan State (0.6%). Such results are not untypical for a country with traditional opium consumption; they are, however, in sharp contrast to the situation in most other countries where drug addiction is primarily concentrated among youth or young adults.

[11] Population age 15 and above

*Figure 12: Distribution of opium addicts - age group and sex*




| | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 | 60-70 | 70-80 | 80-90 | 90-100 |
|---|---|---|---|---|---|---|---|---|---|---|
| Male | 0% | 1% | 4% | 11% | 19% | 22% | 19% | 9% | 3% | 0% |
| Female | 0% | 0% | 1% | 2% | 2% | 4% | 2% | 1% | 1% | 0% |

## 1.6 Demographics and socio-economics of the sampled population

The interviews of village headmen and household heads also facilitated the collection of reference data useful in sketching the socio-economic framework in which opium poppy cultivation takes place.

The headmen interviews were aimed at obtaining a detailed overview at village level while data collected from the sample of households were aimed at specific issues such as productive activities, income and expenditures, with the objective of detecting possible differences between opium-producing and non-opium-producing households.

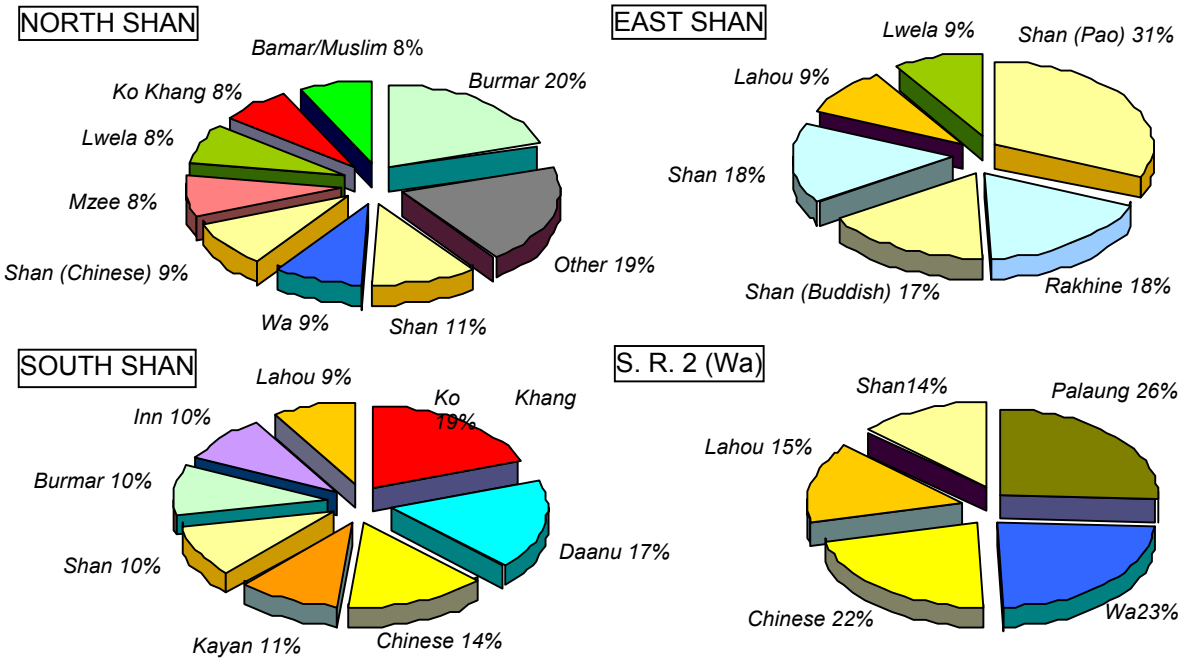
In the Shan State, a total of 1600 villages were visited, including almost 78,000 households and a population of over 414,700 people. The information covered in this sample was thus equivalent to 9% of the total population of the Shan State. The overall sample is described in Tables 22 and 23.

*Table 22: Composition of the Socio-Economic Survey Sample*

| | North Shan | South Shan | East Shan | S. R. 2 (Wa) | Total |
|---|---|---|---|---|---|
| Total n. of villages surveyed | 362 | 598 | 475 | 165 | 1,600 |
| Total n. of households | 21,409 | 34,127 | 14,939 | 7,461 | 77,936 |
| Total population | 118,318 | 177,026 | 80,976 | 38,424 | 414,744 |
| Average Population per Village | 323 | 298 | 165 | 233 | 258 |
| Average n. of HH per Village | 59 | 57 | 32 | 46 | 49 |
| Total Adults[12] | 77,742 | 93,904 | 44,925 | 17,549 | 234,120 |
| Female | 62,520 | 93,240 | 39,674 | 20,122 | 215,556 |
| Male | 55,798 | 83,786 | 41,302 | 18,302 | 199,188 |

The ethnic composition of the regions of the Shan State is possibly the most diversified in the whole of the Union of Myanmar (see Figure 13).[13]

*Figure 13: Ethnic Composition of the Sample*




[12] For a few villages no breakdown of adult and children was provided

[13] Other ethnic groups reported in the survey: Akar, Chin, Gawrakhar, India, Kachin, Kayin, Leshaw, Li Su, Mon, Padaung, Pah O, Taung Yoo, Wa, Yin

*Table 23: Sample household profile*

| | North Shan | South Shan | East Shan | S. R. 2 (Wa) | Total |
|---|---|---|---|---|---|
| Adults | 3.6 | 2.8 | 3.0 | 2.4 | 3.0 |
| Children under 15 years | 2.0 | 2.4 | 2.1 | 2.7 | 2.3 |
| **Total** | **5.6** | **5.2** | **5.1** | **5.1** | **5.3** |
| | | | | | |
| Family members working on the farm | 3.1 | 3.1 | 3.1 | 2.9 | 3.1 |
| Family members working outside the farm | 1.3 | 1.3 | 1.8 | 1.8 | 1.5 |

In the last season (2003 – 2004), the increasing pressure of the authorities in combating opium cultivation was associated with significant movements of population in the Shan State. Emigration was estimated at 2.3 % average, prevailing over immigration that was estimated at 1.4 % among the overall population within the sample.

The North and the East Shan have experienced the highest levels of displacement. In the East Shan inward and outward migration have been rather balanced (3.1% in and 4.5% out), while in the North Shan, outward migration exceeded inward (0.4% in and 3% out).

The opposite pattern can be observed in the Wa, where the immigration rate is more than double that of emigration (5.4 % in and 2.6% out) (See Table 24). This is surprising insofar as the Wa region is generally regarded to be the poorest region in the Wa state.

Though there is a formal commitment to a full cessation of all opium cultivation practices in the Wa by the year 2005-2006, cultivation continues and is *de-facto* tolerated. This probably encourages a certain level of influx. In contrast, in the North Shan, were the strongest opium poppy elimination efforts are taking place, net migration out of the area is unambiguous. The same can be said, though to a somewhat lesser extent for the South and East Shan.

In the course of the survey, it was also possible to gather information on the main ethnic groups that are affected by migration (See Table 24).

*Table 24: Immigration and Emigration Rates and Main Migrating Ethnic Groups.*

| Administrative Region | Immigration Rate | Main Ethnic Groups | % | Emigration Rate | Main Ethnic Groups | % |
|---|---|---|---|---|---|---|
| North Shan | 0.4% | Kachin | 45.6 | 3.0% | Chinese | 54.1 |
| | | Wa | 26.6 | | Palaung | 33.5 |
| | | Leshaw | 25.3 | | Wa | 6.0 |
| | | Shan | 2.5 | | Kachin | 4.6 |
| | | | | | Shan | 1.8 |
| South Shan | 0.3% | India | 39.6 | 1.4% | Pah O | 38.7 |
| | | Chinese | 26.4 | | Danu | 25.8 |
| | | Lahou | 17.6 | | Shan | 19.4 |
| | | Palaung | 8.8 | | Palaung | 16.1 |
| | | Shan | 7.7 | | | |
| East Shan | 3.1% | Lahou | 48.6 | 4.5% | Lahou | 54.2 |
| | | Akar | 35.1 | | Shan | 29.5 |
| | | Shan | 12.6 | | Lwela | 13.7 |
| | | Lwela | 1.8 | | Akar | 2.6 |
| S. R. 2 (Wa) | 5.4% | Wa | 100.0 | 2.6% | n.a. | |
| Total | 1.4% | | | 2.3% | | |

Further analysis would be required to correctly identify the migration routes and the causes of such movements.

Considering the significant impact that opium production and trade still have on the rural economies, it seems to be possible to associate these trends with the current status of the fight against opium cultivation.

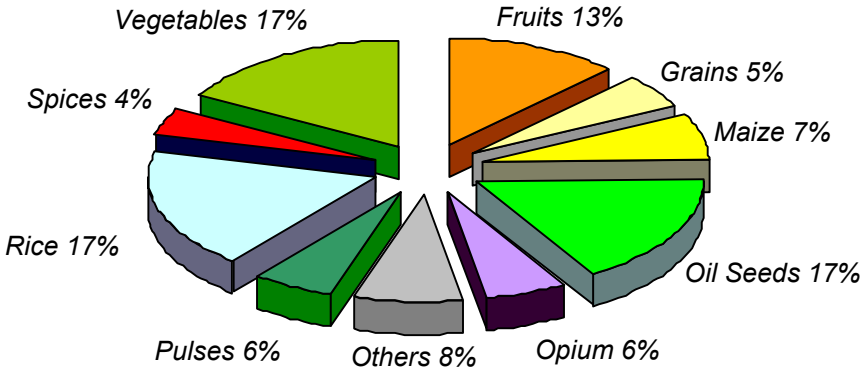
The village headmen interviews also provided a picture of the different land use patterns. Permanent cultivation prevails. But shifting agriculture still covers a significant portion of the territory, possibly increasing at the expense of forests, a worrying indicator of environmental degradation.

