UNODC
United Nations Office on Drugs and Crime

Central Committee for Drug Abuse control

Lao National Commission for Drug Control and Supervision

Opium Poppy Cultivation in South-East Asia

Lao PDR, Myanmar

December 2009

UNODC's Illicit Crop Monitoring Programme (ICMP) promotes the development and maintenance of a global network of illicit crop monitoring systems. ICMP provides overall coordination as well as quality control, technical support and supervision to UNODC supported illicit crop surveys at the country level.

The implementation of UNODC's Illicit Crop Monitoring Programme in South East Asia was made possible thanks to financial contributions from the Governments of Japan and the United States of America.

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PREFACE

Opium cultivation in South East-Asia remains relatively limited. Just under 34,000 hectares of opium was grown in the region in 2009, a quarter of the amount grown in Afghanistan.

Worrisome is the situation in Myanmar where cultivation is up for the third year in a row – an 11% increase from 28,500 ha in 2008 to 31,700 ha in 2009. Most of this increase came in the Shan State where 95% of Myanmar's poppy is grown. More than a million people (most of them in the Shan state) are now involved in opium cultivation in Myanmar, an increase of more than a quarter over 2008.

However, the overall value of the crop is falling since yields were down 28% to 10.4 kg per hectare, production fell 20% (to 330 metric tons), and prices are more or less stable (at just over US$ 300/kg). In total, the potential value of opium production in Myanmar fell by 15% from US$ 123 million in 2008 to US$ 104 million in 2009.

Increased instability in north-eastern Myanmar (where most of the opium is grown) seems to be affecting the opium market. There are indications that ceasefire groups – autonomous ethnic militias like the Wa and Kachin – are selling drugs to buy weapons, and moving stocks to avoid detection.

While South-East Asia's once notorious opium problem has been contained, there are worrying signs that the situation in Myanmar is starting to unravel. Governments and donors need to stay the course and ensure sufficient duration of commitment and funding for all aspects of the drug issue: security, development, and health.

In Lao PDR, cultivation was up 19%, although the overall total is low at 1,900 ha, as is the yield at 6 kg/ha. Nevertheless, with a kilo of opium fetching US$ 1,327 per kilogram (due to stable demand and scarce supply), this illicit crop remains attractive to farmers, especially as the prices of other locally produced commodities are falling. This Report features a chapter on what is being done to promote development in the remote northern province of Phongsali, Lao PDR. In order to consolidate recent gains, the country in general needs more development assistance particularly for remote communities, and greater access to drug treatment. It also deserves support for the implementation of its National Drug Control Master Plan (2009-2013).

While focusing on the opium problem (mostly in rural communities), we should not lose sight of rapidly increasing production and use of synthetic drugs (mostly in cities) in the Greater Mekong region. It would be a Pyrrhic victory for drug control if South-East Asia's appetite for opium was simply replaced by a new craving for ampethamine-type stimulants.

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UNODC

PART 1. REGIONAL OVERVIEW

FACT SHEET - SOUTH EAST ASIA OPIUM SURVEYS 2009

		2008	2009	Change from
Opium poppy cultivation[1]		30,388 ha	33,811 ha	+11%
Of which	Lao PDR	*1,600 ha*	*1,900 ha*	*+19%*
	Thailand	*288 ha*	*211 ha*	*-27%*
	Myanmar	*28,500 ha*	*31,700 ha*	*+11%*
Weighted average dry opium yield				
	Lao PDR	*6 kg/ha*	*6 kg/ha*	*0%*
	Thailand	*15.6 kg/ha*	*15.6 kg/ha*	*0%*
	Myanmar	*14.4 kg/ha*	*10.4 kg/ha*	*-28%*
Potential production of opium[1]		424 mt	345 mt	-19%
Of which	Lao PDR	*9.6 mt*	*11.4 mt*	*+19%*
	Thailand	*4.5 mt*	*3.3 mt*	*-27%*
	Myanmar	*410 mt*	*330 mt*	*-20%*
Opium poppy eradication		5,679.5 ha	4,939 ha	-13%
Of which	Lao PDR	*575 ha*	*651 ha*	*+13%*
	Thailand	*284.5 ha*	*201 ha*	*-29%*
	Myanmar	*4,820 ha*	*4,087 ha*	*-15%*
Average price of opium				
	Lao PDR	*US$ 1,227 /kg*	*US$ 1,327 /kg*	*+8%*
	Thailand	*US$ 1,250 /kg*	*n/a*	*+17%*
	Myanmar	*US$ 301 /kg*	*US$ 317 /kg*	*+5%*
Total potential value of opium production		US$ 140.4 million	> US$ 119 million	*n/a*
Of which	Lao PDR	*US$ 11.8 million*	*US$ 15.1 million*	*+28%*
	Thailand	*US$ 5.6 million*	*n/a million*	*n/a*
	Myanmar	*US$ 123 million*	*US$ 104 million*	*-15%*

The Office of the Narcotics Control Board, Government of Thailand, is acknowledged for providing the figures on Thailand.

[1] These figures differ slightly from those published in the World Drug Report 2008 and 2009, which subsumes Thailand under the category of "other countries".

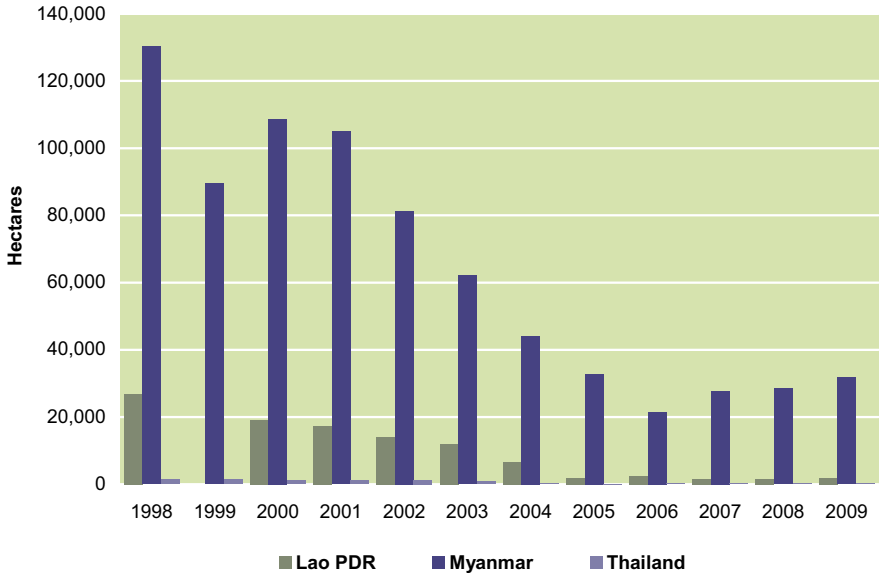
REGIONAL OVERVIEW

In order to assess the scope of opium poppy cultivation and opium production, UNODC has been carrying out opium surveys in cooperation with the respective Governments in Lao PDR (since 1992) and in Myanmar (since 2002), whereas Thailand has established its own monitoring system. This report contains the results of the UNODC supported opium poppy cultivation surveys in Lao PDR and Myanmar. In addition, the results from the opium poppy surveys implemented by the Thai Office of the Narcotics Control Board are presented in this regional overview.

Opium poppy cultivation in South East Asia

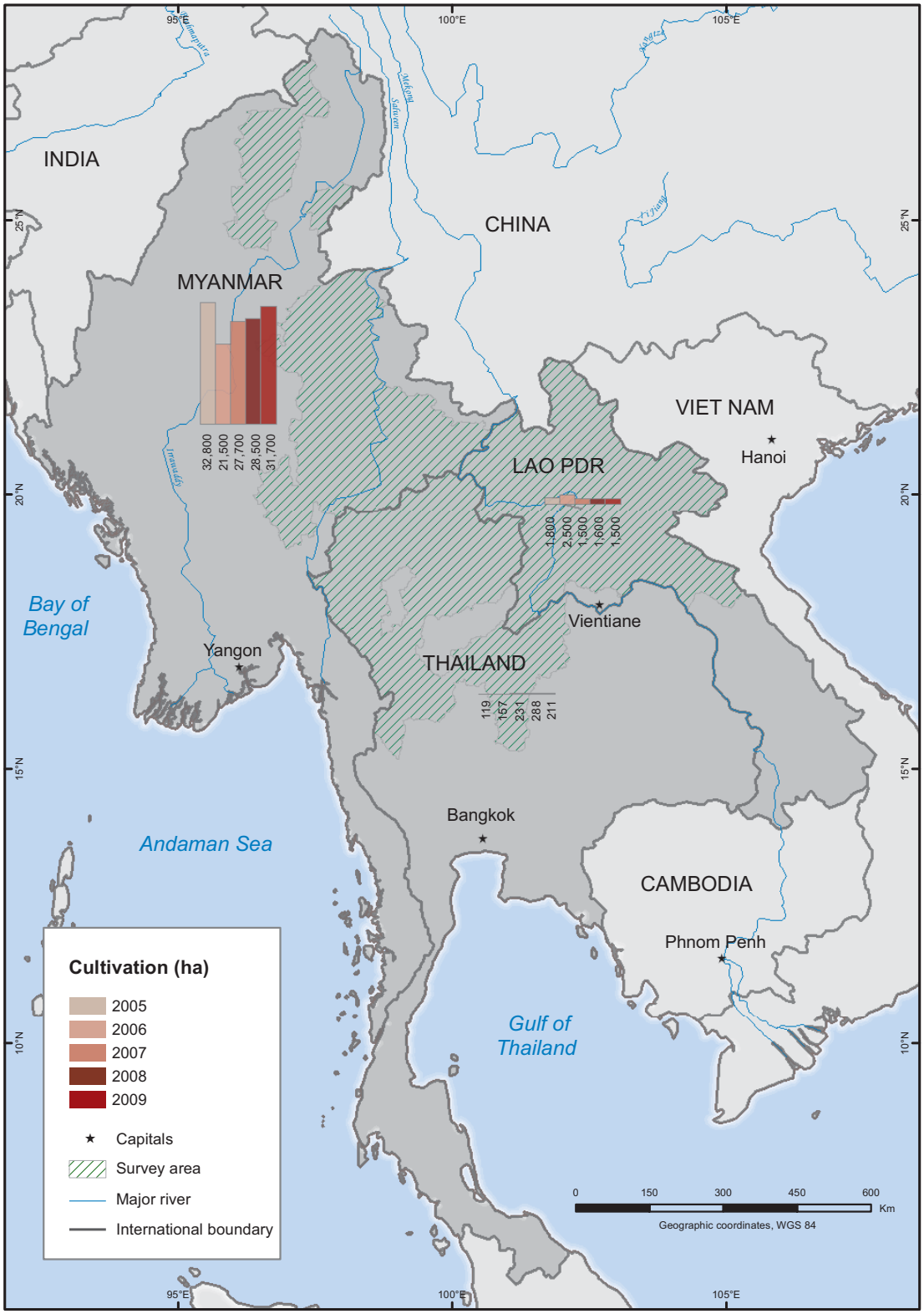
The major part of opium poppy cultivation in South East Asia takes place in Lao PDR, Myanmar and Thailand. The Government of Vietnam indicates that only a negligible amount of opium poppy is cultivated there. Between 1988 to 2006, the cultivation of opium in these three countries decreased from an estimated total of 157,900 hectares in 1998, to only 24,157 hectares in 2006. However, since then, opium poppy cultivation has increased in Myanmar and a mixed pattern of increases and decreases has been observed in Lao PDR and Thailand. Overall, opium poppy cultivation has increased in the region since 2006.

Figure 1: Opium poppy cultivation in South East Asia (hectares), 1998 - 2009



Myanmar, the largest opium growing country in the region, has seen major decreases over the years from 130,300 ha in 1998 to only 21,500 ha in 2006 (an 83% reduction over the period 1998-2006). The downward trend from 2000 to 2006 had been consistent. Since then, opium poppy cultivation has increased although at a relatively slow pace.

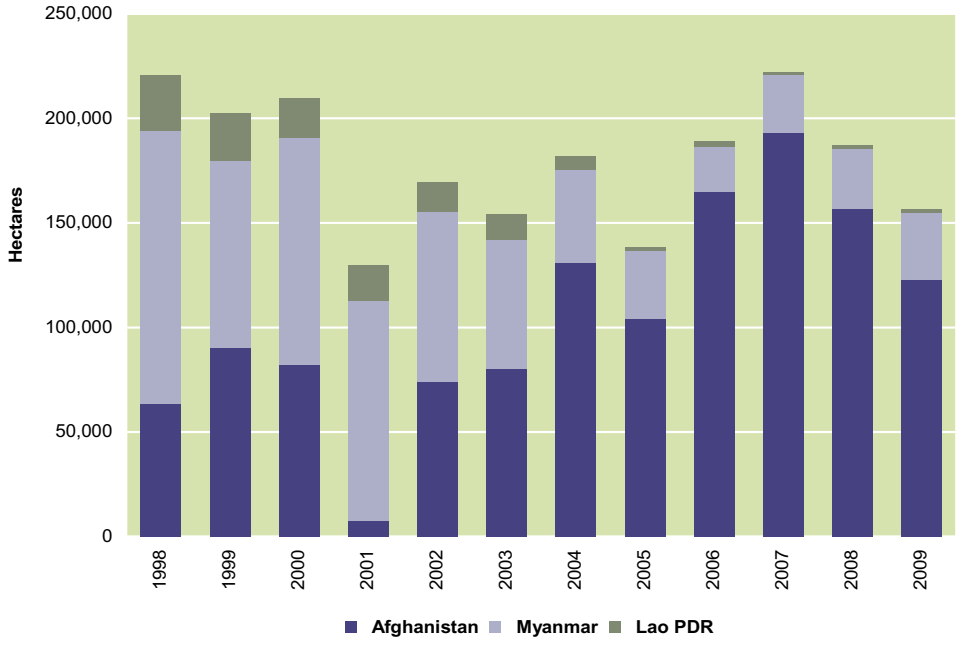
Map 1: Opium poppy cultivation in South East Asia (hectares), 2005 - 2009



Source: Government of Lao PDR, Myanmar and Thailand, national monitoring system supported by UNODC in Lao PDR and Myanmar
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

In Lao PDR, the area under opium poppy decreased from 26,800 ha in 1998 to only 1,600 ha in 2008. This represents a reduction in the area under cultivation by 94%, the largest percentage decline among the three countries. As compared to 2008 however, figures show an increase of 300 ha. This is still insignificant and cannot diminish the efforts of the Laotian government in reducing poppy cultivation in their country. The figures reported by the Thai Government indicated a reduction of its opium poppy cultivation area from 1,486 ha in 1998 to 211 ha in 2008 (a decline of 86%). Lao PDR and Thailand have both reached such low levels of opium poppy cultivation that they no longer produce opium for the international market.