*Table 25: Land Use*

| Land use | North Shan (%) | South Shan (%) | East Shan (%) | S. R. 2(Wa) (%) | Total (%) |
|---|---|---|---|---|---|
| Permanent cultivation | 33.0 | 48.3 | 35.5 | 27.8 | 38.9 |
| Forest | 20.1 | 12.6 | 31.5 | 26.0 | 21.3 |
| Shifting cultivation | 20.2 | 19.3 | 13.9 | 22.2 | 18.2 |
| Pasture | 12.0 | 5.8 | 10.8 | 19.2 | 10.1 |
| Fruit trees | 6.8 | 8.8 | 4.4 | 4.2 | 6.6 |
| Others | 7.9 | 5.3 | 3.9 | 0.6 | 5.0 |

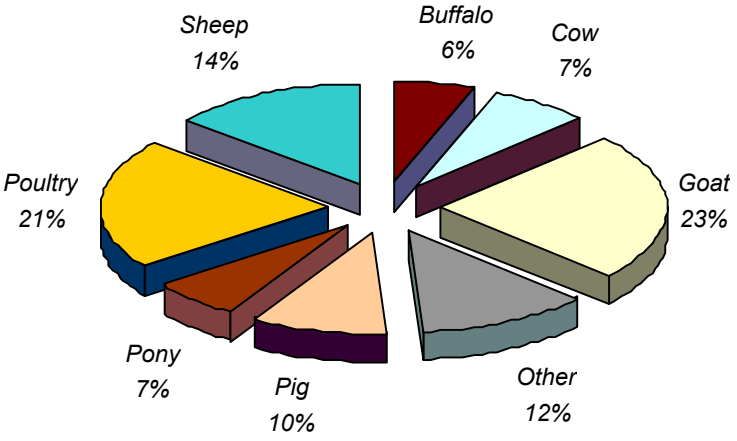
On average the cultivated land parcels are located at a distance ranging from a 25 minute walk (in the North Shan) to a full hour walk from the village (in the Wa). Rice, vegetables and oil seeds are the main cultivated crops, indicating a fairly diversified agriculture (See Figure 13).

*Figure 14: Overall distribution of agricultural crop per household per year (in percent)*




The average livestock availability of the rural household (See Figure 14) also reflects the characteristics of a fairly diversified agriculture.

*Figure 15: Overall distribution of livestock per household*



It was also possible to acquire information concerning the average land tenure among the sample households. Data show that the bulk of the land (80% on average) is owned by those who cultivate it (See Table 26). In the case of opium poppy farmers, the proportion of the land owned by the farmers increases to 85%.

*Table 26: Land Use (all farmers)*

| Land use | North Shan (%) | South Shan (%) | East Shan (%) | S. R. 2 (Wa) (%) | Total (%) |
|---|---|---|---|---|---|
| Owned | 76.7 | 76.9 | 81.7 | 94.1 | 80 |
| Temporary | 11.8 | 6.5 | 8.4 | 2.3 | 7.8 |
| Share cropped | 1.3 | 4.6 | 1.4 | 0.5 | 2.5 |
| Rent in | 1.5 | 4.4 | 0.7 | 0.8 | 2.3 |
| Rent out | 1.1 | 3.2 | 0.3 | 0.1 | 1.5 |
| Tenant | 0.8 | 2.3 | 1.0 | 0.0 | 1.4 |
| Don't know | 0.6 | 0.0 | 0.3 | 0.8 | 0.4 |

*Table 27: Land Use among opium poppy farmers*

| Land us | North Shan (%) | South Shan (%) | East Shan (%) | S. R. 2 (Wa) (%) | Total (%) |
|---|---|---|---|---|---|
| Owned | 77.5 | 80.1 | 74.1 | 94.5 | 85.3 |
| Temporary | 17.8 | 9.8 | 24.3 | 2.4 | 10.9 |
| Share cropped | 0.2 | 5.3 | - | 0.5 | 1.0 |
| Usufruct | 0.6 | 1.0 | - | 1.1 | 0.7 |
| Rent out | 2.5 | 2.0 | 0.0 | 0.1 | 0.5 |
| Rent in | 0.7 | 0.9 | 0.1 | 0.5 | 0.4 |
| Tenant | 0.8 | 0.9 | 0.6 | - | 0.3 |
| Don't know | - | - | 1.0 | 1.0 | 0.8 |

## 1.7 Reported Eradication

In 2004 a total of 2,820 ha were reported to have been eradicated, representing an increase of over 300% with respect to the 638 ha eradicated in 2003. The pressure from authorities has increased significantly in the South Shan (~ + 1000 %), but also in the Kayah State (~+ 800 %) and Kachin State (~ + 100%) as well as on the Sagaing Division where there was no eradication in 2003. In the North Shan State, in contrast, eradications nearly halved, reflecting 'voluntary' abandonment of poppy cultivation.

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

*Table 28: CCDAC official eradication figures*

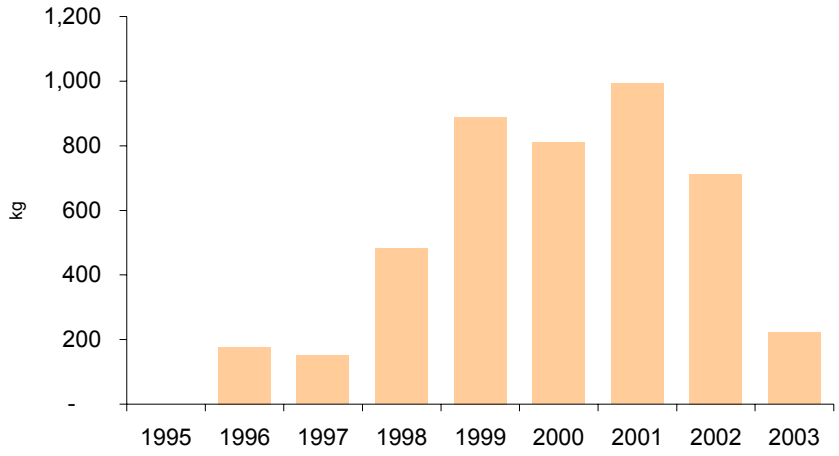
| Administrative Unit | 2004 (ha) | 2003 (ha) | Variation (%) |
|---|---|---|---|
| *North Shan State* | 172 | 235 | -27 % |
| *South Shan State* | 2,170 | 182 | 1092 % |
| *East Shan State* | 195 | 91 | 114 % |
| *S. R. 2 (Wa)* | 0 | 55 | - |
| Shan State | 2,537 | 563 | 351 % |
| Kachin State | 126 | 56 | 125% |
| Chin State | 0 | 2 | -100 % |
| Sagaing | 74 | 0 | - |
| Kayah State | 83 | 9 | 824 % |
| Mandalay Division | 0 | 8 | - |
| Total | 2,820 | 638 | 342 % |

*Figure 16: Eradication of Opium Poppy field in the South Shan State, Mong Nai Township*

## 1.8 Reported Seizures of ATS

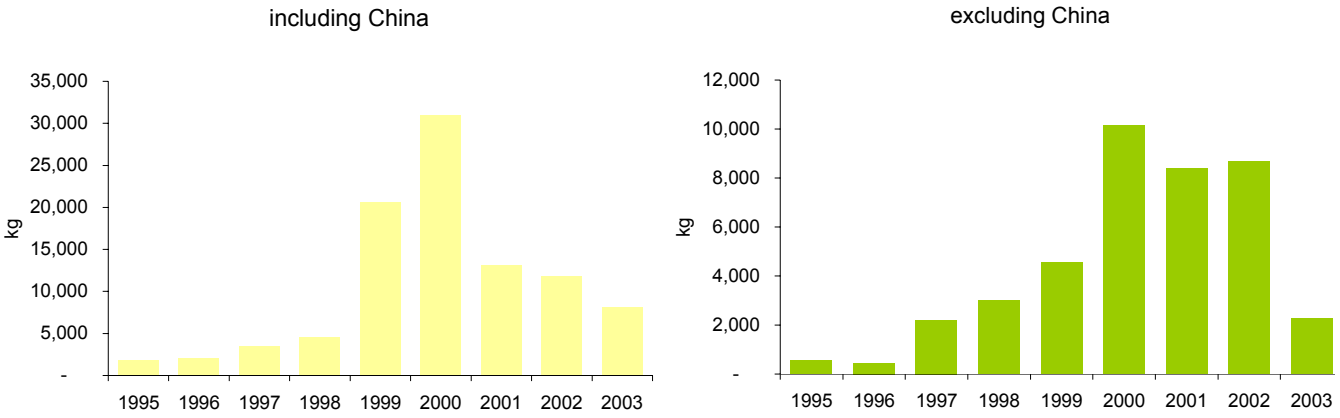
The 2004 Myanmar Opium Survey concentrated on estimating the level of opium poppy cultivated and the amount of opium produced. It did not collect data on the production, seizure, or consumption of amphetamine-type stimulants (ATS). It is, however, interesting to note that seizures of ATS (excluding ecstasy) have started to decline in Myanmar as well as in neighbouring countries. Thus, there is no evidence or fears that the decline in opium production could be compensated by rising levels of ATS production in Myanmar.

*Table 29: Reports of Seizures of ATS (excluding ecstasy) in Myanmar (in kg equivalents)*




*Sources: UNODC, Annual Reports Questionnaires Data / Delta*

*Table 30: Reports of Seizures of ATS (excluding ecstasy) in countries neighbouring Myanmar (in kg equivalents)*




*Sources: UNODC, Annual Reports Questionnaires Data / Delta*

# 2 METHODOLOGY

The Myanmar Opium Survey 2004 is the third such consecutive annual survey implemented in the Union of Myanmar by the Central Committee for Drug Abuse Control (CCDAC) in collaboration with UNODC.

In 2004 an in-depth survey was conducted in the Shan State and rapid assessment surveys took place in the Chin and Kachin States and the Sagaing Division.

Opium poppy cultivation is rapidly decreasing in Myanmar. Fields are moving further away from the villages and, in certain areas, are subject to eradication practices. In the evolving situation, cultivation is also migrating to new environments, in some cases to areas once considered free or climatically less favourable.

All of these considerations, coupled with the reduced accessibility and the relative rareness of the crop, affected the methodological approach for the estimation of the planted area and, therefore, for the planning and implementation of the 2004 survey.

The methodology implemented in the current season followed in the steps of the work done in the previous years. Efforts were however made to improve on a number of methodological details and to adapt to the evolving situation of cultivation. The previous surveys saw the establishment of satellite remote sensing in both the preparation phase, using LandSat TM7 images, and in the data collection phase, with high-resolution IKONOS imagery. This approach was also used in the current survey in an effort to further integrate and structure the ground data collection component, and to combine the use of satellite remote sensing with field surveys and interviews, for the production of comprehensive estimates.

The 2004 opium poppy survey consisted of 5 parallel campaigns:

- A planted area estimation survey through 4 regions of the Shan State (North, South, East and Special Region No. 2 of the Wa). (The Shan State - traditionally - has accounted for more than 90% of total opium production in Myanmar). This survey relied on the use of satellite remote sensing as the prime source of data. Satellite remote sensing was supplemented by field surveys to provide ground truthing and to support the interpretation.

- An opium poppy yield estimation survey in the 4 regions of the Shan State for the description and measurement of opium fields that were researched within a random set of sample sites.

- A socio-economic survey also in the 4 regions of the Shan State based on interviews with village headmen and heads of households in all the villages that were found in a sample of Village Tracts[14].

- A rapid assessment survey to collect information on opium poppy cultivation outside the traditional areas of the Shan State. This survey focused on the Kachin and Chin States and the Sagaing Division where information was available that some opium production takes place.

- An opium-poppy-free area certification survey in the Special Region No. 4 of the Shan State.

[14] A village tract is a cluster of villages and corresponds to the fourth level of the Myanmar administrative system (union / state / township / village tract / village).

## 2.1 Organization and Staff

The survey campaigns were coordinated by the UNODC-ICMP office in Yangon and, as in previous years, operationally implemented in close collaboration with Myanmar official institutions:

- The opium poppy yield and socio-economic survey was supervised and implemented by the Myanmar CCDAC while UNODC-ICMP provided technical support, coordination and supervision throughout the survey.
- The rapid assessment surveys in the Kachin and Chin States and in the Sagaing Division, as well as the opium-free certification survey in the Special Region No. 4, were implemented directly by UNODC-ICMP in close collaboration with the CCDAC and local Institutions participating in the field supervision.
- The area planted estimation campaign instead, was conducted in collaboration with the Remote Sensing and GIS Section of the Ministry of Forestry.

***Area Planted Estimation Survey***

The area planted estimation was based on the identification of opium poppy fields on a sample of 69 high-resolution IKONOS satellite images. This process was supported by field surveys aimed at acquiring reference ground truthing for the interpretation and/or the classification of the images.

Three separate teams, each comprising two surveyors from the Remote Sensing and GIS Section of the Department of Forestry, went to the field with printouts of the satellite images. Once they reached the area represented in each single scene, they proceeded to annotate the print with the land use classes and relative boundaries, proceeding along specific transect itineraries.

Work was characterized by a slow start due to the need for access authorization to some of the sites. Survey operations eventually started the first week of February and carried on until mid March 2004.

***The Opium Poppy Yield And Socio-Economic Survey***

For the socio-economic and yield estimation campaign, 159 surveyors carried out the fieldwork from December 28, 2003 to March 11, 2004. They were organized in 54 teams, each comprising three surveyors. Work was coordinated by a head supervisor based in Kyaing Tong (East Shan) who relied on the work of 4 local supervisors, one each for the 4 Regions (North, South, East and Wa). The survey teams were all involved in interviews with village headmen and heads of households as well as field measurements for the collection of yield estimation variables.

Each ground survey team was composed of 3 members: one from the Police Force, one from the General Administration Department and one from the Land Record Department or the Myanmar Agriculture Service. The officer from the Police Force acted as the team leader.

The duration of this campaign, including the preparation phase, was 8 weeks from January 16 to March 11, 2004. The surveyors were divided into 4 groups, received training courses, respectively, in Taunggy for the South Shan, in Kyaing Tong for the East Shan, in Lashio for the North Shan and, finally, in Pang Seng, for the Special Region No. 2 of the Wa. The training covered the description of the survey process, the familiarization with the questionnaire, the use of GPS, the application of field measurement techniques including poppy capsule measurement techniques, the random selection of households for the interviews and, finally, interview techniques. A day and a half of field practice followed the theoretical part of the preparation. Training was completed with the

distribution to participants of the map of the target areas, the GPS instruments and the questionnaires.

*Table 31: Training schedule and logistics*

| Location | Survey Zone | Training Dates | No of trainees |
|---|---|---|---|
| Taunggy | South Shan State | 16/12/03 to 22/12/03 | 54 |
| Kyaing Tong | East Shan State | 26/12/03 to 2/01/04 | 30 |
| Lashio | North Shan State | 7/01/04 to 13/01/04 | 51 |
| Pang Seng | Special Region No. 2 (Wa) | 7/01/04 to 13/01/04 | 24 |
| TOTAL | | | 159 |

In general, one survey team was assigned to one township and so, after receiving the training, each team was dispatched to their respective assignment post. However, for Townships with a heavy workload (many Village Tracts and survey sites), two ground survey teams were assigned to the task.

The operational survey started on December 28, 2003 in the South Shan, and all the 159 trainees were finally in the field by January 21. The supervision teams met for a first reporting session on February 10, to assess the state of advance of the survey and organize the quality control activities. The duration of ground survey was 8 weeks and operations wrapped up within the second week of March.

*Table 32: Opium poppy yield estimation and socio-economic survey fact sheet*

| | North Shan (%) | South Shan (%) | East Shan (%) | S. R. 2 (Wa) (%) | Total (%) |
|---|---|---|---|---|---|
| Start date | 28/12/03 | 8/01/04 | 21/01/04 | 21/01/04 | |
| End date | 22/02/04 | 3/03/04 | 11/03/04 | 11/03/04 | |
| Survey Teams | 19 | 10 | 17 | 8 | 54 |
| Targeted Village Tract | 67 | 39 | 60 | 33 | 200 |
| Surveyed Village Tract | 64 | 39 | 55 | 33 | 191 |
| Targeted Field sites | 401 | 190 | 238 | 176 | 1005 |
| Surveyed Field sites | 318 | 126 | 212 | 154 | 810 |
| No of villages Surveyed | 598 | 475 | 362 | 165 | 1600 |
| Household Surveyed | 6592 | 3654 | 3255 | 1947 | 15448 |
| No. of sites with opium | 13 | 18 | 5 | 136 | 172 |

The surveyors could not identify and reach all of the assigned sites in the course of the survey because of specific impediments:

- Unfavourable security conditions prevailing in some of the assigned areas at the time of the survey, especially in the East and South Shan.
- Some of the assigned points of survey were located in Townships adjacent to those were the teams were operating. This seemingly tedious detail was actually of some impediment to operations because movement and communication even between neighbouring Townships is not straightforward and, in many cases, requires authorization.
- The same problem listed above, occurred in the case of recently created (in the context of the Country's administrative system) Sub-Townships.

***Opium poppy free Certification survey in the Special Region No. 4***

The Rapid Assessment Survey was conducted on a sample of 184 sites situated over 5 townships and 78 villages. These sites were randomly selected on a Bare Soil Map identifying all those areas that presented as barren or cultivated at the end of the rainy season. This map could focus the survey on areas where the probability of finding opium poppy fields was rather high and, just like the one used for the yield survey, was derived on the full 2003 LandSat satellite coverage of the Shan State.

A team, consisting of 2 trained surveyors carried out the field survey and the local authorities of the S. R. 4 provided full assistance and cooperation during the operations. The survey lasted 8 weeks, starting February 23, 2004 and succeeded in accessing a total of 110 sites out of 184. The work was completed by April 8, including a sample quality assessment survey by personnel from the Yangon UNODC office.

Overall 74 sites could not be reached, mostly due to a number of factors, among which the following were listed: no access tracks or roads, rocky mountains and very step cliffs, danger of land mines and very thick jungle.

***Rapid Assessment Surveys in the Kachin and Chin States and in the Sagaing Division***

The survey conducted in the Kachin, Chin and Sagaing, was the first such intervention by UNODC in those territories. A whole logistic and organization framework had to be put in place before starting the survey. The interview of potential surveyors started in Hakha, (Chin State) on January 26, 2004. Two surveyors for the Chin State and two for the Sagaing Division were chosen among 33 candidates with the help of an officer from the CDRT/UNDP. A second round of selections took place in Myitkyina for the Kachin State, starting February 2. This led to the selection of 2 further surveyors. In Hakha and in Myitkyina, the selection was followed by a training course that included the basics on field survey planning, data collection, GPS operation and reporting techniques. Survey operations started on February 16 and were completed on April 30, 2004.

*Table 33: Kachin, Chin and Sagaing rapid assessment survey, fact sheet*

| | Chin State | Kachin State | Sagaing Division |
|---|---|---|---|
| Start date | 16/02/04 | 18/02/04 | 16/02/04 |
| End date | 30/04/04 | 11/04/04 | 30/04/04 |
| Targeted Village Tract | 209 | 48 | 176 |
| Surveyed Village Tract | 52 | 22 | 66 |

In the Kachin, Chin and Sagaing the surveyors experienced several logistic problems. As no autonomous transport facility was available, at times they had to walk two to four days between villages. Points that looked very near on the map were in fact almost unreachable because of the mountainous nature of the terrain and, last but not least, since the local authority had not always been properly informed about the campaign in advance, a significant amount of time was spent on introductions and explanations. All things considered, however, the experience allowed UNODC to take a first look at these territories and acquire precious information for the planning and management future surveys.

*Figure 17: Training of the Chin and Sagaing Survey teams in Hakha.*

## 2.2 Sampling procedure

The planning of the various sample surveys started with the creation of stratification maps in order to optimise the process by focusing the distribution of the samples where they could have the highest probability of finding opium poppy fields. Within these maps, "sampling frames" were defined by dividing stratification areas into the sub-units that make up the population among which the sample is selected.

In the 2004 Myanmar Opium Poppy Survey there were 5 different sets of samples:

- The high–resolution images from the IKONOS satellite used for the opium poppy planted area estimation.
- The field sites where opium poppy was searched for and where the parameters necessary for the yield estimation were mentioned. Each of these sites was made up of a grid of 3*3 points of observations, 200 m apart, set on a square portion of land of 600 * 600 m (0.36 $Km^2$) in size.
- The Village Tracts in which the villages for the socio-economic interviews were located.
- The points for the rapid assessment of opium poppy presence in the Kachin and Chin States and in the Sagaing Division, having the same structure as the survey sites used for the collection of yield estimation parameters.
- The sites for the certification of the "Poppy Free Area" of the Special Region No. 4. These were simple points characterized by latitude and longitude coordinates

***Stratification***

"*The Principle of Stratification is to partition the population in such a way that the units within a stratum are as similar as possible*"[15].