Figure 2: Opium poppy cultivation in major cultivating countries (ha), 1998 - 2009

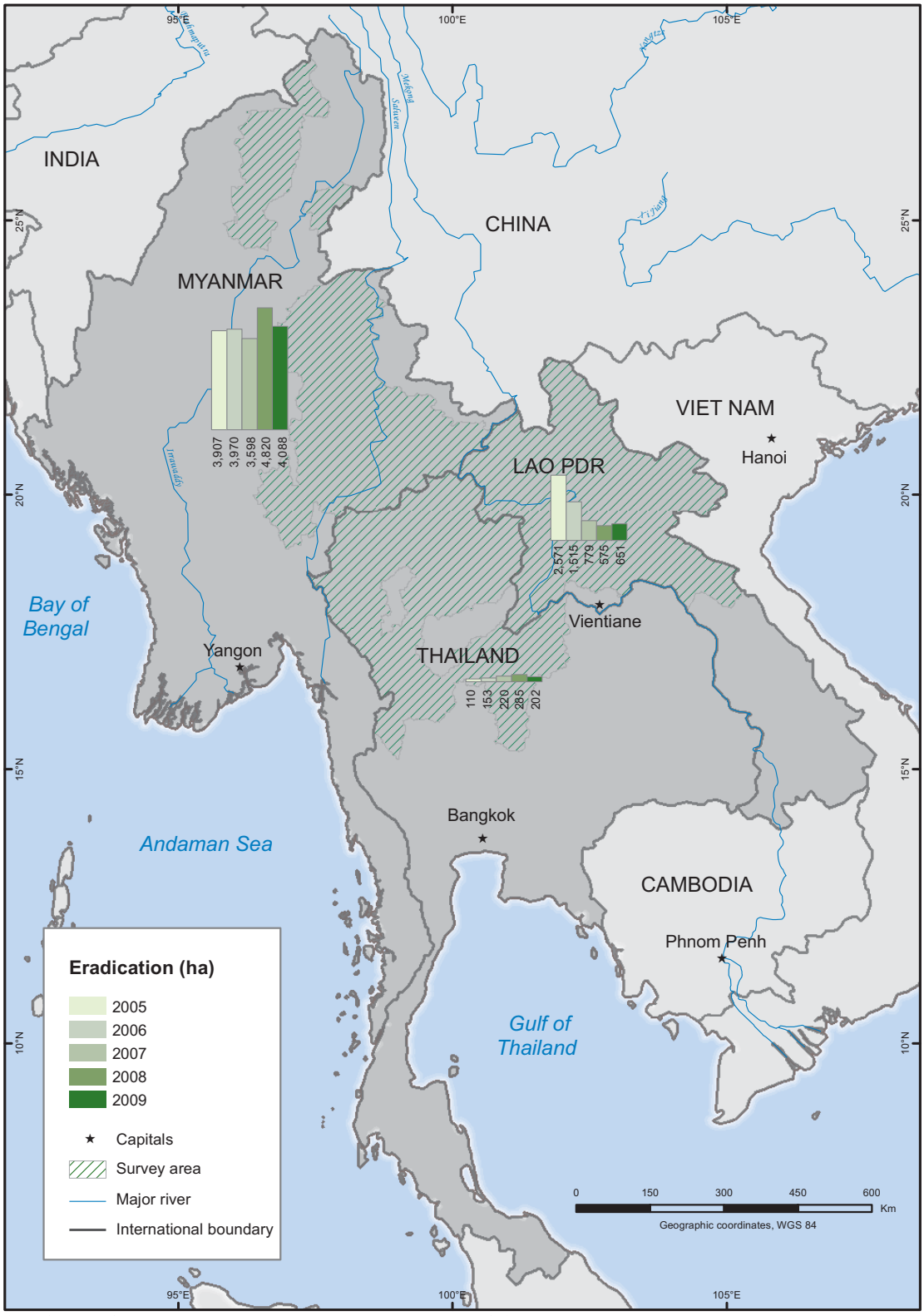


Despite years of decrease between 1998 and 2006, Myanmar is still the second largest opium poppy grower in the world after Afghanistan. Myanmar contributed 20% of opium poppy cultivation in major cultivating countries in 2008. Lao PDR accounted for less than 1% in 2009. Since 2003, South East Asia has clearly ceased to be the largest opium poppy cultivating region, and Afghanistan became the by far the largest opium poppy cultivating country.

Eradication

Official reports from the Governments of Lao PDR, Myanmar and Thailand indicate that a total of 4,939 hectares of opium poppy were eradicated in 2009. This represents a decrease of 13% compared to 2008, when 5,679 ha were eradicated in the region. A total of 651 ha were eradicated in Lao PDR, 4,087 ha in Myanmar and 201 ha in Thailand.

Map 2: Opium poppy eradication in South East Asia (hectares), 2005 - 2009



Source: Government of Lao PDR, Myanmar and Thailand, national monitoring system supported by UNODC in Lao PDR and Myanmar
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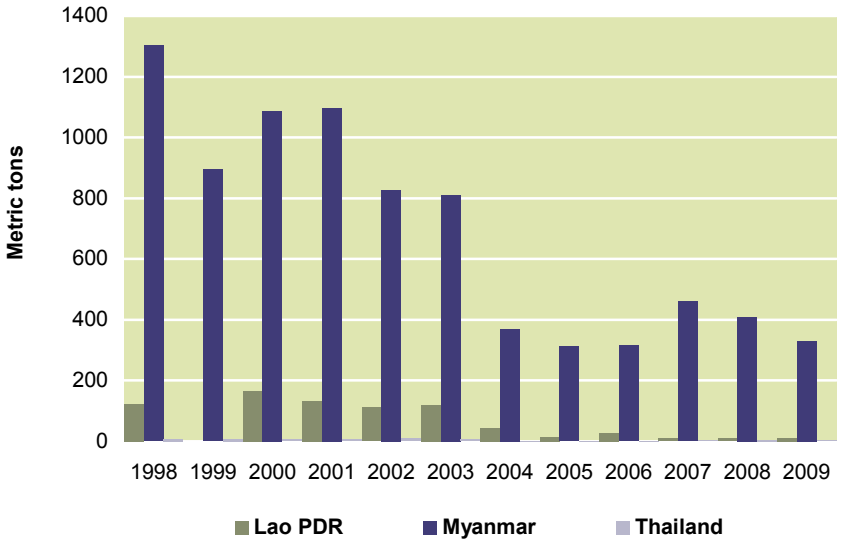
Opium yield and production

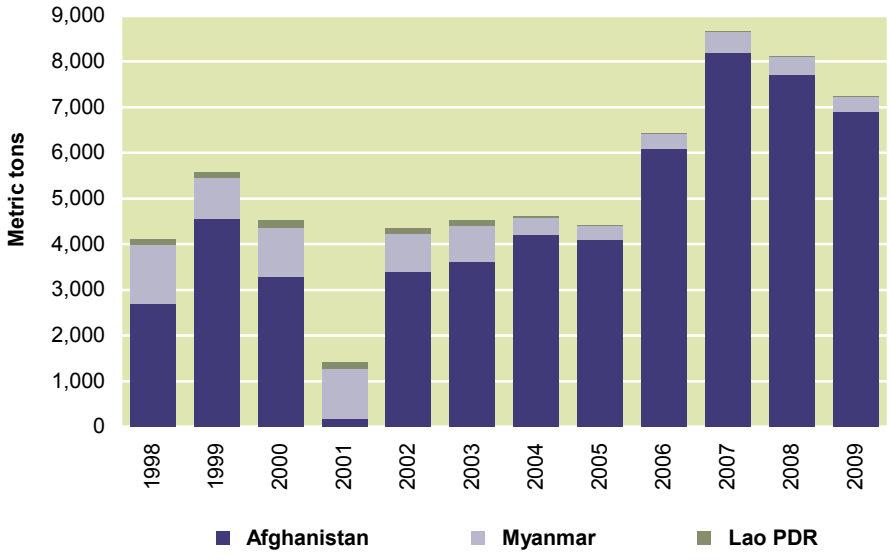
Opium poppy in South East Asia is mostly cultivated on steep hills with poor soil and no irrigation facilities. Opium yields are much lower than in Afghanistan where the crop is often cultivated on good soil and irrigated land. In 2009, opium yields were estimated at 6 kg/ha in Laos, 10.4 kg/ha in Myanmar and 15.6 kg/ha in Thailand. The total potential opium production in South East Asia has decreased from an estimated 1,435 mt in 1998[2] to only 345 mt in 2009, which represents a decrease of 76%.

Figure 3: Opium production in South East Asia (metric tons), 1998 - 2009



Myanmar is still the second largest producer of illicit opium after Afghanistan. However, its share of opium production of major producing countries fell from 32% in 1998 to only just 5% in 2009.

Figure 4: Opium production in major producing countries (metric tons), 1998 - 2009

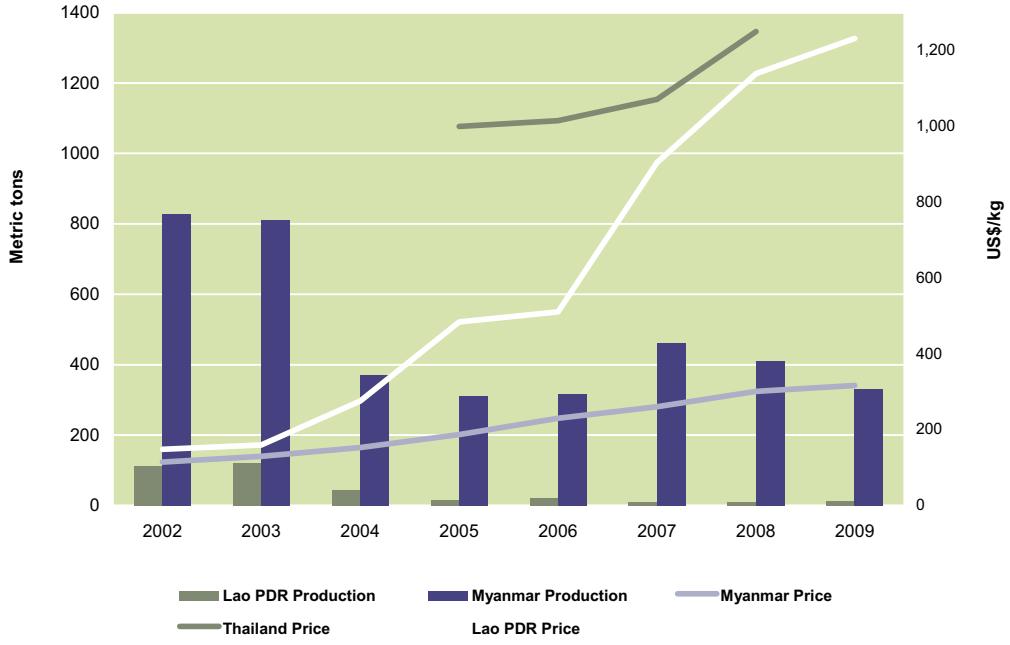


[2] Source: World Drug Report 2006.

Opium prices

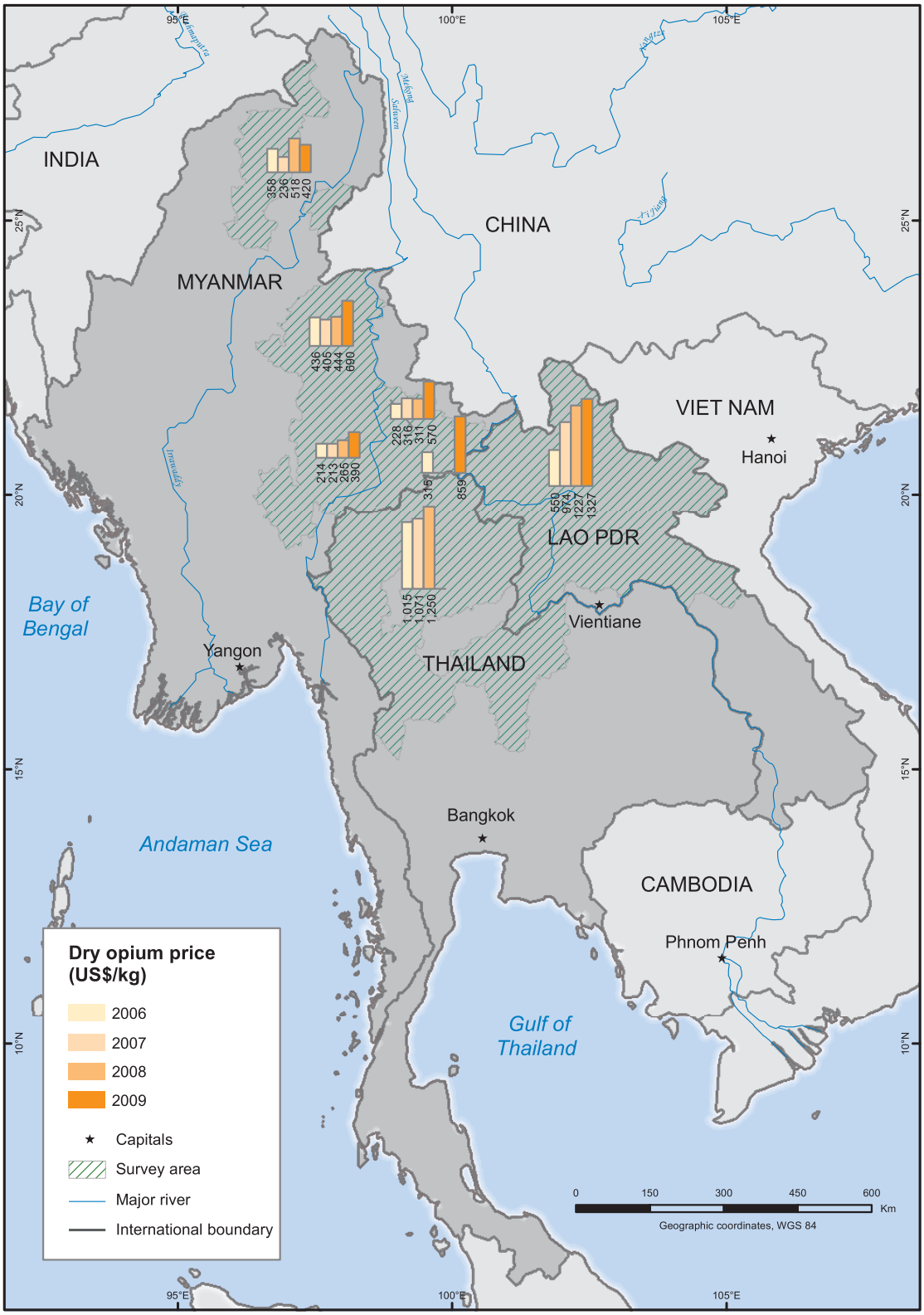
Opium prices in South East Asia have increased over the past years and there are pronounced price differences between countries as well as between regions within these countries. In 2009, the average price of opium was at a very high level in Lao PDR with prices of US$ 1,327/kg, and similar to the situation in previous years, much lower in Myanmar (US$ 317/kg at the farm-gate).[3] No prices in Thailand were reported for 2009. The steep price upsurge in Lao PDR continues to be due to the scarcity of opium in the country. In some regions, opium cultivation has been completely eliminated or is very scarce, while demand is still relatively high compared to the small amounts of opium produced locally. In Myanmar, by far the largest producer, prices rose much slower, from US$ 261/kg to US$ 317/kg from the year 2007 to 2009.