Stratification is a key element for the whole process as it accounts for all the variables that characterize the cultivation of the target crop and drives the placement of the sample. At the same time, it provides the 'expansion area' for the estimate. The process of stratification implied identifying all those features that define the territory as more or less at risk of hosting opium poppy. The description of these features was made available in the form of maps.

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

- The **Opium Poppy Cultivation Risk Map:** This map was derived from the integration of two Land Use / Land Cover Maps available for the Shan State:
    - The land cover map produced in the year 2001 by the Remote Sensing and GIS Section of the Myanmar Forestry Department
    - The land cover map produced by UNODC in 2002, used as stratification for the 2003 Opium Survey.

  These documents, derived from the interpretation of medium resolution satellite data (LandSat TM7), actually had different information content and for certain aspects they were complementary. For this reason they were combined to produce a comprehensive document. The processing started with the review of the definitions of the land use classes of both maps, so that they could be, at the same time, compared and considered viable in the medium term. The 2 documents were then merged to create a 2003 Land Cover Map and the resulting new land cover / land use classes

[15] S. K. Thompson, "SAMPLING", Pennsylvania State University, J. Wiley& Son Inc.

were re-interpreted to define a Risk Map for poppy cultivation. The analytic procedure is schematically described in the following table.

*Table 34: Processing of the 2001 and 2002 Land cover maps to a 2003 Risk map*

| 2001 Forest Dpt. Land Cover | 2002 ICMP Land Cover | 2003 ICMP Land Cover (2001 + 2002) | 2003 ICMP Interpreted Risk map |
|---|---|---|---|
| Agricultural Land | Agriculture | Agriculture | LOW RISK |
| | Irrigated-agric. | | |
| | Mix-agric. | Mixed Agriculture | HIGH RISK |
| Shifting Cultivation | | Shifting Agriculture | |
| Degraded forest affected by shifting cultivation | | | |
| Closed forest | Forest | Forest | NO RISK |
| Degraded forest | Forest + bush | Open Forest | HIGH RISK |
| | Open forest | | |
| Scrub Land | Rangeland | Rangeland | HIGH RISK |
| Grass Land | | | |
| Scrub Land with Grass Land | Non-Agric. | | |
| Urban | Settlement | Urban Areas | NO RISK |
| | Settlement + Agric. | | |
| Water bodies | Water | Water | |
| Wetland | Wetland | | |
| | Marshland | | |
| Sand | Bare rock | Rock | |
| Cloud Cover | | | |

- The **Altitude Interval Map**: This map, derived from a D.E.M.[16], identifies the average environmental conditions of poppy cultivation in South East Asia, ranging between 700 and 1800 m of altitude. It was used to create a mask so as to exclude from the survey all areas lying below 700m a.s.l. (and above 1800 m).
- The **Administrative Boundaries Map**: This map outlines the boundaries of the regions, the Special Regions, the Townships and the Village Tracts of the Union of Myanmar. The statistics were provided at the scale defined by the region (and Special Region) boundaries, as a higher level of detail (Township or Village Tract) was not required.
- The **Bare Soil Map** (BSM): This map identifies all those surfaces[17] that are ploughed and bare in autumn and consequently potentially suitable for opium poppy cultivation, as few other crops require land preparation in that season. The source information was the LandSat TM7 coverage of the Shan State, for the period October-November 2002[18]. Though outdated, last year's data was still considered relevant, providing an indication of the areas of potential opium cultivation.

To define the stratification for the selection of the satellite images, the first three maps (2003 interpreted risk map, Altitude Interval map and Administrative Map) were overlaid to identify areas were all the criteria overlapped. The stratified surfaces can be described as follows: *"Those areas over 700 a.s.l. that are considered to be at risk of opium poppy cultivation, for each region and Special Region"*. The same stratification was used for the socio-economic survey.

[16] D.E.M.: Digital Elevation Model
[17] At the resolution provided by the satellite sensor, the LandSat TM7, which is ~30 m.
[18] Processed according to a Principal Component Analysis

For the selection of the sample sites for the yield estimation survey, however, the Bare Soil Map was added to the previous stratification so as to improve the resolution within the selected Village Tracts and allow a more focused selection of the sites. The same stratification criteria were applied for the poppy free certification survey in the Special Region No. 4.

The 2001 Forest Department land cover map was used as stratification for the Kachin, Chin and Sagaing rapid assessment survey.

***Sampling Frame***

In statistical terms, a spatial sampling frame represents an area made up of a population of either polygons (Area Sampling Frame) or points (Point Sampling Frames) among which either polygon or point samples are selected on the base of their characteristics. Both types of sampling frames were used for the 2004 Opium Poppy Survey:

In an Area Frame, the polygon samples, are defined as “segments” or “reporting units”, and are characterized by recognizable limits or boundaries. These surfaces, once sampled, are described either by mapping or other means of data collection (e.g. interviews).

For the Point Sampling Frames the samples are either a-dimensional points or limited surfaces, with a measurable size but not necessarily with recognizable limits.

In the 2004 Opium Poppy Survey an Area Frame approach was used for the planted area, and for the socio-economic surveys. The segments for the planted area estimation were the satellite images. The stratification was overlaid on a grid representing all the possible image frames covering the area of interest. Each frame was then labelled according to the relative prevalence of one the risk classes as defined in the following Table 33.

*Table 35: Definition of the Image Frame and Village Tract stratification criteria*

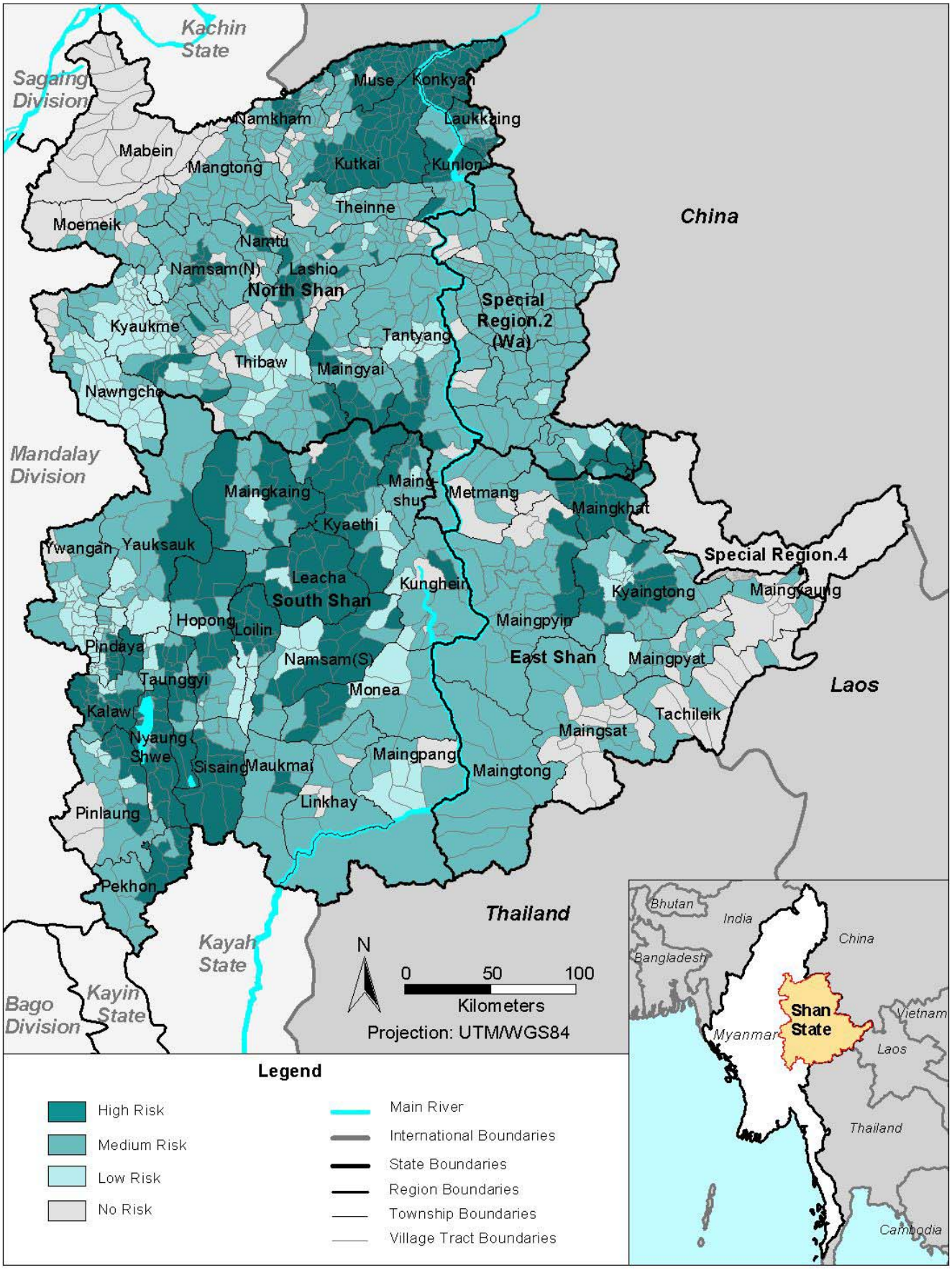
| Criteria | Class assigned to segment of the Area Frame |
|---|---|
| NO RISK > 95% of the surface | NO RISK |
| HIGH RISK > 60 % of the surface | HIGH RISK |
| LOW RISK > 60 % of the surface | LOW RISK |
| All the other Image Frames/Village Tracts | MEDIUM RISK |

For the socio-economic survey Area Sampling Frame, the administrative boundaries of the Village Tracts were intersected with the Risk Map. For each Village Tract the percentage coverage of the three risk classes was calculated and a single class assigned following the criteria provided by Table 33.

The Village Tract, though being the smallest administrative unit in Myanmar, is actually quite a large surface, comprising several villages. Since the real focus of the survey is the interviews at village and household level, a smaller reporting unit would be required to improve on the logistic of the survey and to allow a more efficient distribution of the samples across the territory. Villages in Myanmar, however, do not have mapped boundaries so in order to reduce the size of the area in which villages are potentially identified, as an experiment, sub-units of the Village Tracts were defined as sample segments in the Special Region No. 2 of the Wa.

The sites for the opium poppy yield estimation survey were selected from a “Point Frame” within the Village Tracts selected for the socio-economic survey. This approach was adopted in order to limit the search for the sites to areas as near as possible to the surveyed villages while keeping the selection process as unbiased and randomised as possible. The specific stratification map (inclusive of the Bare Soil Map) was overlaid to each selected Village Tract. The area of interest was then overlaid on a grid with a 600*600 m step and each grid assigned to a risk class with a criterion of surface prevalence. The single grids were then numbered sequentially to define them as elements of a population.

Map 4: Myanmar Opium Survey 2004: Socio-Economic Survey Area Sampling Frame




Source: CCDAC - UNODC Myanmar Opium Survey 2004

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

A "Point Sampling Frame" was also used for the selection of the sites for the rapid assessment in the Kachin and Chin States and the Sagaing Division and for those used for the certification of the "Poppy Free Area" of the Special Region No. 4.

***Definition of the Sample Size***

The definition of the sample size is influenced by a number of requirements and constraints. The main requirement is the level of accuracy considered acceptable for the estimates, while the constraints are either economic or logistical. In general terms, the standard of accuracy of a sample is defined by the following parameters:

- The Coefficient of Variation (CV) is a measure of the precision of an estimate. A low CV shows that the estimator has very little variation relative to the centre estimate and is precise. Conversely, a high CV means that the estimator has a wide confidence interval and that the estimated value can change greatly given a different sample[19]
- Confidence Level or risk level: In a normal distribution, approximately 95% of the sample values are within two standard deviations of the true population value. In other words, if a 95% confidence level is selected, 95 out of 100 samples will have the true population value within the range of precision specified earlier.

These criteria were combined with the 2003 figures of cultivation of opium poppy, the size of the various strata and of the overall surface of the area of interest to define the sample size (or sampling ratio) for the various surveys. A target accuracy value was set and the sample was sized as if the object of the survey had the same extent as in the previous season. One of the advantages of such an approach is to have a direct functional link between cost (function of the number of samples) and the obtainable CV of the estimate, thus allowing a cost benefit analysis of the methodology.

***Socio-economic survey: Determination of number of sample Village tracts***

The number of Village Tract samples was determined by defining a target sample surface under constraints of "confidence interval" and "relative error" and on the base of the 2003 estimates of opium planted surface (constrained allocation scenario[20]). After a number of tests, the target confidence level and relative error were set at 0.8 and 0.2 respectively. The proportion used for this calculation is between the 2003 opium poppy cultivated surface estimate and the surface (per region) of the stratification. The size of the sample area, per Administrative region was derived with the following formula:

$$S_n = \left(\frac{z}{c}\right)^2 * \frac{1 - P_R}{P_R}$$

Where: $S_n$ = Sample surface (in Sq Km)
$z$ = Target confidence level
c = Target relative error

$$P_R = \frac{S_{Ops}}{S_{St}}$$

$P_R$ = Ratio between opium planted surface[21] strata surface per region

Where: $S_{Ops}$ = Surface planted to opium poppy in 2003
$S_{St}$ = Surface of the stratification

*Notations: R = Region; Ops = Opium planted surface; St = stratum*

[19] (Garibay et al. 1996).
[20] Cochran, (4.2), p.76
[21] 2003 estimate

The number of samples per Administrative region was obtained by dividing the average surface of the Village Tracts of the region by the target sample area. This number of samples was then systematically extracted from the Area Frame, using a step given by the ratio between the total number of samples and the overall number of Village Tracts (population).

Since Village Tracts have different surfaces, in the cases where the selected sample did not reach the target surface, it was progressively increased with the random selection of additional Village Tracts until it met the target. No adjustment was applied in cases where the total surface of the selected Village Tracts exceeded the target.

*Table 36: Sample Size for the North, South, East Shan and Special Region No. 2 (Wa)*

| Administrative Zone | 2003 Planted Area ($Km^2$) | Strata | Surface ($Km^2$) | Village Tracts | Sample Size ($Km^2$) | Sample Size (%) | Total Sample Village Tracts |
|---|---|---|---|---|---|---|---|
| North Shan | 196 | No Risk | 10,078 | 98 | 3273 | 8% | 60 |
| | | High Risk | 9,691 | 243 | | | |
| | | Medium Risk | 24,338 | 343 | | | |
| | | Low Risk | 6,259 | 100 | | | |
| South Shan | 105 | No Risk | 2,207 | 13 | 8110 | 15% | 60 |
| | | High Risk | 21,378 | 185 | | | |
| | | Medium Risk | 25,543 | 126 | | | |
| | | Low Risk | 6,406 | 76 | | | |
| East Shan | 67 | No Risk | 10,252 | 49 | 6409 | 24% | 48 |
| | | High Risk | 3,596 | 29 | | | |
| | | Medium Risk | 22,420 | 99 | | | |
| | | Low Risk | 887 | 10 | | | |
| S. R. 2 (Wa) | 204 | No Risk | 635 | 24 | 915 | 8% | 32 |
| | | Risk | 11,868 | 125 | | | |
| Total | 572 | Total | 155,558 | 1,520 | 17792 | 11% | 200 |

In Special Region No. 2 (Wa) the sampling procedure was slightly modified to test the possibility of improving the distribution and the appropriateness of the sample for the socio-economic interviews. The rationale behind this test is that a Village Tract may be too big a segment to survey. There may be a large number of villages concentrated in a limited area and consequently a large number of interviews, The results of this can eventually end up averaged as a single sample, which compromises detail and specifics and, in practical terms, wastes time and resources.

In order to maintain the area selection criteria adopted for the rest of the Shan State, it was decided to try and define the "segments" as portions of the Village Tracts, thus making up an administrative sub-unit containing the minimum possible number of villages. An average surface of 18 $Km^2$ per segment was calculated on the base of the average number of villages per Village Tract in the Special Region No. 2. In other words, a segment of approximately 18 $Km^2$ is the area (on average) pertaining to a single village in the Wa. Following the same procedure applied in the other administrative zones of the Shan State, the target overall surface for the sample was calculated and, from that, the target number of sample segments derived.

The process of selection of the sample segments would theoretically have required the breaking down of each and every Village Tract into segments with a surface approximately centred on the target size of 18 $Km^2$. However, in order to avoid this lengthy process, the number of potential segments for all the Village Tracts of the Special Region No. 2 was simulated, dividing the overall surface by the target segment size. From this, a

theoretical list of segments was generated and this list was sampled. Only the Village Tracts containing the selected segments were then broken down by outlining boundaries based on recognizable geographic features[22] (See Map 8). Similarly to what was done for the Village Tracts in the other administrative zones of the Shan State, when the selected sample did not reach the target surface, it was progressively increased with the random selection of additional segments until it met the target. No adjustment was applied when the surface exceeded the target.

***Yield estimation survey: Determination of the number of sites to be surveyed***

The sample of points for the estimation of the opium yield was established with the same formula shown above. The samples in this case were grids of 3*3 points, 200 m apart (600*600 m; 0.36 $Km^2$), without definite boundaries. The number of sites was derived using the following formula:

$$n = S_n / 0.36$$

Where: $n$ = Number of samples per Province
$S_n$ = Sample surface (in Sq Km)

They were systematically selected from a grid, with cells of 600*600 m, overlaid with the Stratification map (defined by the intersection of the sample Village Tracts with the Bare Soil Map) with a selection step given by the ratio between the sample area and the total number of grids per Village Tracts. This was done only on the samples of Village Tracts previously selected. A number of controls were applied in order to avoid clumping of the points[23].

*Table 37: Sample Size for the yield estimation sites*

| Administrative Zone | Surface of BSM Per Sample VT ($Km^2$) | Sample Size (Km2) | Sample Size (%) | Sample VT | Sites[24] | Sites per VT |
|---|---|---|---|---|---|---|
| North Shan | 1,099 | 91 | 8% | 64 | 252 | 4 |
| South Shan | 4,081 | 144 | 4% | 65 | 400 | 6 |
| East Shan | 1,060 | 64 | 6% | 39 | 178 | 5 |
| S. R. 2 (Wa) | 723 | 64 | 9% | 32 | 178 | 4 |
| Total | 6,963 | 363 | 5% | 200 | 1007 | 5 |

(*) Site =Sample Size /0.36 $Km^2$

In the case of Special Region No. 4, where the certification of the condition of "poppy free area" was tested, the number of survey sites was calculated as a function of an estimated work capacity of 2 teams over 1 month, surveying an average of 4 new sites per day. Taking this into consideration, the overall number of sample sites was set at 184. To place the selected sites, a Point Frame was defined. The region boundaries were overlaid with the stratification, rasterized to cells of 600*600 m. The sample was selected by defining a step given by the ratio between the total number of cells and the number of sample points. Also here a number of controls were applied in order to avoid clumping of the samples. Similar criteria as those used in Special Region No. 4 were adopted for the Kachin, Chin and Sagaing. For each Administrative unit, the sample size was calculated as a function of work capacity, but consideration was also given to the extension of the overall potential area of cultivation for opium poppy. The selected survey points were 48 in the Kachin, 208 in the Chin and 176 in Sagaing.