Figure 5: Opium production and prices in cultivating areas in Lao PDR, Myanmar, and Thailand, 2002 - 2009



[3] Prices in Lao PDR and Myanmar are not directly comparable as they refer to farm-gate prices in Myanmar and to prices in the Northern region at an unspecified trading level in Lao PDR.

Map 3: Prices of opium in South East Asia (US$/kg), 2009



PART 2. LAO PDR

CONTENTS

ABBREVIATIONS

DCDC	District Committee for Drug Control
GoL	Government of Lao PDR
ICMP	Illicit Crop Monitoring Programme
LCDC	Lao National Commission for Drug Control and Supervision
NTFP	Non-timber forest products
PCDC	Provincial Committee for Drug Control
PFU	Program Facilitation Unit
SASS	Statistics and Surveys Section (UNODC)
UNODC	United Nation Office on Drug and Crime

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FACT SHEET - LAO PDR OPIUM SURVEY 2009

	2007	2008	2009	Change from 2008
Opium poppy cultivation[1]	1,500 ha (1,230 ha to 1860 ha)	1,600 ha (600 ha to 2,700 ha)	1,900 *ha (1,100 ha to 2,700 ha)*	+19%
Average dry opium yield[2]	6 kg/ha	6 kg/ha	6 kg/ha	-
Potential production of dry opium	9 mt (7.4 mt to 11.2 mt)	9.6 mt (4.3 mt to 16.1 mt)	11.4 mt (5.4 mt to 18 mt)	+19%
Average retail/wholesale price of opium [3]	US$ 974/kg	US$ 1,227/kg	US$1,327 (US$ 350 to US$ 2,440)	+8%
Eradication [4]	779 ha	575 ha	651 ha	+13%
Number of new opium addicts	7.700	4,906	n/a	-
Average drug prevalence rate (in 7 northern provinces)	0.30%	0.19%	n/a	

[1] Range refers to the 90% confidence interval of the estimate.

[2] In the absence of a yield survey in 2009, the yield per hectare for 2008 was used.

[3] Source LCDC, Provincial authorities survey. Due to the limited market for opium, a clear distinction between farm-gate, wholesale and retail prices could not be established. The range refers to the lowest and highest provincial price observed, respectively.

[4] Source: LCDC. Since 2008, eradication campaigns were conducted during and after the survey.

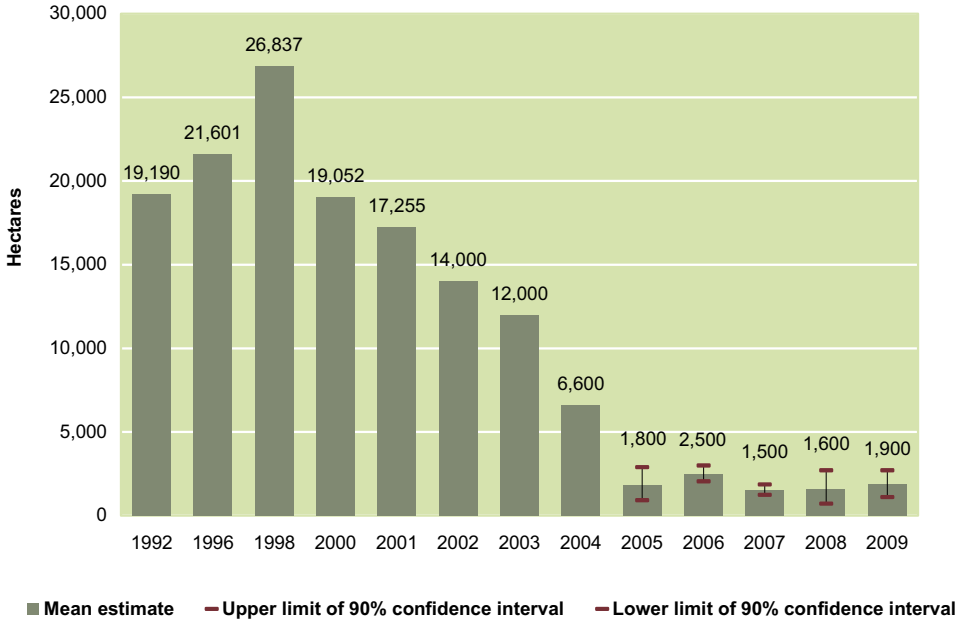
EXECUTIVE SUMMARY

The Lao PDR Opium Survey 2009 is undertaken and produced by the Government of Lao PDR and UNODC. Since 2005, the methodology has consisted of an aerial survey by helicopter over sample sites in 6 provinces in northern Lao PDR.

Opium poppy cultivation

In 2009, opium poppy cultivation was found in four of the six surveyed provinces. The total area under opium poppy cultivation in the Lao PDR expanded 19% in 2009 to 1,900 hectares (ha) ranging from 1,100 ha to 2,700 ha. Overall, the level of opium poppy cultivation in the country remains extremely low. Although some plots this year are found close to villages, it is mainly restricted to isolated plots in remote areas.

Figure 1: Estimated area under opium poppy cultivation in Lao PDR, 1992-2009

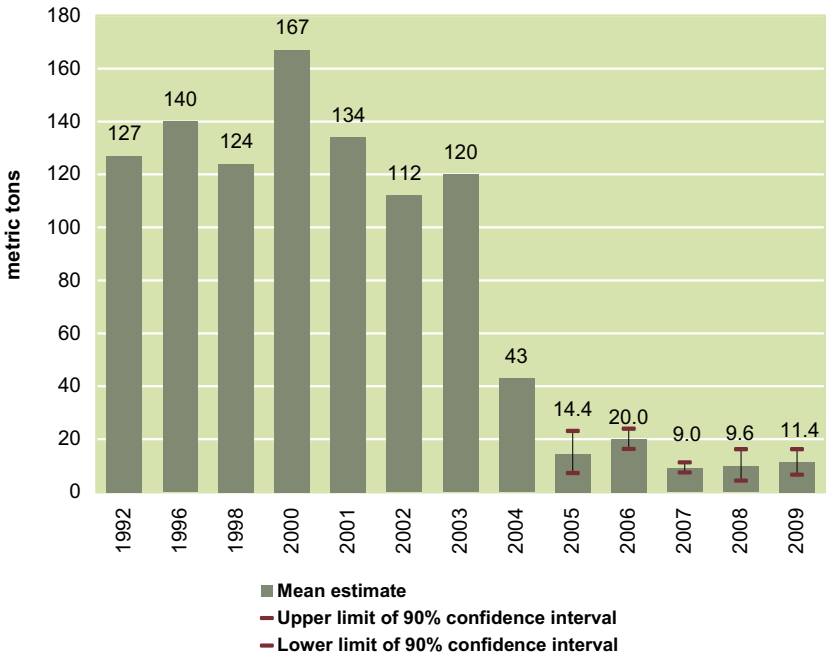


Opium yield and production

Observations made from the helicopter indicated that crop health was similar to that of 2007 and 2008, i.e. characterised by poor fields and weak plants. At the harvest stage, the capsules observed were small and capable of producing only a limited amount of opium gum. Therefore, the yield of 6 kg/ha, estimated for 2007, was used to calculate opium production.

The potential production of opium for the year 2009 was estimated at 11.4 metric tons (mt), (ranging from 6.6 mt to 16.2 mt) representing a 19% increase in production over 2008 based on the estimated area under cultivation.

Figure 2: Potential opium production (metric tons), 1992-2009



Opium prices and trade

The low level of cultivation combined with their disparate locations and security issues raised by the continued enforcement of the opium ban, mitigated against the collection of price data at the farm gate level. However, opium prices were collected at the provincial level by local authorities during or soon after the 2009 opium harvest[5]. The average opium price increased 8% over the same period in 2008, to US$ 1,327/kg in 2009 (minimum price collected of US$ 352/kg in Bolikhaxay and maximum of US$ 2,442/kg in Xayabouly).

Strong regional disparities in prices indicate that there are significant local variations in supply, as well as variations in market access.

Opium poppy eradication

The opium survey does not monitor or validate the results of the eradication campaign carried out by the Government of Lao PDR. According to Government reports, eradication took place on 651 ha (during or after the helicopter survey). In the majority of cases, eradication took place when opium harvesting was already underway. The largest area eradicated was in Huanphan where 191 ha, (or 29% of the total eradication), were eradicated, followed by Phonsaly (157 ha) and Luang Prabang (87 ha).

Addiction

In 2009 a total of 12,000 to 15,000 opium addicts were reported for the Northern provinces of Laos.

[5] Since 2006, no clear distinction can be made between retail, wholesale and farm-gate prices. Limited amounts of opium are thought to be sold in or to markets outside the province of origin.

Young addict injecting opium

1 INTRODUCTION

This report presents the results of the tenth Lao PDR opium survey. The survey has been conducted annually since 1999 by the Lao National Commission for Drug Control and Supervision (LCDC) and UNODC.[6]

In 1999, the Government of Lao PDR and UNODC developed the programme strategy "Balanced approach to opium elimination in the Lao PDR." In November 2000 Prime Minister Order Fourteen stipulated concrete Government measures against opium poppy cultivation and opium abuse. In 2001, the 7th National Party Congress called for opium production and use to be eliminated by 2005, and linked this with poverty reduction. A National Campaign against Drugs was launched in October 2001 to encourage communities to give up opium production. The Government increased the momentum of this campaign in 2004 and 2005 to measurable success, Lao PDR was declared opium free in February 2006.

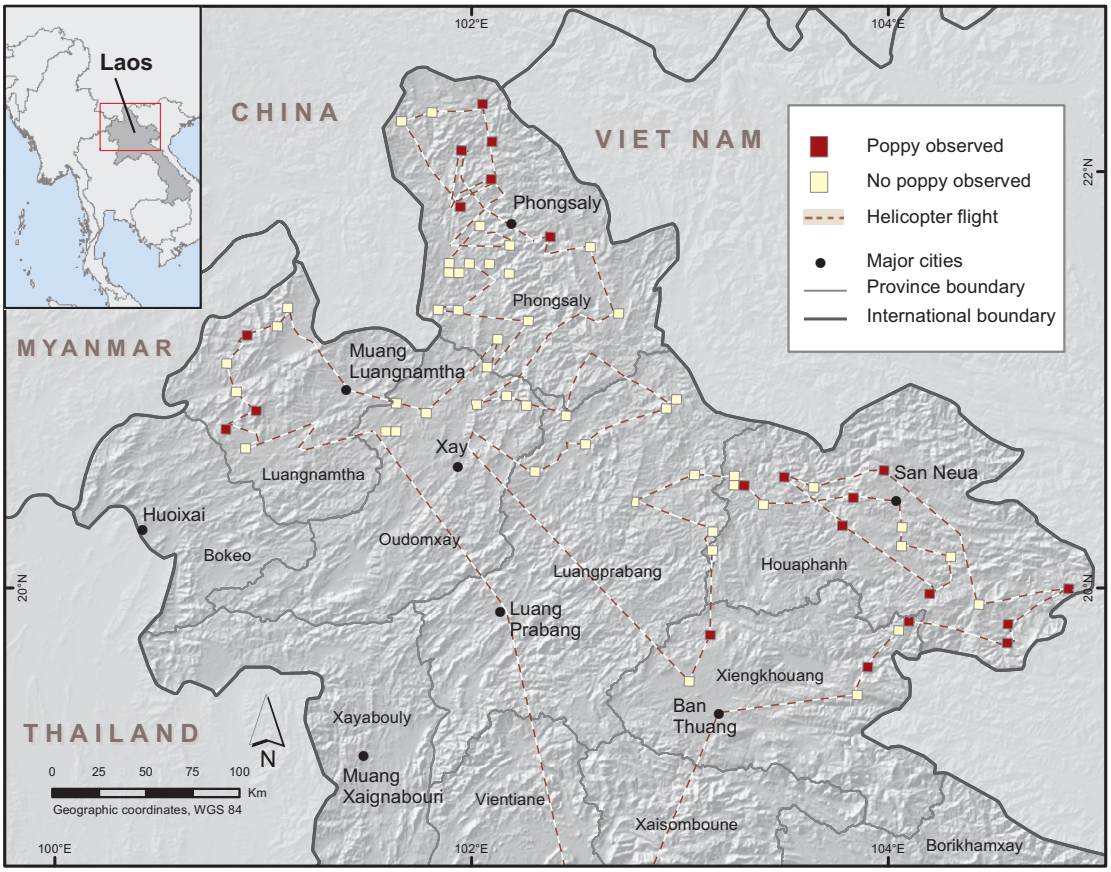
The results, since the 2006 survey, demonstrate that a total elimination of opium poppy cultivation has not yet been achieved. Levels of cultivation still appear at marginal levels and the trend since 2007 shows that every year there is a slight increase. While these are small enough to enable the country to be declared 'opium free' they are large enough to ensure that the knowledge of opium production (a) remains in the country (b) is still used to supply addiction and other needs (c) is still used for livelihood by some communities and (d) most importantly, could be returned to as a livelihood strategy relatively easily in the absence of other development initiatives. Therefore, it is necessary to closely monitor the remaining opium cultivation, not only to sustain the achievements reached so far but also to prevent a possible resumption of opium poppy cultivation.[7] Further, it is necessary to assess coping strategies for ex-opium poppy farmers to facilitate the transition towards productivity and the generation of livelihoods in the licit economy. UNODC aims to continue providing technical support to the Lao PDR, both to monitor the opium poppy elimination process and to analyse the livelihood strategies of farmers who abandoned illicit cultivation.