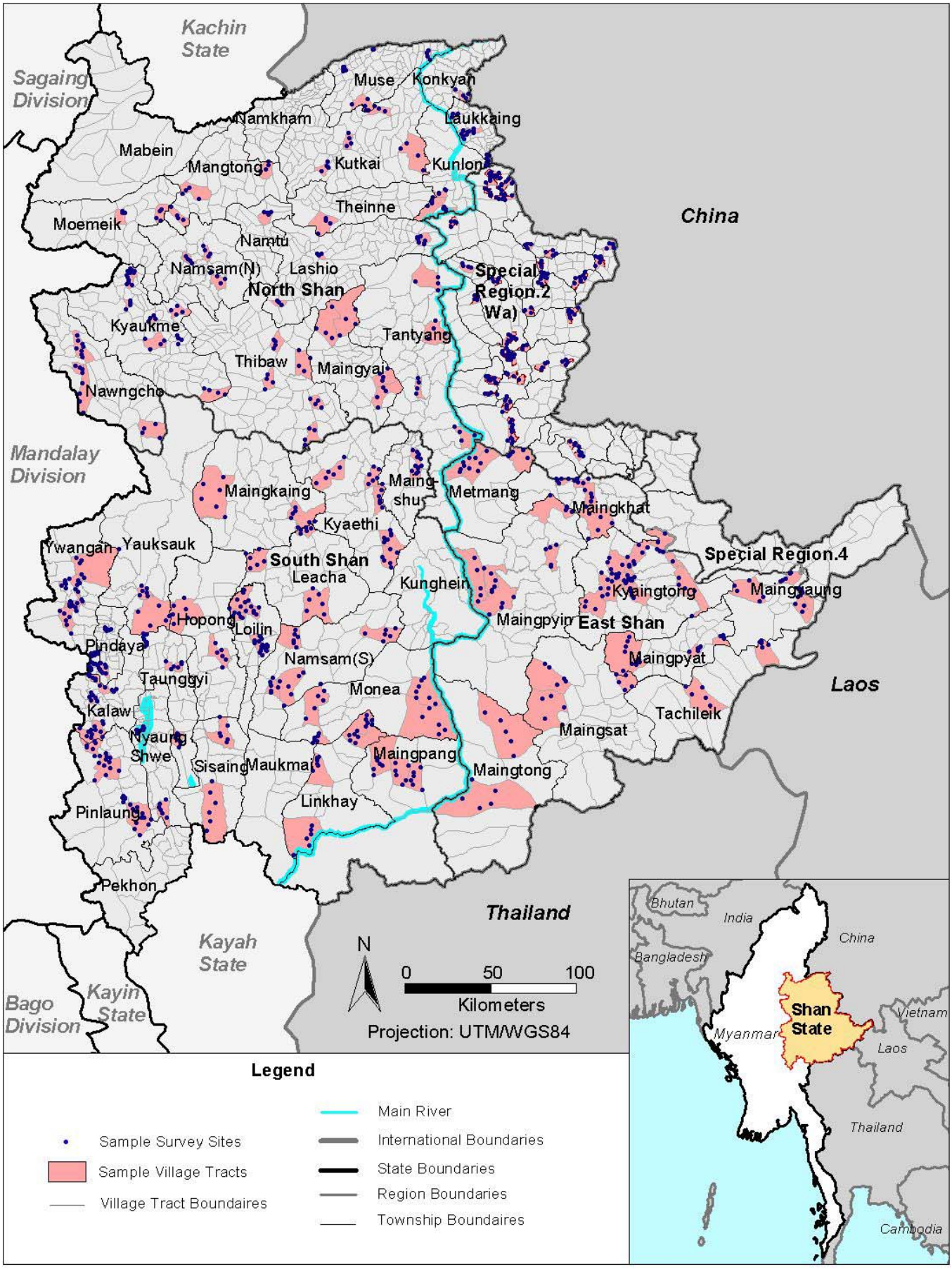
[22] Roads, rivers, ridges and other geographical landmarks
[23] No adjacency between sample
[24] Site =Sample Size /0.36 $Km^2$

Map 5: Myanmar Opium Survey 2004: Sample IKONOS Satellite Frames


Source: UNODC Myanmar Opium Survey 2004

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

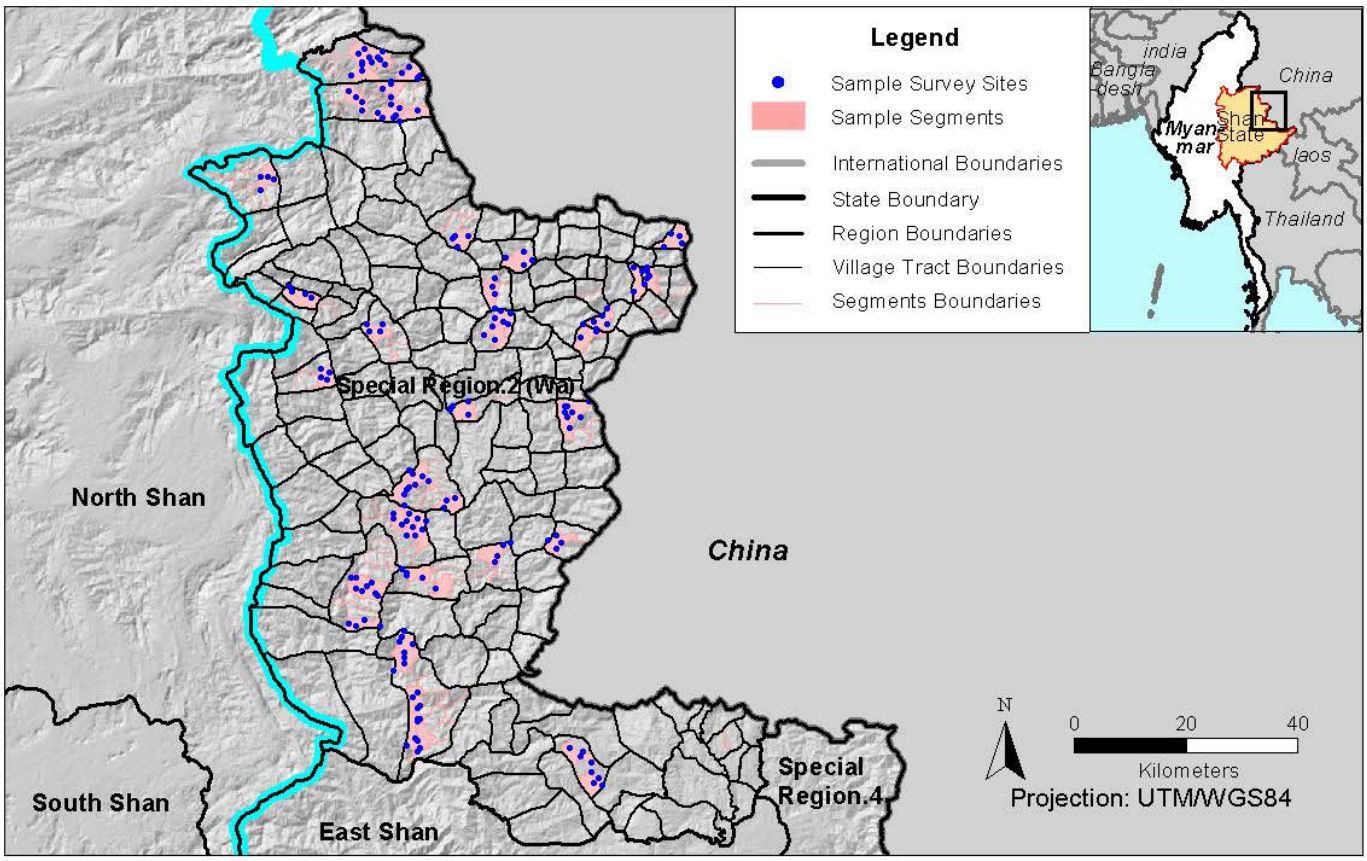
Map 6: Myanmar Opium Survey 2004: Sample Village Tracts And Survey Sites




Source: CCDAC - UNODC Myanmar Opium Survey 2004

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

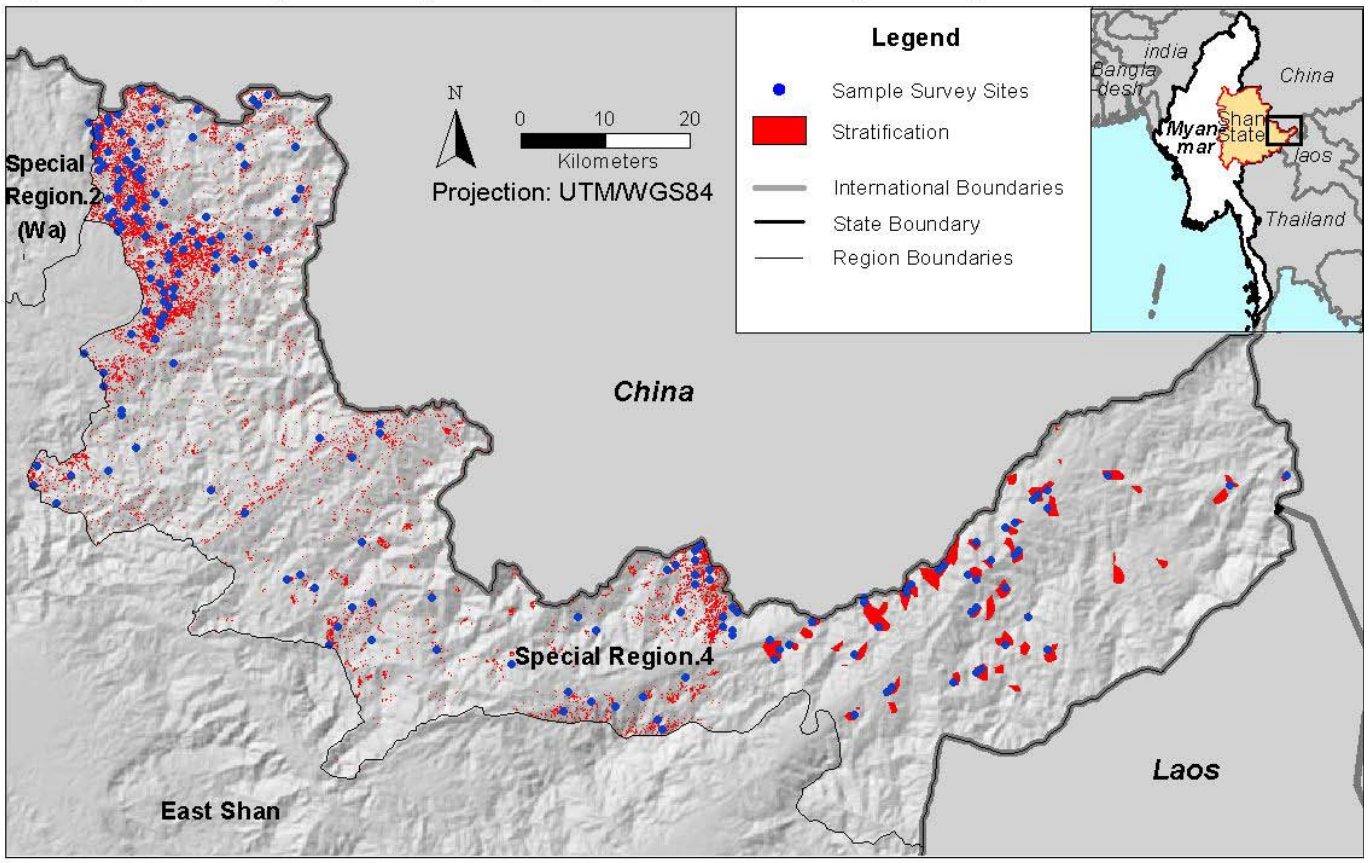
Map 7: Myanmar Opium Survey 2004: Special Region n. 2 (Wa) – Stratification and Survey Sites




Source: CCDAC - UNODC Myanmar Opium Survey 2004

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

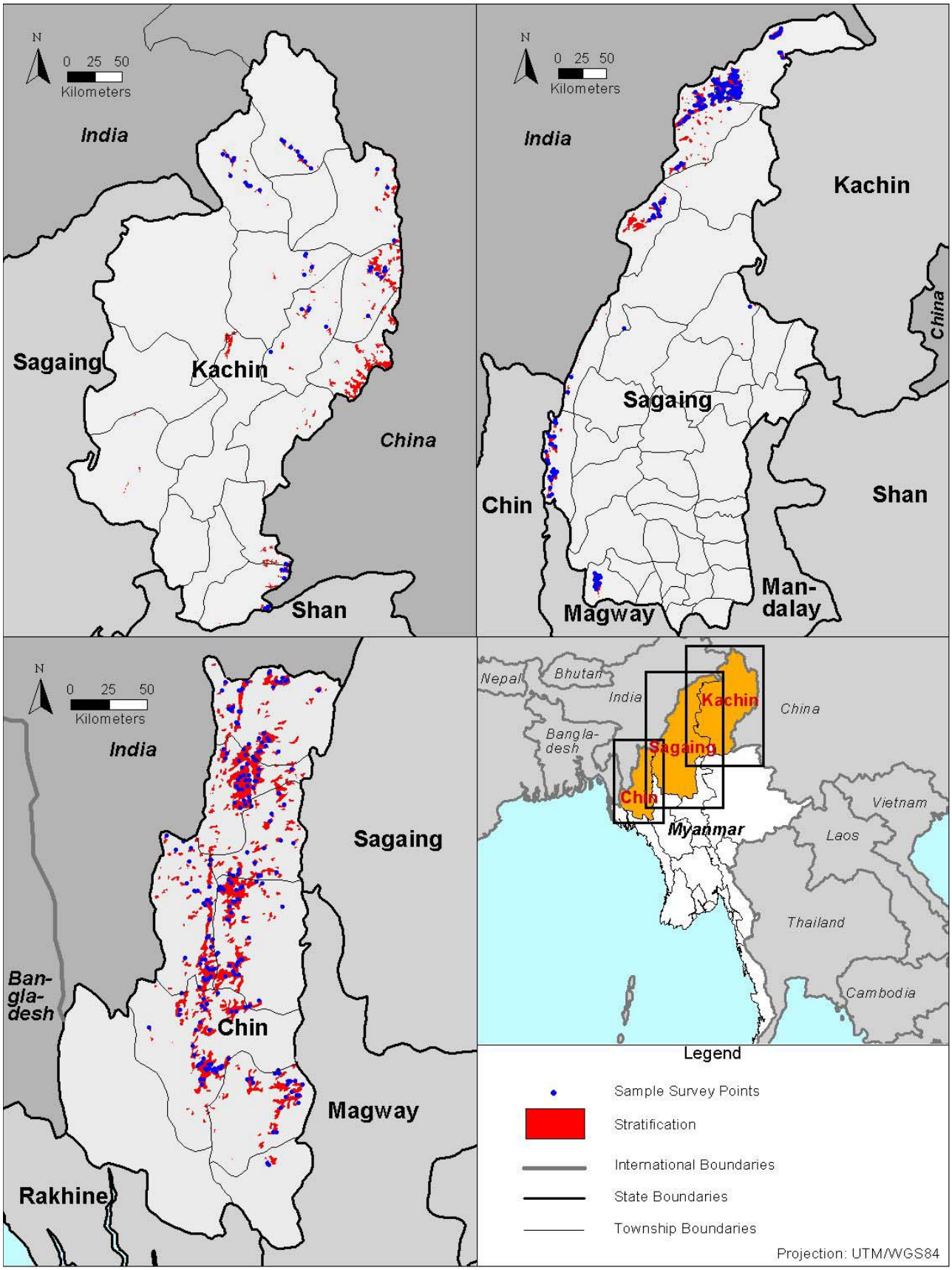
Map 8: Myanmar Opium Survey 2004: Special Region n. 4 - Stratification and Survey Sites




Source: CCDAC - UNODC Myanmar Opium Rapid Assessment Survey 2004

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

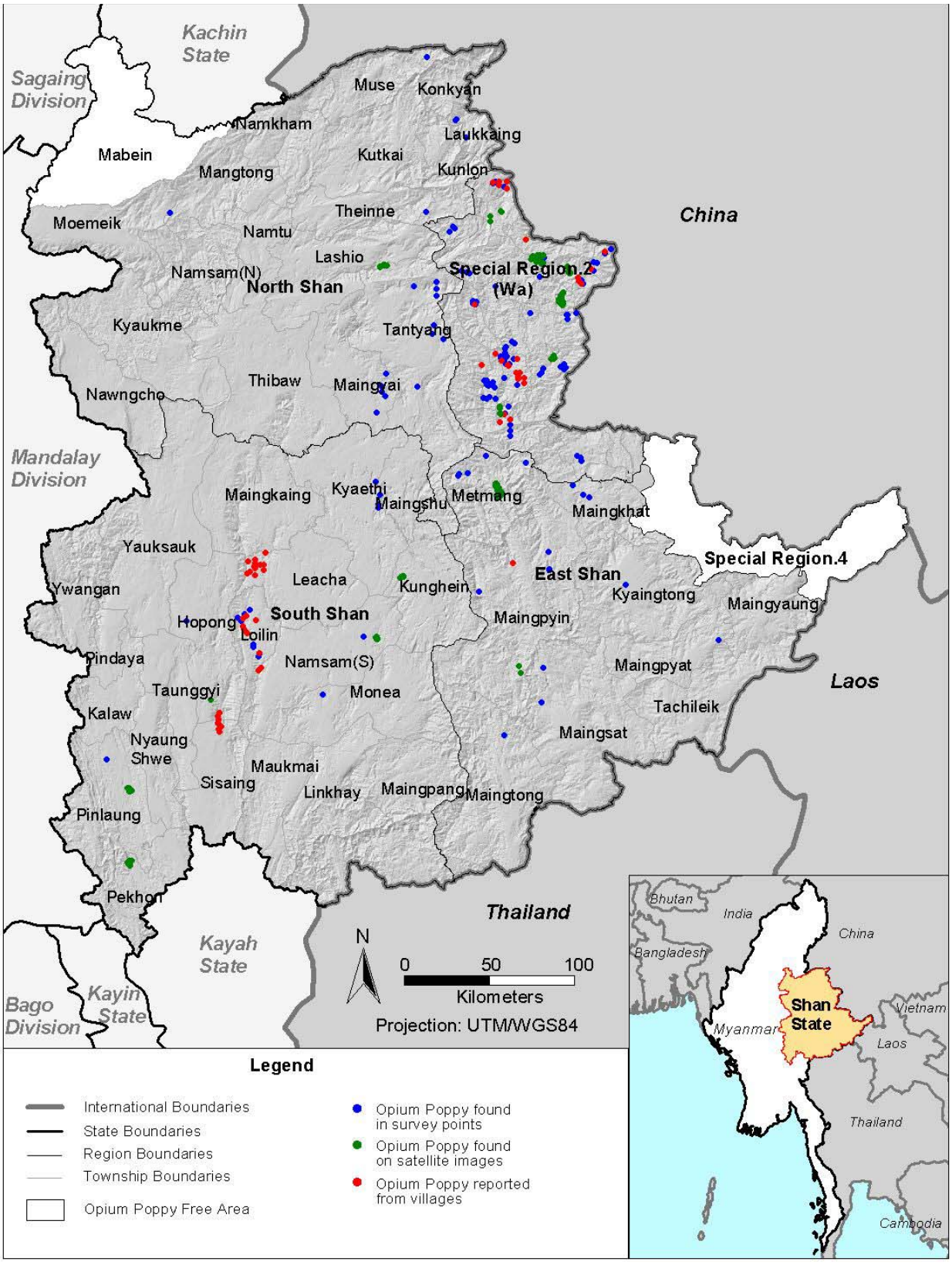
Map 9: Myanmar Opium Survey 2004: Kachin State, Chin State Sagaing Division - Stratification and Survey Sites




Source: CCDAC-UNODC-Myanmar Opium Rapid Assessment Survey 2004

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

Map 10: Location of opium poppy cultivation found in the survey samples




Source: CCDAC - UNODC Myanmar Opium Survey 2004

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

***Survey Procedure***

As mentioned previously, the Myanmar Opium Survey for 2004 was structured in several, parallel surveys:

- The surveys to support the interpretation and provide ground truth for the planted area estimation.
- The survey for the description and measurement of opium fields for the opium poppy yield estimation.
- The interviews of village headmen and household heads.
- The rapid assessment survey in the Kachin and Chin States and the Sagaing Division.
- The opium-poppy-free area certification survey in the Special Region No. 4 of the Shan State.

***Planted area estimation survey***

In 2004, 69 multi-spectral IKONOS satellite images were used as samples for the estimation of the area planted with opium poppy in the Shan State. The area covered by these images was surveyed for ground truthing training and accuracy assessment for the interpretation/classification.