Since 2005, a helicopter was used to survey six provinces of Northern Lao where opium poppy cultivation had taken place and where the probability of finding poppy fields remains relatively high. Surveys by helicopter proved to be cost effective in situations where opium poppy cultivation is limited, dispersed and moving into remote areas.

[6] UNODC begin initial surveying in Lao PDR in 1992 based on an inventory of all known opium producing villages. Similar surveys were conducted in 1996, 1998 and then annually since 2000

[7] A similar situation exists in neighbouring Thailand, where opium poppy monitoring continues and a few hundred hectares of opium poppy are reported every year, although the country was declared opium free in 2002.

Map 1: Sample segments surveyed by helicopter, Northern Lao PDR, 2009



Source: Government of Lao PDR - National monitoring system supported by UNODC
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

2 FINDINGS

The helicopter survey implemented by UNODC in coordination with the Ministry of Defence of Lao PDR covered the six northern provinces of Lao PDR. The survey covered a distance of approximately 3,900 km over the provinces of Phongsaly, Luang Namtha, Oudomxay, Luang Prabang, Xieng Khouang, and Huaphanh during more than 26 flight hours. The aerial survey covered 70 randomly sampled segments of 5 x 5 km each. In addition, observations were made from the helicopter in the corridors between the segments. This information was not used for statistical analysis but as a reference for future surveys. The total area covered during the flight was approximately 1,730 km^2, corresponding to 6% of the total area under risk (31,170 km^2) of the six provinces surveyed.

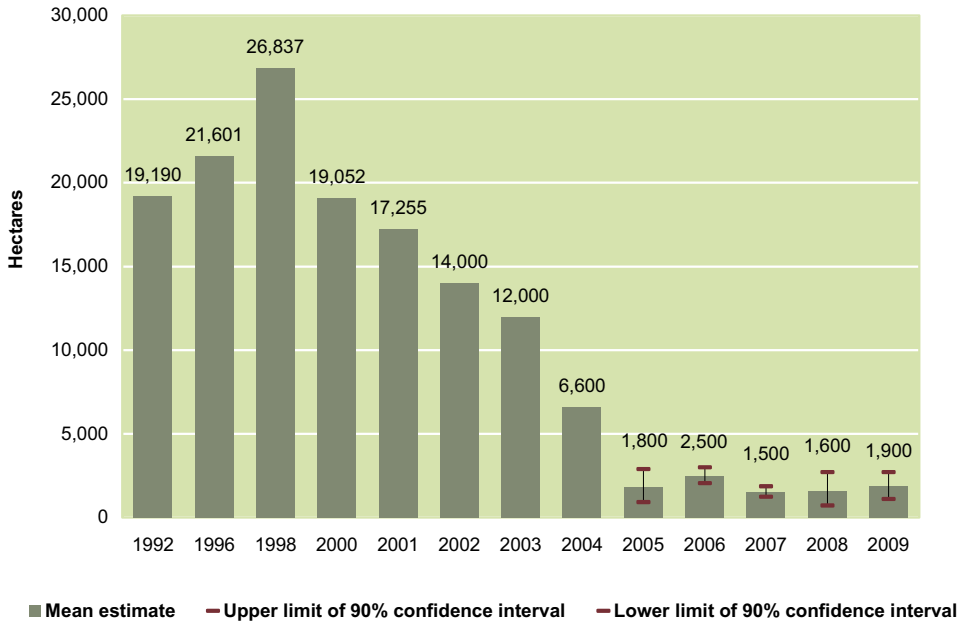
Data on opium yield could not be collected during the helicopter survey.

2.1 Area under opium poppy cultivation

The aerial survey revealed the existence of opium poppy cultivation in six provinces in Northern Lao PDR (Phongsaly, Luang Namtha, Oudomxay, Luang Prabang, Huaphanh and Xaien Khoung).

The total area under opium cultivation was estimated to be 1,900 ha (90% confidence interval between 1,100 ha and 2,700 ha). This represents an increase of 19% compared with the 2008 estimate, and is fourteen times less than in 1998 (26,800 ha). It can be assumed that the actual area harvested was smaller due to Government eradication. However, similar to the previous years, eradication took place after the aerial survey in 2009, when harvesting was already underway or completed. Eradication efforts by the Government might have reduced the area where opium was actually harvested, to less than 651 ha. Even though this year poppy cultivation is seen in some cases nearer to the villages, the majority of the opium cultivation is planted far from villages, as well as in remote clearings on forested slopes, so that eradication teams had a great deal of difficulty in reaching and destroying these fields.

Figure 3: Estimated area under opium poppy (ha), 1992 – 2009



The estimated area under opium poppy cultivation was calculated based on a sampling frame which included the potential areas for opium poppy cultivation in Phongsaly, Luang Namtha, Oudomxay, Luang Prabang, Huaphanh, Xieng Khouang. Taking into account the results of previous surveys as well as information from the Government and UNODC projects, it was assumed that opium poppy cultivation outside the sampling frame was negligible.

Opium poppy fields were found in 19 out of 70 randomly selected grids. All the grids were surveyed. The average land under opium poppy cultivation was 1.1 hectare per grid of 25 km^2.

The proportion of opium poppy fields observed in very remote locations (far from any villages and/or access roads) is less than last year. This year, cultivation was closer to the villages and in one case around the village itself. Nevertheless, eradication is still difficult since a majority of the fields are set into heavy jungle. Because of this, in many cases, it is impossible to identify the village responsible for a particular field. This is thought to be a risk (eradication and/or law enforcement) averting strategy on the part of the farmers. Temporary settlements were observed near these fields. These are thought to have allowed labourers to reside close to plots during the opium poppy growing season. Observations also revealed some staggered cropping with fields in the same settlement at different stages of plant development.

Since 2007, the number of opium poppy cultivating households has not been assessed by the Government of Lao PDR due to the remoteness of most of the opium fields and the difficulty in associating them to established villages.

Table 1: Estimated number of opium cultivating villages and households, 2002-2009

Year	No. of opium growing villages	No. of opium growing households
2003	1,537	40,000
2004	846	22,800
2005	270	6,200
2006	n/a	5,800
2007	n/a	n/a
2008	n/a	n/a
2009	n/a	n/a

2.2 Cultivation practices and crop calendar

Opium poppy cultivation in Lao PDR has become rare over the last few years. The main areas of cultivation and production are now found in Phongsaly province and Huaphanh, with small pockets of cultivation remaining in the other four northern provinces. In 2009, it seems that new trends in cultivation are emerging:

- The majority of the fields are still located in remote areas to avoid eradication, but it was observed that some cultivation is getting closer to the villages. For the fields far from the villages, which make up the majority of the fields observed during the survey, they are rather well hidden, in deep jungle or on remote mountain sides where there are no access roads and only visible by helicopter. For the fields observed close to villages and for one case around the village, the extend of cultivation is fairly large.
- Farmers are cultivating larger fields, on better soil and with improved cultivation techniques. Several opium poppy fields have been found near rivers and streams which eases the manual watering of fields. No irrigation systems or fertilizers were observed.
- The survey team also witnessed multi-staged cropping (planting the same crop at different time intervals in the same field). This is done to avoid eradication of the entire harvest, since eradication teams hardly ever return to the same field in the same year, but also to

stagger the maintenance of the poppy fields especially during the harvest. Usually, the opium poppy grower lives alone, for at least 3 months, directly in his field and cannot count on external labour especially during the time of the harvest

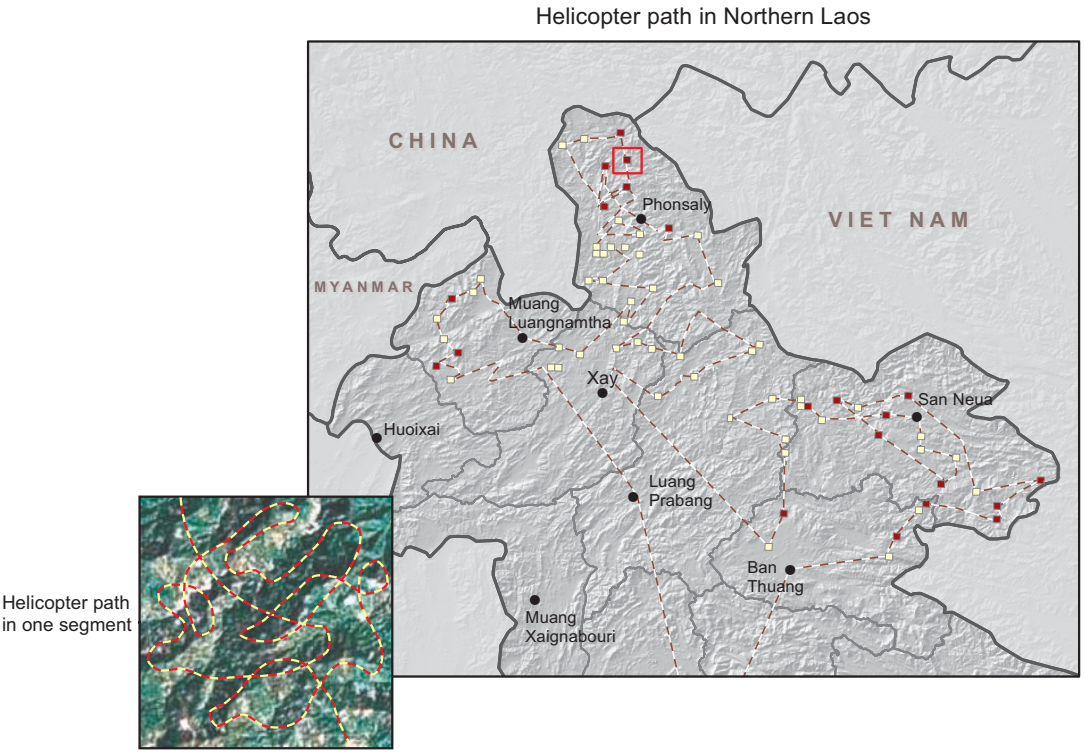
Opium poppy grower settlement in the middle of the poppy field

Table 2: Crop calendar

	Field preparation	Sowing	Harvest
Average	Mid Sept – end October	Early October – mid November	End January – mid March

Isolated poppy fields in the forest in Huanphan Province

Map 2: Example of opium poppy fields identified during the helicopter survey



2.3 Yield and production

As in previous years, no yield survey was conducted. The observations from the helicopter showed poor fields with weak plants, similar to the situation in 2007 and 2008. Even when the poppy fields were at harvest stage, the capsules were small and produced only a small amount of opium gum. Therefore, the yield of 6 kg/ha, estimated for 2007, was used to calculate total opium production.

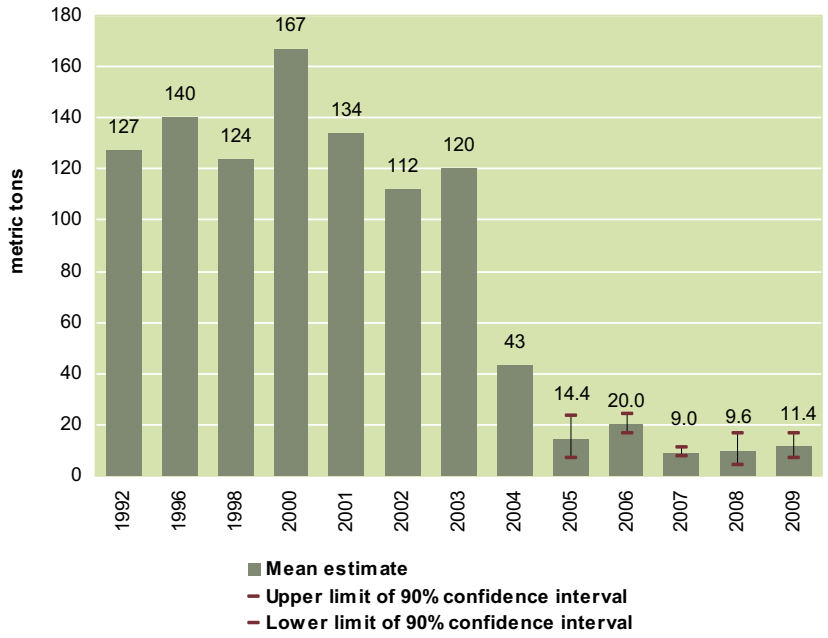
Based on the estimated area under cultivation, the potential production of dry opium for the year 2009 was 11.4 mt, which represents a 19% increase over 2008. The actual amount of opium harvested in 2008 could be lower than the estimated potential production due to the impact of eradication.

Table 3: Opium yield (kg/ha), 1992 - 2009

	1992	1996	1998	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Potential opium yield (kg/ha)	6.6	6.4	4.6	8.7	7.2	8	10	6.5	8	8	6	6*	6*

** The 2007 yield estimate was also used for 2008 and 2009.*

Figure 4: Potential opium production (metric tons), 1992 - 2009



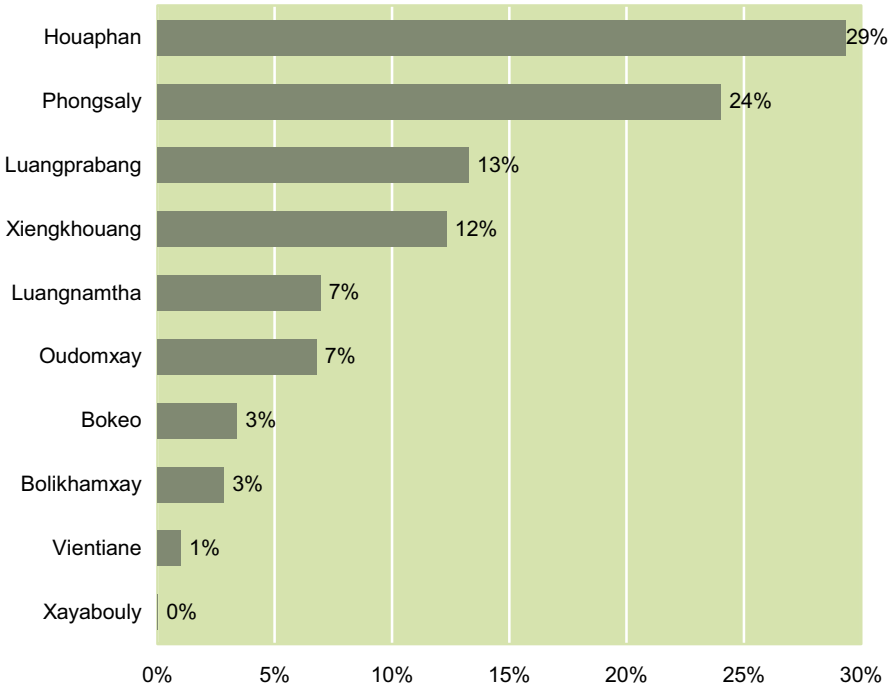
2.4 Opium poppy eradication

This opium survey was not designed to monitor or validate the results of the eradication campaign carried out by the Government of Lao PDR. According to Government reports, eradication took place on 651 ha during or after the helicopter survey, and in most cases at a time when opium harvesting was already underway. The largest area eradicated was in Huanphan where 191 ha (or 29% of the total) were eradicated, followed by Phonsaly (157 ha) and Luang Prabang (87 ha).