Before actually going to the field the surveyors of the Remote Sensing and GIS Section of the Forest Department carried out an in-office analysis of the images that identified areas of potential agricultural activity and to transect these areas with an itinerary that would cover the maximum possible cases of land use.

Other key activities in the pre-survey phase were the drafting of a common legend for all possible land use classes to be surveyed and the production of printouts of the images -- to serve as a support and annotation document during the survey.

Once the teams were finally in the field, the first activity was to get oriented, identify the portion of territory covered by the satellite image and reach the start point of the itinerary that had been drawn in the preparation phase.

The survey itself entailed taking the GPS positions of each agricultural and non-agricultural parcel along the transect itinerary and its observable vicinities (especially cultivated crops and poppy), and annotating them on the printout. The annotation consisted of outlining each parcel, labelling them according to the legend and giving each polygon with the same land use class a sequential number.

The surveyors of the Forest Department could not collect the ground truth data for 16 out of the 69 images that were available due to accessibility and security problems. These images were, for the most part, in the central portion of the South Shan State.

At the end of the survey and once the team had returned to the head office in Yangon, the annotations were all digitised and a database for each polygon was created having the following information content:

| IKONOS Scene | Acquisition Date | Administrative Zone | Land Use Code | Sequential No. |
|---|---|---|---|---|

### *Socio Economic and Yield Estimation Survey*

Socio-economic data was collected by means of interviews with key informants. Yield estimation variables were collected by physical measurement of the opium fields.

The survey was conducted by field teams, which had the task of completing a questionnaire following a standardized interview protocol made of 3 parts:

- Village head man/key informants interview
- Heads of households/key informants interview
- Site/Individual field measurement questionnaire.

Surveyors were equipped with GPS instruments and maps to track the geographic location of the villages and of the field sites. They were provided with village questionnaires, field measurement forms and field manuals; these were all were prepared in Burmese and in English.

The forms and manuals are available upon request from UNODC.

### *Village interview*

For the village interview, the survey team reached the target using the coordinates of the location, the coding system of the villages and the information provided by the topographic maps. Once on site, the village headman was identified and approached.

The interview started after respectful introductions and the necessary explanations of the purposes of the survey took place.

The main purpose of the village headman interview was to obtain first hand information on the village's demography and socio-economics, ethnic composition, land tenure distribution, as well as on the number of households growing opium poppy and information on addiction by gender and age. This information was then used to crosscheck or complement the data provided by the district authorities.

### *Household /key informants interview*

After the headman the survey team proceeded with the selection of a variable number of households to interview. The number of households interviewed was a function of the size of the villages. The households interviewed were limited to a maximum of 12 per village, so that the surveyors would not spend more than one or two days within the same village. The number of interviews undertaken was decided on the basis of the number listed in the following table 36.

*Table 38: Number of households to interviews*

| No. of opium producing households in the village | From: | 1 | 11 | 21 | 31 | 41 | 51 | 61 | 71 | 81 | 91 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | To | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| Number of households to interview | | 3 | 6 | 9 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |

Once determined the number, the households to be interviewed were selected by randomly picking a direction out of the house of the village head and repeating the process after every new interview. The household head was questioned regarding the composition of the family and various economic indicators. Surveyors collected data on property, cash income and expenditures; costs associated with opium poppy cultivation (if cultivated by the household) and information on the opium poppy calendar and sale practices.

***Site survey***

A new ground survey technique was adopted in 2004. Instead of asking opium farmers in the villages to take them to their fields, this year surveyors had to search for opium poppy fields using GPS, in pre-determined sites, defined by latitude and longitude coordinates.

Each site was made of 9 points placed on a grid of 3*3 and spaced 200 m from each other (equivalent to an area of 36 hectares or 90 acres). The main measurement on the survey site was the identification of the average percentage land cover in the area around each grid point, using the land use classes listed in Table 36.

*Table 39: Land cover interpretation legend for the yield estimation survey*

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

Any peculiarity was noted including the non-accessibility of the survey point or parts of it.

If an opium poppy field was found on the site, besides the percentage coverage estimation, its presence was reported by outlining its shape and position on the specific section of the questionnaire and by labelling it with a sequential number. The GPS position of the field was also reported. If there was more than one field, all were reported with a sequential number and position.

For each survey site where the presence of opium poppy was assessed, the surveyors proceeded with the measurement of the yield estimation variables.

***Yield estimation measurements***

The field survey for the acquisition of the opium yield parameters was carried out on a random sample of 62 fields.

Unlike last year when the surveyors were brought to fields by the opium farmers encountered in the villages, this year the fields had to be sought in the course of a “blind” survey among the 810 random sites.

This approach was motivated by the consideration that the mounting political pressure to end the cultivation of illicit crops reduces the possibility of receiving information directly from villagers on the location of their opium fields. The random search, however, while making the samples more representative of average cultivating conditions, greatly reduced the chance of finding opium fields.

Opium poppy was found in only 172 out of the 810 sites, for the whole survey area, and 62 fields on these sites were measured for yield. Further to this, the sites were also intended to provide an alternative to the data from remote sensing, in the event that the acquisition of high-resolution imagery in the target period had failed. The sites were chosen within the Village Tracts sampled for the socio-economic survey. The physical location was assigned on the base of the same stratification used for the selection of the satellite images for the planted area estimate.

In consideration of the reduced size of the field survey samples (0.36 $Km^2$), a Bare Soil Map, derived from the full LandSat satellite coverage of the Shan State acquired for the 2003 Opium Survey, was integrated to the base stratification to increase the detail.

A transect was laid randomly in the field and 5 plots of one square meter selected along it. From each plot the number of flowers, immature capsules and mature capsules were recorded, as well as the diameter and height of up to 10 opium poppy capsules. A set of

data on the opium poppy agricultural practices and physiological conditions was also collected at this stage.

When the opium fields were mature, i.e. when the plants were ready for harvest or were being harvested, the surveyors also measured the capsule diameter and height.

## 2.3 Data capturing and storing

Following the survey, all the compiled questionnaires were collected and brought back to the CCDAC head office in Yangon. Once there, all the forms were reviewed for possible inconsistencies and then entered into a consolidated database.

Data entry took place from May 5 to June 15, 2004. The database was designed to process data reports concerning socio-economic, opium cultivation and population data. It was structured for easy data recovery and consultation.

## 2.4 Estimation procedure

The estimation procedure included all those statistical operations necessary to extrapolate the variables from the measured samples to the whole of the interest areas of the Shan State. The implemented methodology saw the use of a simple direct percent expansion, based on the ground truth data results.

The mapped opium poppy fields accounted for a total of 774 ha over a total of 13,993 ha of agricultural area on the images. These 13,993 ha can be considered a sample, corresponding to 0.60% (sampling ratio) of the total agricultural area in the North, South and East Shan and Wa Regions. The highest sampling ratio was in Special Region No. 2 of the Wa, with 4 %.

*Table 40: Total Digitised Agricultural Area and Sampling %*

| Region | Digitised Agriculture (ha) | Total Agriculture Area- (ha) | Sample ratio % |
|---|---|---|---|
| North Shan | 3,297 | 1,127,573 | 0.29% |
| South Shan | 2,411 | 724,612 | 0.33% |
| East Shan | 952 | 245,926 | 0.39% |
| S. R. 2 (Wa) | 7,032 | 170,412 | 4.13% |
| Total | 13,692 | 2,268,523 | 0.60% |

Poppy area estimation for each region was calculated by using the following formula:

*Opium Planted Surface (ha) = Total Agriculture (ha) x (% Opium Poppy in Agriculture)*

The total agriculture surface was derived from the ICMP land cover interpretation of 2003, while the % opium poppy in agriculture was obtained by dividing the total opium poppy amount in the region by the total agricultural digitised on the images, per region. With the current data set, the best estimate is given Table 38.

*Table 41: Opium planted area estimation*

| Region | Digitised Agriculture (ha) | Mapped Opium Poppy (ha) | Total (ha) | Opium Poppy % | Total Agric. Area (ha) | Total Opium Poppy (ha) | Lower Limit (ha) | Upper Limit (ha) |
|---|---|---|---|---|---|---|---|---|
| North Shan | 3,297 | 18 | 3,315 | 0.5% | 1,127,573 | 6,026 | 5,570 | 6,480 |
| South Shan | 2,411 | 35 | 2,446 | 1.5% | 724,612 | 10,512 | 10,169 | 10,856 |
| East Shan | 952 | 30 | 982 | 3.2% | 245,926 | 7,765 | 6,031 | 9,498 |
| S. R. 2 (Wa) | 7,032 | 691 | 7,723 | 9.8% | 170,412 | 16,745 | 14,968 | 18,523 |
| Total | 13,692 | 774 | 14,466 | 5.7% | 2,268,523 | 41,048 | 36,738 | 45,357 |

The confidence intervals have been calculated by using the confidence limits of average percent poppy value for each region, although the data collection procedure did not properly fit the sampling assumptions that had been determined in the preparation phase.

*Standard Error of % p = Standard Deviation / Sqrt (n-sample)*

95 % confidence interval is estimated with alpha = 0.05 = p +/- 1.96* Standard Error

### *Yield Estimation*

Opium gum yield for Myanmar in 2004 was calculated using a linear correlation between capsule volume per one square metre ($cm^3/m^2$) and oven dry gum yield (kg/ha):

$$Y = 1.89 + 0.0412 * VC$$

Where: $Y$ = Dry gum weight (kg/ha)

$VC$ = *Projected mature capsule volume per square metre ($cm^3/m^2$)*

Data on the number and size of capsules were collected from a sample of 5 square metres from **68** opium fields to calculate the projected mature capsule volume per square meter. The estimated yields per square meter were then averaged to provide regional estimates of the opium yield.

Practical field procedures used to collect data (number, and height and diameter of poppy capsules) to estimate opium gum yield are based on the "Guidelines for Yield Assessment of Opium Gum and Coca Leaf from Brief Field Visits"[25] prepared by UNODC. The guidelines provide for practical field procedures and for options to calculate yield from capsule volume using different formulas.

[25] ST/NAR/33, United Nations, New York, 2001.