Table 4: Reported eradication by province (ha), 2009

NO	Province	Eradication area in hectares
1	Phongsaly	156.53
2	Luangnamtha	45.27
3	Oudomxay	44.22
4	Bokeo	22.15
5	Houaphan	191.20
6	Luangprabang	86.50
7	Xiengkhouang	80.24
8	Xayabouly	0.16
9	Vientiane	6.54
10	Bolikhamxay	18.50
	Total	**651.31**

Figure 5: Reported eradication by province (in % of total eradicated), 2009



Poppy fields found in various provinces in Lao PDR, 2009

2.5 Opium addiction

In 2009, it was not possible to get any data regarding new opium addicts, those untreated or those who had relapsed. However, the Lao authorities indicates that the total number of addicts in 2009 is in the range 12,000 to 15,000.

3 ALTERNATIVE INCOME GENERATION IN LAO'S NORTH: A VIEW FROM THE GROUND

3.1 Introduction

This chapter examines the opportunities and challenges of supporting alternative income generation in former opium poppy cultivating villages in Phongsali province, Lao PDR. Such activities need to be conceived within the wider socio-economic context of the remote North of Laos. A qualitative case study approach is taken, which seeks to supplement the predominantly quantitative data presented in this report by providing a "view from the ground" of two target villages of the Phongsali Alternative Development Fund (PADF). It seeks to provide some insight into the complexity of issues influencing income generation in Laos' North, ranging from remoteness and lack of access to ethnic minority culture, a low human development index, dependency on middlemen, and encroaching rubber plantations impacting on food security. The case studies illustrate the need for promoting 'flexible cooperation' between villages, which need to be adapted to local conditions.

3.2 Contextualizing PADF Target Villages

According to Lao PDR's National Socio-Economic Development Plan 2006-2010, the Northern provinces are the most difficult to develop due to their lack of access and high illiteracy rates (Committee for Planning and Investment 2006; page 176). Phongsali constitutes Lao PDR's northern-most province, bordering China to the North and Vietnam to the East. Phongsali currently contains the highest number of districts below the poverty line and is composed of a multi-ethnic population, comprising of 28 different ethnic groups. The human development index is very low for most of Phongsali's ethnic groups, such as the Akha or the Phu Noi. Accessing the province is difficult and time consuming, with roads being in poor condition and Lao Airlines having recently discontinued serving Phongsali regional airport.

The province encompasses a total of 611 villages, 513 of which used to cultivate opium at the beginning of the new millennium. Then, Phongsali contributed 20% of total national opium production, with poppy being cultivated on 3,872 ha land. Despite a major decrease since the government ban on opium poppy cultivation, Phongsali has remained one of the main opium producing provinces within Laos, as well as a key drug transit area. Apart from the high prices that can be obtained for opium, this continuation is not least due to a lack of access to markets for legal products. It has been estimated that more than 50% of villages within Phongsali province have no access to markets, which is directly linked to the daily per capita income of well below US$ 1 per day.

Some trade in legal goods such as timber, non-timber forest products (NTFPs), cash crops (e.g. maize; cassava) and livestock occurs with China and Vietnam. Traders tend to visit markets at district capitals or visit villages directly to purchase raw materials for processing abroad. The value added in the villages is marginal at best; normally it is restricted to the very first step in the value chain, which is the provision of raw materials, thus minimizing the benefits retained within the communities.

This situation is reflected in the 30 PADF target villages, which are located in the districts of Khoua and Mai in Phongsali's south-east. The majority of the PADF target population belongs to the Akha ethnic group, while Khamu, Tai Dam, Lao Saeng and Lao Bid are also represented. Literacy rates of well below 10% are the norm especially in the Akha villages – the majority of whom are unable to communicate in Lao. This situation affirms the observation that a lack of proficiency in Lao language and rates of poverty are closely linked (see GTZ 2009).

The district capitals, as well as approximately 50% of the target villages are regularly visited by traders from China, and particularly Vietnam due to the districts' very close proximity to the Vietnamese border. However, accessibility is largely restricted to the dry season. For approximately 3 months per year (July – September) some villages are not accessible at all, while many others require a boat and motorbike ride coupled with a walk of several hours. Even in dry

season the majority of the PADF target population is unable to regularly visit the district capital due to a lack of transportation, which increases their dependence on middlemen such as traders.

3.3 The Socio-Economic Situation in PADF Target Villages

Although the economic system in the target villages may still be classified as largely based on subsistence agriculture, the cash economy has certainly advanced – in sync with the intensifying planting of rubber. From a socio-cultural point of view, material values increasingly dominate in the villages: when asked about personal aspirations for the future, few would not mention a TV, a set of speakers and a mobile phone alongside basic needs such as improved access to water. Sourcing a small amount of hydro-power, most village chiefs would already possess and operate such status symbols. In order to achieve such aspirations, the majority of households would therefore aim to engage in commercial activities to some extent.

In terms of trade relationships, while some traders purchase within the villages directly, others merely visit weekly (or rather bi-monthly) markets which normally serve between 5 and 10 villages. In-village 'bestsellers' include cash crops (especially maize) and NTFPs such as broomgrass (dogkhaem), nang niao (a local bark used for the production of incense sticks), cardamom, galangal and dried bamboo. In return, traders deliver commodities ranging from MSG and salt to Chinese biscuits and washing powder, as well as small appliances (plastic goods manufactured in China).

The difficulty of gaining profitable access to the market becomes clearer when exemplified with a product, in this case the NTFP nang niao. While value would be added if processing into incense sticks occurred in the villages, a simplified cost-benefit analysis illustrates that the product would not be competitive: a bag containing 80 sticks is sold for a price ranging between 16,000 and 20,000 kip (US$ 2 - US$ 2.50), which leaves a profit of merely 1.000 – 5.000 kip (US$ 0.10 – US$ 0.60) per bag, as costs (excluding labor) already amount to 15,000 kip per bag[8]. Hence, a high volume and efficiency in production and transport would be required for capturing part of the market and turning the activity profitable. However, neither of these requirements is given in PADF target villages due to their remoteness, as well as the existing workload of the communities. The workload of Akha women is particularly paramount to consider in this context given unequal gender roles which place the highest burden on females: due to intensive daily fieldwork and social obligations, there is only little time left for engaging in additional income generating activities. Therefore, the promotion of income generating products needs to be integrated into the traditional production system and needs to consider that quantities to be produced within the village are likely to be low. Seeking to replace one activity with the other would be very risky given low levels of food security. For instance, Ban Phakphae, in Muang Mai district, now suffers from rice shortage due to a Chinese company having convinced farmers to replace upland rice with rubber plantations. Due to the Chinese rubber companies normally discouraging intercropping, farmers are rendered highly dependent on constant rubber prices, as well as sufficient supplies of rice available on the local market.

The suggested way forward is therefore to promote products with a high value added and low degree of labor intensity. Examples include the NTFP honey, where quality and packaging improvements can lead to a significant increase in sales price, as well as high-quality and/or unique handicrafts for which there is clear demand. In addition, it is necessary to improve access to markets for existing produce, particularly through promoting farmers' understanding of the market (demand/prices) to improve their bargaining power vis à vis traders, as well as to enable more informed decision-making regarding the various options for generating income.

3.4 Phonxay Village Market

Ban Phonxay is one of the remotest PADF target villages in Muang Mai district, Phongsali province, accessible only in dry season. Its residents belong to the Tai Dam ethnic group; levels of

[8] 2009 prices: Packaging: 700 kip/piece; wood/sticks: 3.000 kip /kg; nang niao 7.000 kip/kg; beuag bom (NTFP) 2.000 kip/kg

education and health, as well as 'entrepreneurial spirit' are significantly higher than in the communities belonging to other ethnic groups, such as Khamu, Lao Bid, and especially Akha.

A typical house in Ban Phonxay (Tai Dam ethic)

Akha women and children in Ban Meuteurn

In comparison with other villages, Phonxay village is economically relatively well diversified; traders, as well as residents of surrounding villages (including those located across the nearby border with Vietnam) visit regularly to purchase produce ranging from *nang niao* and galangal to chillies and handicrafts. The latter includes mostly woven traditional Tai Dam fabric, as well as pillows and bags. In order to promote this economic activity further, PADF is supporting a bi-monthly village market, implemented through Muang Mai's Commerce Department since May 2009. The market is intended to serve as a platform for economic activity, as well as for social exchange among members of different ethnic groups who would not normally have any regular contact. Importantly, Ban Phonxay is expected to serve as a market outlet, as well as a role model in terms of economic activity to surrounding villages that do not yet engage in commercial activities to a significant extent due to a lack of access to markets or a lack of awareness about existing opportunities.

Although demand, particularly from the Vietnamese, is substantial, farmers in Ban Phonxay and surrounding villages have not gained any information about market prices and demand patterns in Vietnam, which points to some missed opportunities. Therefore, PADF conducted a market survey in villages bordering Vietnam, the results of which will be distributed to PADF target villages to promote increasingly informed decision making regarding the choice of income generating activities. As an example, demand for both peanuts and soy is strong; however, farmers have so far neglected this option in favor of maize, the market price of which, however, has dropped considerably. Although the produce offered at the Phonxay bi-monthly market is still mostly restricted to raw materials and unprocessed foodstuff, it is expected that processing, despite on a smaller scale, will occur in the near future due to the increased regular exchange among members of different ethnic groups. Particularly in the realm of handicrafts, exchange and trade has traditionally occurred between the various groups due to differences in skills and 'specialization'. The Tai Dam, for instance, specialize in weaving and embroidery; the Khamu and Lao Bid are well known for their bamboo weaving (such as boxes for sticky rice); while the Akha traditionally spin and dye cotton (a skill which is increasingly disappearing in villages belonging to other ethnic groups due to cheap cotton imports from Vietnam).

3.5 The Need for Flexible Cooperation

Overall, it can be said that cooperation between villages needs to be encouraged to overcome the challenges of insufficient market knowledge and quantities of produce. The low quantities able to be produced within any one village are a main hindrance to promoting long-term trade relationships. Moreover, the differences in local knowledge due to ethnic diversity play a significant role with regard to the promotion of goods with a higher value added. For example, the production of bags made of piad, a local plant, is currently promoted in Tonchong village, Khamu ethnic group. Prices obtained at the international 'fair trade' and 'organic/green' market are high; however, given the need for this activity to be based on existing skills and local knowledge, piad

bags can only be produced in Khamu villages. Particularly, the Khamu families interviewed about handicrafts were proud of their skills and did not wish to see any copies being produced by members of another ethnic group. Hence, should 'piad' bags prove to be sustained successfully as a niche product, extension will need to be promoted in a flexible manner only among those villages belonging to the Khamu ethnic group, rather than 'grouping' neighboring villages due to ease of access. The location factor therefore comes second.

Given the lack of contact even between villages belonging to the same ethnic group, it would be necessary to set up mechanisms of flexible cooperation between producer groups. Such groups would work independently of each other (with their own system of placing orders and collecting and distributing funds), and merely sell the product in a coordinated manner - ideally through a central marketing or distribution center, such as the Productivity and Marketing Center soon to be opened in Oudomxay Province, which was supported by UNODC and UNIDO, or a centrally acting group, such as the Lao Handicraft Association (LHA). Despite strong demand for handicrafts made of organic fibers, for example, the supply would need to be centrally coordinated and encouraged on a wider scale (such as through the LHA) in order to generate any significant impact. While the remoteness of the former opium producing villages in Lao's North is a main hindrance to socio-economic development in many regards, it is also precisely the reason for the retention of some traditional skills which are sought after on niche markets – particularly the profitable market for 'green' and organic goods.

References

Committee for Planning and Investment (2006) *National Socio-Economic Development Plan 2006-10.* Vientiane: Committee for Planning and Investment

GTZ (2009) *Remote Villages in the North of Lao PDR: Aggregate Findings of the RDMA Village Profiles*. GTZ Lao PDR

4 METHODOLOGY

4.1 Helicopter survey 2009

Under its global illicit crop-monitoring programme, The United Nations Office for Drugs and Crime (UNODC) has established methodologies for data collection and analysis, with a view to increasing the government's capacity to monitor illicit crops and assisting the international community in monitoring the extent, growth and contraction of illicit crop cultivation.

In Lao PDR, the area under opium poppy cultivation is small and not easily accessible. This, coupled with the relative scarcity of the target crop, meant that an aerial survey by helicopter[9] was chosen as the optimal method of estimating the extent of cultivation.

The survey team visited selected sites by helicopter and an estimation of the area covered by poppy was made for each field within the selected site. The sites were selected through a poppy risk definition. In order to calibrate the poppy cultivation area visually estimated from the helicopter, various ground measurements were made and compared to the estimate from the air.

Poppy fields area photographed at 500 feet (160 m) above the ground and the same fields observed from the ground. Note the irregular growing pattern from healthy to average and poor.

[9] Special thanks to David Dunn, pilot, Lao West Coast Helicopter Company.

4.2 Sampling frame

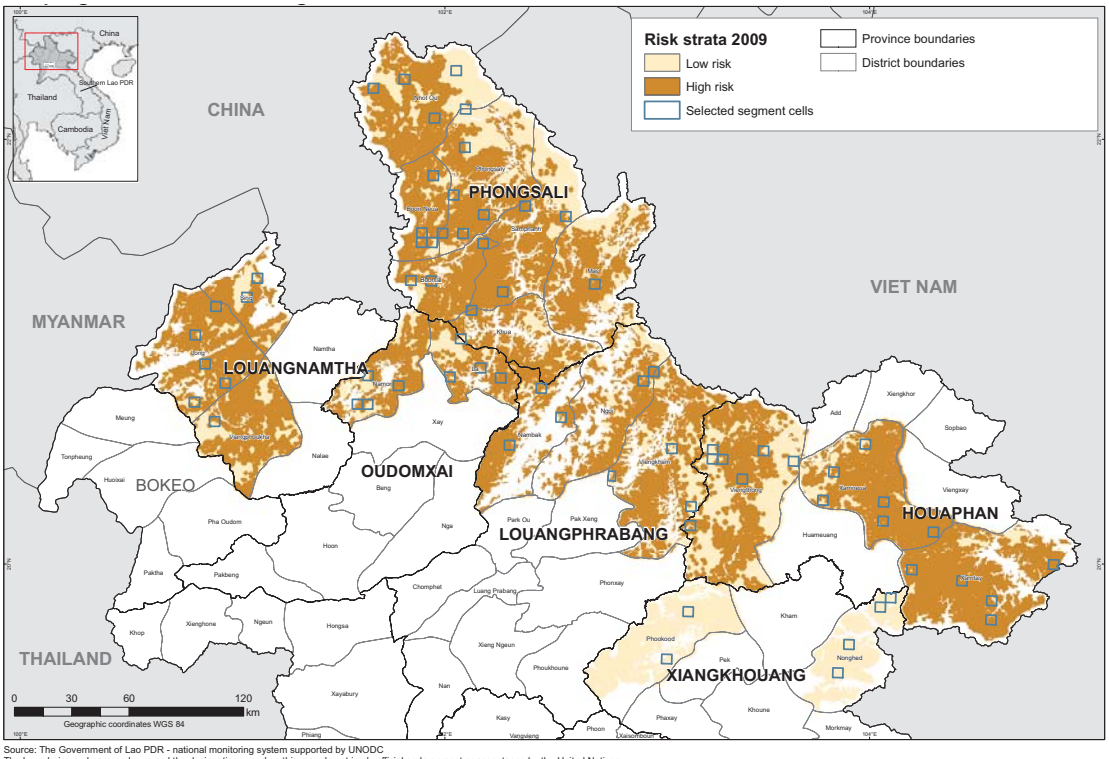
The quality of the data collected from the aerial survey depends to a large extent on the quality of the sampling frame from which the sample is selected. Building the sampling frame and estimating the extent of illicit crop cultivation in Lao PDR is challenging due to the fact that cultivation is highly dispersed and normally takes place in small plots.

Therefore a high quality sampling frame is required. This process begins with a selection of provinces and districts where poppy cultivation is hypothesized to occur. This is made on the basis of information from experts on the ground. In 2009, the sampling frame for the area estimation was established by defining the potential land available for opium poppy cultivation within the six selected provinces in Northern Lao PDR (Phongsaly, Luang Namtha, Oudomxay, Luang Prabang, Huaphanh, and Xieng Khouang). Within this frame, a sample of plots was selected.

In Northern Lao PDR plots where opium is cultivated are mainly found in mountainous areas. Farmers avoid the large, sparsely forested plains and densely inhabited/settled areas, which are located at the lower altitudes. Past surveys have indicated that up to 80% of opium poppy-growing villages are above 700 meters in altitude and on slopes with inclines of over 10%. Because these topographic conditions correspond so closely with actual cultivation patterns (past) and probable cultivation patterns (forecast) they were used to define the frames themselves. The calculations were performed with the help of a Geographic Information System. A digital elevation model (90 meter pixels) and its derived slope map were used to delineate (a) the areas above 700 meters altitude and (b) slopes of more than 10% incline. The sampling frame was further defined by a 3 kilometre buffer area along the country's international borders which was completely excluded from all survey activities for security reasons.

The resulting sampling frame was divided into a set of grids measuring 5 km by 5 km (area of 25 km^2). The estimate for opium poppy cultivation in the 2009 survey is only for the area within the sampling frame.

Map 3: Sampling frame and selected segment cells in Northern Lao PDR, 2009



Source: The Government of Lao PDR - national monitoring system supported by UNODC
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations

Table 5: Stratified risk areas used for the segment selection, 2008

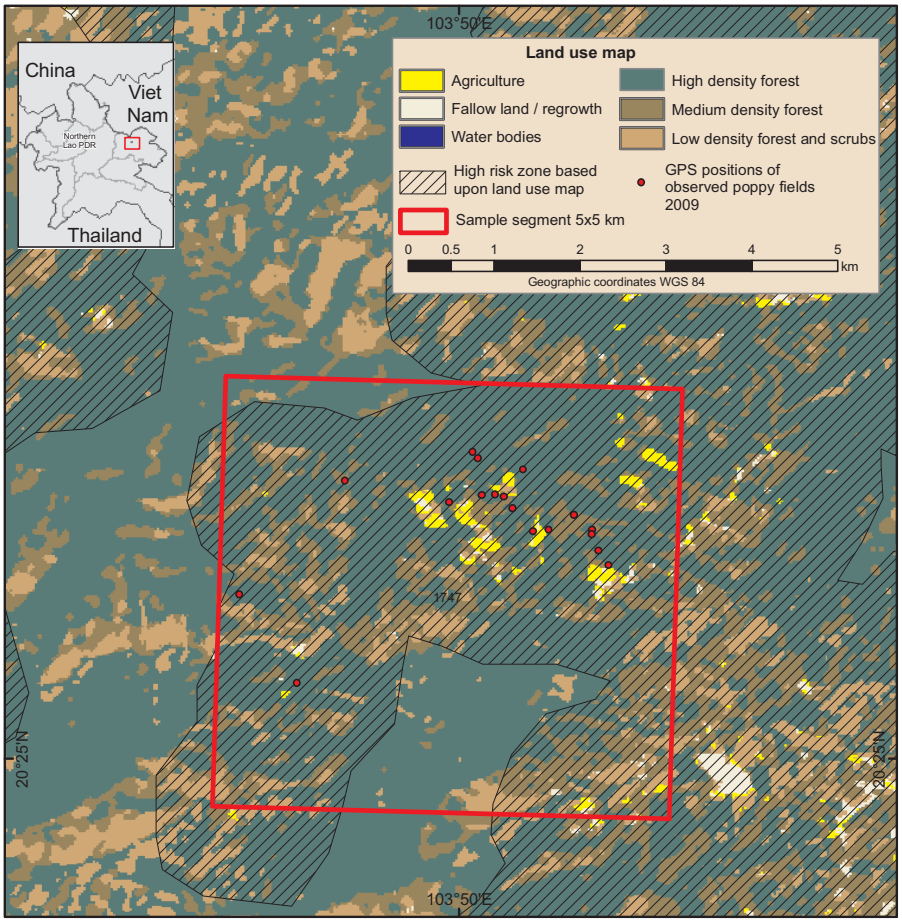
Strata	Area (km²)	Area (%)
High risk	21,043	68
Moderate risk	10,127	32
Total	31,170	100

4.3 Stratification

Previous sample designs and data analysis have demonstrated that there are sharp differences in the distribution of opium poppy cultivation across the entire survey area. Therefore, the results of the previous surveys and auxiliary geographic data were used to define areas with higher risk of opium poppy cultivation.

Agricultural plots for poppy cultivation are typically small fields. They are normally not identified on low definition land cover maps. However, poppy fields proved to be close to the larger agricultural areas in existing land cover maps. This characteristic has been used to design the stratification of the sampling frame. In 2007, 88% of identified opium poppy fields were located less than 4,000 meters from agricultural areas as defined in a 2003 land use map (scale: 1:100,000). In 2008, a new land cover map was developed which enabled a more accurate stratification. The updated land use map was developed on the basis of 6 Landsat-5 images taken between December 2006 and March 2007. The result is displayed in the map below and analysis shows that the standard distance of identified poppy fields to agricultural areas could be decreased to 1, 000 meters, with almost 90% of the poppy fields in 2007 found within this distance.

Map 4: The poppy fields observed from the helicopter in 2009 show that the land use map is a valid way to define the risk areas



Source: The Government of Lao PDR - national monitoring system supported by UNODC
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations

Taken at the same location as the example area above, with a poppy field in the center

4.4 Sampling frame

Buffer areas with 1 km width were established to surround each agricultural area. These were identified as areas where it was most likely that poppy cultivation would occur. The buffer calculation was performed in a Geographic Information System and resulted in two risk stratums.

- Stratum 1 - Areas with *high* risk of opium poppy cultivation; 1 kilometer or less away from agricultural areas identified by the land use map of 2007.
- Stratum 2 - Areas with *moderate* risk of opium poppy cultivation; more than 1 kilometer away from agricultural areas identified by the land use map of 2007.

Information from the ground indicated that opium poppy in Xieng Khouang Province is grown at significantly lower altitudes than in the rest of the area. Therefore, the calculated stratums were lowered by one step (the high risk area was lowered to moderate and moderate risk to no risk, i.e. excluded from the sampling frame).

Table 6:

Strata	Area (km2)	Area (%)
High Risk	21,043	68
Medium Risk	10,427	32
Total	**31,170**	**100**

The final sampling frame consisted of 31,170 km^2 distributed in 583 grids.

The type of sampling method used to estimate the area under opium poppy cultivation corresponds to a Stratified Area Sampling Frame approach. This technique is often used in agricultural and crops surveys. The methodology starts by dividing the target area into mutually exclusive and collectively exhaustive subgroups or strata. Subsequently, separate samples are then selected from each stratum.

4.5 Sample size

An imperative consideration in the determination of the sample size for a survey is the quality of the data that will be collected. On the other hand, financial resources are serious constraints limiting the scope of the survey. Compromising both conditions, the resulting sample size was calculated as a function of the costs associated to the helicopter flying time and the precision.

The budget available limited the number of flying hours up to the maximum of 25 hours. Therefore, in order to estimate the number of potential selected segments, it was necessary to investigate the helicopter characteristics.

The helicopter used for the survey was a "Squirrel" helicopter. This type of helicopter is used mostly for rescue, aero medical, survey and military roles. The Squirrel has a maximum cruise speed of 220 kph powered by a single jet engine. It can accommodate up to four passengers and carry loads of up to 750 kg.

To determine the maximum number of sample segments, a compromise between a sampling ratio of 5.4% of the total potential area and the maximum total of segments has been taken.

The total number of segments is derived from the following formula:

$$n_{\alpha} \leq MAX\left[\left[\left\{\frac{TEDWs \bullet n}{ESWs}\right\}\right] + \left\{\frac{(MaxDBs - MinDBs)\bullet n}{ESBs}\right\}\right] + BTso \leq 33\,h$$

Where:

TEDWs = Total expected surveillance distance traveled within segments

ESWs= Total expected Helicopter speed within segments

MaxDBS, MinDBs = Maximum and Minimum expected distance between segments

ESBs= Total expected helicopter speed between segments

Btso = Buffer time to stopovers

And,

$$n_{\beta \leq} PotentialL\ and * 5\%$$

Where:

Potential Land = Total potential land for opium poppy cultivation in Lao PDR

or

40,463X0.05=2,023, or in terms of segments is equal to 80 grids.

Finally,

$$n = Min\{n_{\alpha}, n_{\beta}\}$$

or n =Min (65,80)

Table 7: Final Sample Size

Sample Size	Grids	Area Sq Km
High Risk	*47*	*1,173*
Moderate Risk	*23*	*557*
Total	***70***	***1,730***

The sample allocation used for this survey is optimum allocation. Optimum allocation distributes the sample proportionally using the opium poppy area standard deviation in each grid.

The sample of 25km^2-grids was systematically selected using a probability proportional to size (PPS) approach. PPS sampling is a technique that employs auxiliary data to yield dramatic

increases in the precision of survey estimates, particularly if the measures of size are accurate and the variables of interest are correlated with the size of the unit.

In this survey, the variable used was the size of the potential land area for opium poppy cultivation. It is the methodology of choice for sampling areas for most crop estimation surveys. PPS sampling yields unequal probabilities of selection for primary sampling areas. Essentially, the measure of size of the primary sampling areas determines its probability of selection.

Table 8: Number of selected grid samples by province

Province	Sample
HOUAPHAN	18
LOUANGNAMTHA	8
LOUANGPHRABANG	8
OUDOMXAI	8
PHONGSALI	22
XIANGKHOUANG	6
Total	**70**

4.6 Estimation procedure

The estimation of the area under opium poppy cultivation was based on the information collected during the helicopter survey. The expansion area for the aerial research was limited to the sampling frame and does not consider opium poppy fields outside this domain.

Ratio estimation formulae were used to estimate the extent of the opium poppy cultivation at the stratum level using the equations described below.

a. Average proportion of opium poppy cultivation per stratum:

$$\bar{p}_k = \sum_{j=1}^{t} \frac{Poppy\_in\_segment\_j}{Potential\_land\_in\_segment\_j}$$

k =1,2 and j=1,…,28, or 37

b. Average proportion of opium cultivation in Northern Lao PDR.

$$\bar{p}_{st} = \frac{1}{N} \sum_{h}^{3} N_h \bar{p}_h$$

Or

$$\bar{p}_{st} = \sum_{k}^{3} W_k * \bar{p}_k$$

W_h= relative weight for each stratum

c. Unbiased estimate of the variance of the proportion of opium poppy cultivation in Northern Lao PDR:

$$Var(\bar{p}_{st}) = \frac{1}{N^2} * \sum_{1}^{3} \frac{N_h^2 (N_h - n_h)}{N_h - 1} * \frac{P_h * Q_h}{n_h}$$

The second term on the right represents the reduction due to the finite population correction[10].

[10]Cochran, W.G.; Sampling techniques, Third edition; Wiley Eds. 1977.

The results for the two strata were refined by the bootstrap method[11]. Bootstrapping is recommended[12] for cases when the sample observations have different sizes. This was the case in the survey area, where the potential land suitable for opium poppy cultivation as defined by the sampling frame within the selected grids was very different from each other. The bootstrap method does not have a significant influence on the mean estimation. The main reason for using bootstrap is to calculate the standard error of the estimates.

Bootstrapping consist of sampling with replacement from the original sample thousands of times. The collection of 70 selected grids constitutes the original sample. After performing each iteration, a mean value is estimated and scored. At the last stage, a distribution of means can be observed, producing a mean estimate and a confidence interval for the mean.

[11] Resampling Stats. Stand alone Version 5.0 with 100,000 iterations.

[12] Resampling methods, a practical guide to data analysis; Good, P. Birkhauser 2006

PART 2. MYANMAR

CONTENTS

ABBREVIATIONS

CCDAC	Central Committee for Drug Abuse Control
GOUM	Government of the Union of Myanmar
ICMP	UNODC Illicit Crop Monitoring Programme
INGO	International Non-Governmental Organization
SASS	Statistics and Surveys Section (UNODC)
SR	Special Region
UNODC	United Nations Office on Drugs and Crime
USG	United States Government
WCS	Wildlife Conservation Society

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FACT SHEET - MYANMAR OPIUM SURVEY 2009

	Year 2008	Year 2009	Change from 2008
Opium poppy cultivation in Myanmar	28,500 ha (17,900 to 37,000)	31,700 ha (24,00 to 42,900)	+11 %
Opium poppy cultivation in Shan State	25,300 ha	30,000 ha (24,000 to 40,000)	+19 %
Average opium yield (weighted by area)	14.4 kg/ha	10.4 kg/ha	-27.8%
Potential production of dry opium in Myanmar (including the Shan State)	410 mt	330 mt (214 to 447)	-19.5%
Opium poppy eradication in Myanmar[1]	4,820 ha	4,087 ha	-15.2 %
Average farm-gate price of opium[2]	US$ 301/kg	US$ 317/kg	+5 %
Total potential farm-gate value of opium production[3]	US$ 123 million	US$ 105 million (68 to 142)	-15 %
Estimated number of households involved in opium poppy cultivation in Myanmar	168,000	192,000 (160,000 to 225,000)	+14 %
Number of persons involved in opium poppy cultivation in Myanmar	840,000	1,066,000 (890,000 to 1,250,000)	+27 %
Estimated number of households involved in opium poppy cultivation in the Shan State	148,900	176,500 (141,200 to 235,300)	19 %
Average yearly household income in opium producing households (Shan State)	US$ 687	US$ 700	+2 %
Of which from opium sales	US$ 253	US$ 160	-37 %
Per capita income in opium producing households (Shan State)	US$ 137	US$ 125	-9 %
Household average yearly income in non-opium poppy producing households (Shan State)	US$ 721	US$ 750	+4 %
Per capita income in non-opium producing households (Shan State)	US$ 144	US$ 133	-8 %
Addiction prevalence rate in Shan State and Kachin (population aged 15 and above)	1.1 %	1.5 %	+36%

[1] Source: CCDAC.

[2] For 2008: yearly average price. For 2009: price at harvest time.

[3] The farm-gate value should calculated with the price of dry opium. However, the price of dry opium is difficult to establish in Myanmar because of the selling and storing practices of the farmers. The farm-gate value here is calculated with the price of fresh opium. This result in a lower estimate.

EXECUTIVE SUMMARY

The 2009 Opium Survey in Myanmar was conducted jointly by the Government of the Union of Myanmar (GOUM) and the United Nations Office on Drugs and Crime (UNODC). Due to significant differences in the extent of opium poppy cultivation across the geographic regions of the country it was necessary – like in previous years - to apply different methodologies for the identification of opium poppy cultivation in each region. In the Shan State, where most of the opium poppy cultivation takes place, a probabilistic sample of satellite images was used to estimate area under opium poppy cultivation. Ground verification activities were carried out in order to improve the accuracy of the remote sensing results. In addition, a village survey was done to collect data on socio-economic indicators. In Kayah State, a ground survey (socio-economic survey) in the opium risky areas was used to estimate the area under opium poppy cultivation. The extent of opium poppy cultivation in Kachin State was estimated partly with satellite images and partly with the analysis of data collected during the socio-economic survey in the opium risky areas. This survey was conducted interviewing the village headmen and a group of farmers. Finally, Special Region 1 (Kokang), Special Region 2 (Wa), and Special Region 4 were verified with visual interpretation strengthened with information collected from local authorities.

Opium poppy cultivation

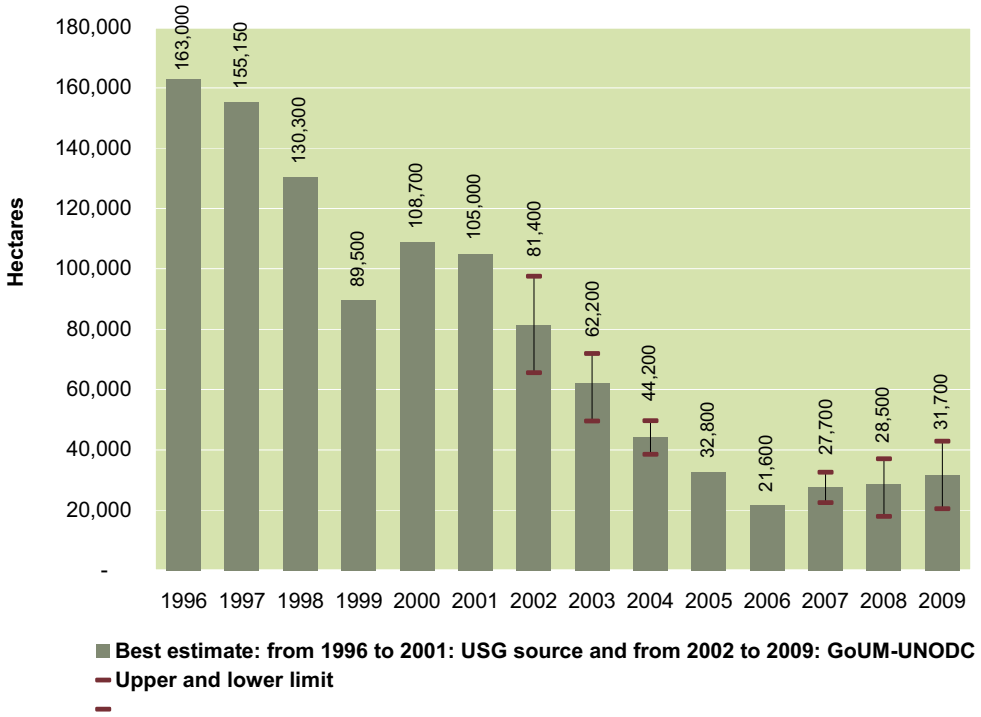
In 2009, the total area under opium poppy cultivation in Myanmar was estimated at 31,700 hectares, representing an increase of 11% from the 28,500 ha under cultivation in 2008. The largest area under cultivation was observed in the Shan State, where 95% of the total opium poppy in Myanmar was grown. South Shan and East Shan accounted for 52% and 38% respectively, of the total national cultivation of opium poppy. Opium poppy cultivation in the North Shan remained low, accounting for just 5% of the national area under poppy cultivation. However, the North Shan showed some of the strongest increases in poppy cultivation, rising by 100% as compared to 2008. Meanwhile, cultivation in Kachin State and the Kayah State remained rather low, totalling 5% of the cultivation in Myanmar. There are some indications regarding the cultivation in other parts of the three States which were surveyed but these cultivations appear to be marginal and not significant.

Table 1: Opium poppy cultivation (hectares) in Myanmar by state (2007-2009) with 95% confidence intervals.

Region	2007	2008	2009	% of total area of opium poppy cultivation
East Shan	7,000 (4,140 to 9,600)	9,300 (6,800 to 11,800)	11,900 (8,100 to 15,000)	38%
North Shan	390 (140 to 540)	800 (400 to 1,200)	1,600 (390 to 2,900)	5%
South Shan	18,000 (16,400 to 19,600)	15,500 (9,500 to 21,500)	16,500 (10,900 to 22,600)	52%
Special Region 2 (Wa)	0	0	0	-
Shan State Total	**25,390**	**25,300**	**30,000 (24,000 to 40,000)**	**95%**
Kachin	1,440 (1,150 to 1,760)	1,500 (1,100 to 1,900)	1,400 (1,100 to 1,700)	4%
Kayah	870 (710 to 1,040)	1,800 (1,800 to 2,500)	300[4] (60 to 700)	1%
National Total (rounded)	**27,700 (22,500 to 32,600)**	**28,500 (17,900 to 37,000)**	**31,700 (20,500 to 42,800)**	**100%**

[4] The estimates in Kayah for 2008 and 2009 are not directly comparable due to a change in methodology.

Figure 1: Opium poppy cultivation (hectares), 1996-2009



Estimate	2002	2003	2004	2005	2006	2007	2008	2009
upper	97,500	71,900	49,600			32,600	37,000	42,800
lower	65,600	49,500	38,500			22,500	17,900	20,500
Mean	**81,400**	**62,200**	**44,200**	**32,800**	**21,600**	**27,700**	**28,500**	**31,700**

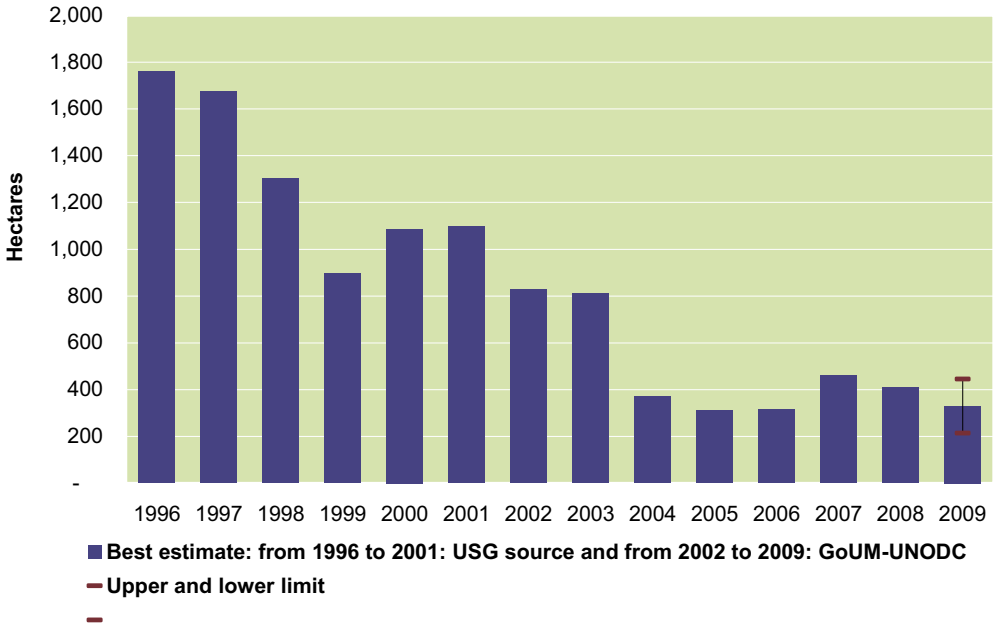
Opium yield and production

Based on a total of 134 fields measured in this study, the weighted national average opium yield for 2009 was estimated at 10.4 kg/ha, leading to an estimated potential opium production of 330 metric tonnes (range between 214 and 447 metric tonnes). In 2008, the estimated yield was 14.4 kg/ha and the estimated potential opium production was 410 metric tonnes. This shows a drop both in yield and production of opium by almost 28% and 20% respectively.

Similar to the cultivation findings, the results show that opium production was the highest in the Shan State (88% of total production), particularly in South Shan (56%) and East Shan (32%). States of Kachin and Kayah both contributed with 6% each to the national opium production.

Yielding capsules during the harvest and drying capsules after the harvest. The capsule is lanced several times at a few days interval with self-made tools made of several blades

Figure 2: Opium production in Myanmar (metric tons), 1996-2009



Opium prices

The price of fresh opium varied significantly across regions. This year, the average farm-gate price of opium at harvest time was estimated at 317 US$/kg. This represents an increase by 5% compared to the average price reported in 2008 (301 US $/kg). The price continues to differ across the states, with Northern Shan, where opium production levels are low, reporting the highest price (570 US$/kg) and South Shan state, where production levels are high, reporting the lowest price (280 US$/kg). The highest increases in price compared to last year were observed in Kachin and North Shan States, whereas in South Shan and East Shan States, price increases were moderate.

The current fragmentation of the opium market in Myanmar was confirmed by the information collected during the village survey.

Household income from opium

In 2009, the average annual cash income of an opium poppy growing household in Shan State was estimated at US$ 700 (range: $640 to $750), while that of a non-opium poppy cultivating household was higher, at US$ 750 (between $700 to $805). The share of income coming from the sale of opium represented, on average, $160 (or 23%). The average income from the three States that were investigated (Kayah, Kachin and Shan) reaches $745 ($700 to $800) for non-growers and $735 ($680 to $790) for opium poppy growers. Income in Shan villages where poppy was never cultivated, reached, on average, $850 per household and was thus above average. This suggests that opium poppy cultivation in the Shan State has been taking place in the poorest villages. The findings for the year 2009 also show that households who stopped opium poppy cultivation more than 2 years ago could not find adequate means of substituting their lost income from opium. Consequently, their income decreased to, on average, $640 per household.

Addiction

Opium users in the Shan State, Kachin and Kayah represent 0.7% of the adult total population (age 15 and above). Within the surveyed area, the average level of addiction was significantly higher in villages with opium poppy cultivation (1.7%) than in non-growing villages (0.5%). As in previous years, opium addiction continues to be predominantly concentrated among males: 1.4% of the male population was addicted compared to 0.1% of the female population. The level of amphetamine type stimulant (ATS) and heroin addiction remained low as compared to opium abuse. However, the survey did not cover urban areas where the use of these types of drugs are thought to be higher.

Opium addict farmer from Kachin using Khar Ku
(Raw opium cooked with soft banana leaf)

Eradication

According to official reports from the Government of Myanmar, 4,087 ha of opium poppy were eradicated in 2009. This represents a decrease of 15% compared to last year. Eradication saw a decrease in the Shan State (-31%) across all its three regions In Kachin 71% more opium poppy was eradicated than a year earlier.

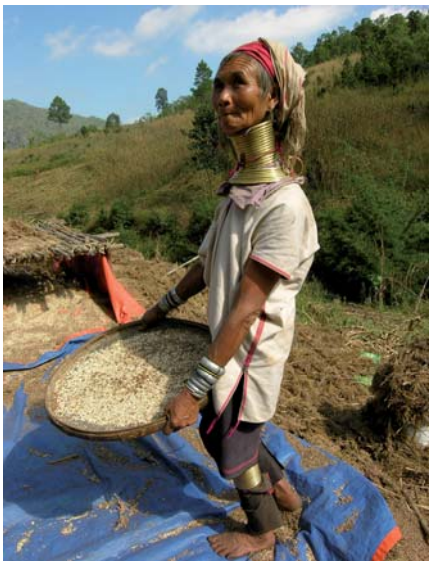
Eradication of a poppy field consists of slashing the poppy plants with a flexible stick. The eradication usually takes place when the plant is about to be harvested

Table 2: Percentage of opium poppy eradicated, 2004-2009

Region	2004	2005	2006	2007	2008	2009
Estimated cultivation in hectare	44,200	32,800	21,600	27,700	28,500	31,700
Eradication in hectares	2,820	3,907	3,970	3,598	4,820	4,087
% of opium eradicated at time of the survey	6%	12%	18%	13%	17%	13%

Food security and coping strategies

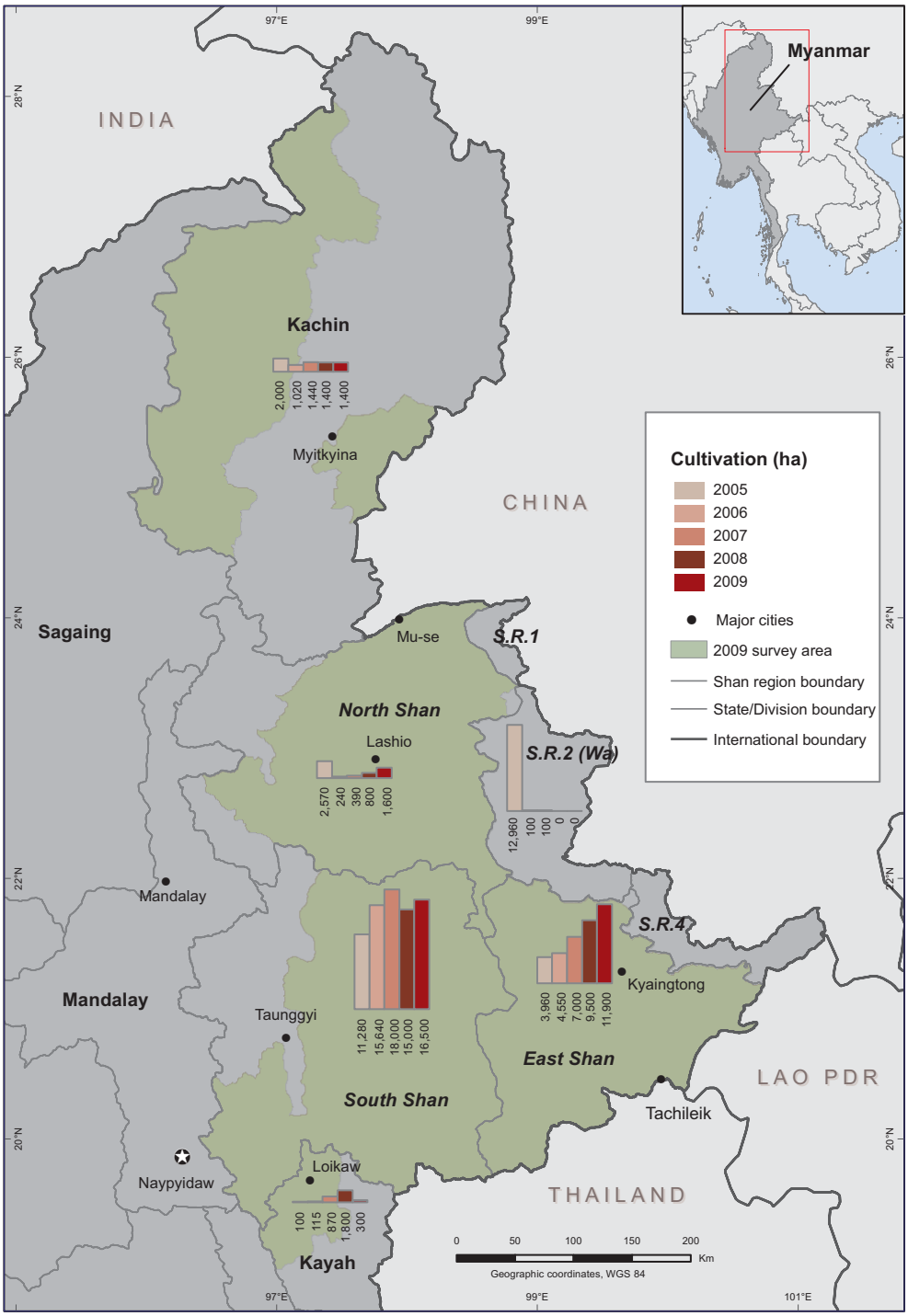
The 2009 survey confirmed previous years findings that villages reporting opium poppy cultivation continued to be characterised by lower levels of food security compared to opium poppy-free villages. As observed in previous years, villages with access to paddy land tend to cultivate less opium poppy, because a higher level of food security may be reached through cultivation of rice.



Compared to non-growing villages, villages growing opium poppy showed a significantly higher intensity of shifting cultivation, both in terms of acreage of forest cleared and duration of fallow periods.

The most common coping strategy used by farmers, who stopped opium poppy cultivation, was to grow more rice and maize and to sell livestock.

Map 1: Opium poppy cultivation in Kachin, Kayah and Shan States, Myanmar 2005-2009



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

1 INTRODUCTION

This report presents the results of the annual opium survey in Myanmar, conducted for the eighth consecutive year by the Central Committee for Drug Abuse Control (CCDAC) of Myanmar, with the support and participation of UNODC. Since 2001, UNODC has collected statistical information on illicit crop cultivation in Myanmar, within the framework of its Illicit Crop Monitoring Programme (ICMP). ICMP works with national governments to increase their capacity to monitor illicit crops and supports the international community in monitoring the extent and evolution of illicit crops in the context of the elimination strategy adopted by United Nations General Assembly Special Session on Drugs in June, 1998. The survey methodology combines satellite imagery with field and village surveys. In combination, these three surveys provide the information needed to determine the extent of opium poppy cultivation and production and the socio-economic situation of farmers.

Opium poppy has been grown in Southeast Asia as a medicinal and cash crop for centuries. Some 150 years ago, cultivation of the crop was commercialized in what was then known as Burma. Opium poppy cultivation has remained village-based, widely dispersed and very "low tech". The agricultural economy of opium–growing regions of Myanmar is based on a traditional opium poppy-maize-rice cropping system. Surplus opium, which is not needed for medicinal purposes or consumed by addicts in their own household, is often sold to alleviate food shortages, as most households are not self-sufficient in food.

In the 1980s, Myanmar was the world's largest producer of illicit opium. Between 1981 and 1987, it had an average annual production of about 700 metric tons. Opium production in Myanmar continued to increase until 1996, reaching annual production levels of some 1,600 metric tons. Afghanistan replaced Myanmar as the world's largest producer of opium in 1991, primarily due to its higher opium yield per hectare. The area under cultivation remained larger in Myanmar than in Afghanistan for another decade, until 2002.

In 1996, the surrender of the notorious drug trafficker Khun Sa, leader of the Mong Tai Army, resulted in the collapse of armed resistance movements and led to the negotiation of a series of truce agreements with most break-away factions. This paved the way for control by the government of opium poppy-growing regions and allowed the implementation of measures to reduce opium poppy cultivation.

In 1999, the Government of Myanmar and local authorities in areas cultivating opium poppy decided to engage in a 15-year plan to eliminate the illicit crop by the year 2014. Since then, there has been a considerable decrease in the area under cultivation and a strong decline in potential opium production in Myanmar.

Opium poppy has been confined almost entirely to the Shan State with a few pockets of cultivation in other states. The Wa Region of Shan State played a major role in opium production in the past. After a ban on opium cultivation which was declared in June 2005, the Wa Region remained poppy free. Similarly, no significant opium poppy production has been observed in Kokang and in Special Region 4 since 2003. After reaching a minimum level in 2006, opium cultivation began to have marginal increases in 2007.

The achievements in reducing cultivation and production of opium, and the efforts made to treat opium users, can only be sustained if alternative livelihoods are available to local communities. Farmers are very vulnerable to loss of income derived from opium, especially those who depend on this source for food security. Also, opium cultivation is often linked to a lack of peace and security, which also contributes to impoverishment of the local population.

The annual opium surveys remain essential to assess the extent of opium poppy cultivation within the country and shifts in cultivation. It is also a useful tool for gauging the effectiveness of opium bans and their implications. The present survey examines, among other things, how farmers continue to cope with the opium ban. Such information is essential for developing effective strategies to sustain the transition from an illicit economy to a licit economy.

2 FINDINGS

2.1 Opium poppy cultivation

In 2009 the annual opium survey in Myanmar covered the Shan State (North, East, and South Shan), Kachin and Kayah States, i.e. all the regions of Myanmar where opium poppy cultivation was reported. As in 2008, the survey included several Special Regions in Shan (Wa Special Region 2, Kokang Special Region 1 and Special Region 4), where rapid assessments were conducted. The survey confirmed the sustainability of the opium-ban in these three Special Regions.

In 2009, the total area under opium poppy cultivation in Myanmar was estimated at 31,700 ha, representing an increase of 11% compared to 28,500 ha in 2008. This upward trend started slowly from 2007 after five years of decline (2002 to 2006).

Figure 3: Opium poppy cultivation (ha), 1996-2009

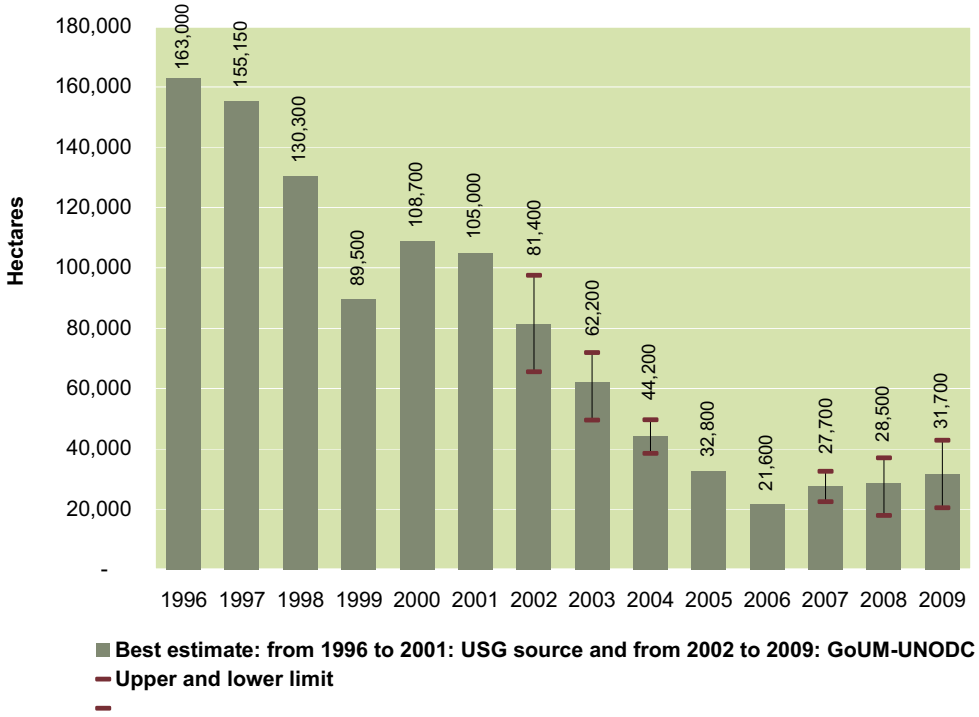


Table 3: Opium poppy cultivation (ha), 2002-2009

Estimate	2002	2003	2004	2005	2006	2007	2008	2009
upper	97,500	71,900	49,600			32,600	37,000	42,800
lower	65,600	49,500	38,500			22,500	17,900	20,500
Mean	**81,400**	**62,200**	**44,200**	**32,800**	**21,600**	**27,700**	**28,500**	**31,700**

The vast majority of the opium poppy cultivation in Myanmar continued to take place in South Shan (52%) and East Shan State (38%). In North Shan State, the level of opium poppy cultivation accounted for only 5% of the total area. The overall area under poppy cultivation in the Shan State accounted for 95% of total opium poppy cultivation in Myanmar. Most of the opium poppy cultivation outside the Shan State took place in Kachin State and in Kayah State. In Kachin State,

poppy is cultivated in the areas of Tanai, Waingmaw and Hpakant. Some information indicates that poppy is also growing in Putao township. In Kayah State, poppy cultivation is mainly concentrated in the northern townships of the State namely Phyu Soe, Loikaw and De Morsoe townships.

In 2009, like in 2008, it was the East Shan which recorded the most important increase (2,400 ha or 25 %). The South Shan State, which represents more than half of total cultivation, poppy cultivation increased by 10%. There was a significant percentage increase (100%) in North Shan State, but the magnitude of cultivation remained modest compared to other regions. Nonetheless, special attention should be sustained to this region because over the past two years the extent of cultivation has doubled.

Table 4: Opium poppy cultivation by State (best estimate in ha), 2008-2009

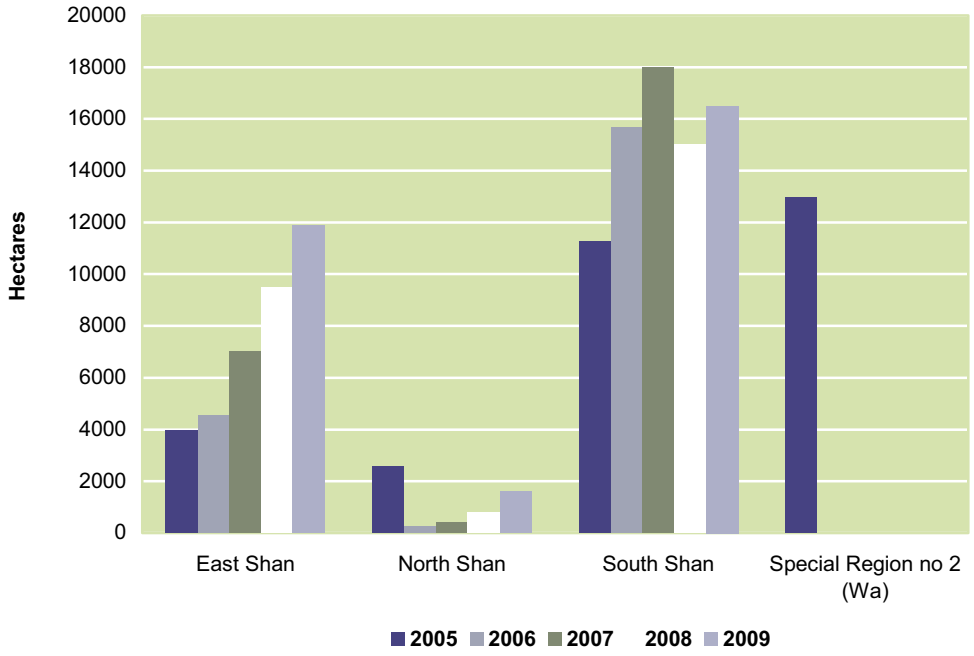
Administrative unit	2008 Opium poppy cultivation (ha)	2009 Opium poppy cultivation (ha)	2009 % of total area of opium cultivation	Variation (%)
Shan State	25,300	30,000	95%	+19%
Kachin State	1,400	1,400	4%	0%
Kayah State	1,800	300	1%	-83%
Rounded Total	**28,500**	**31,700**	**100 %**	**+11%**

Table 5: Opium poppy cultivation in the Shan State (best estimate in ha), 2008-2009

Administrative unit	2008 Opium poppy cultivation (ha)	2009 Opium poppy cultivation (ha)	Variation (%)
East Shan	9,500	11,900	+25%
North Shan	800	1,600	+100%
South Shan	15,000	16,500	+10%
Special Region No.2 (Wa)	0	0	0%
Total (rounded)	**25,300**	**30,000**	**+19%**

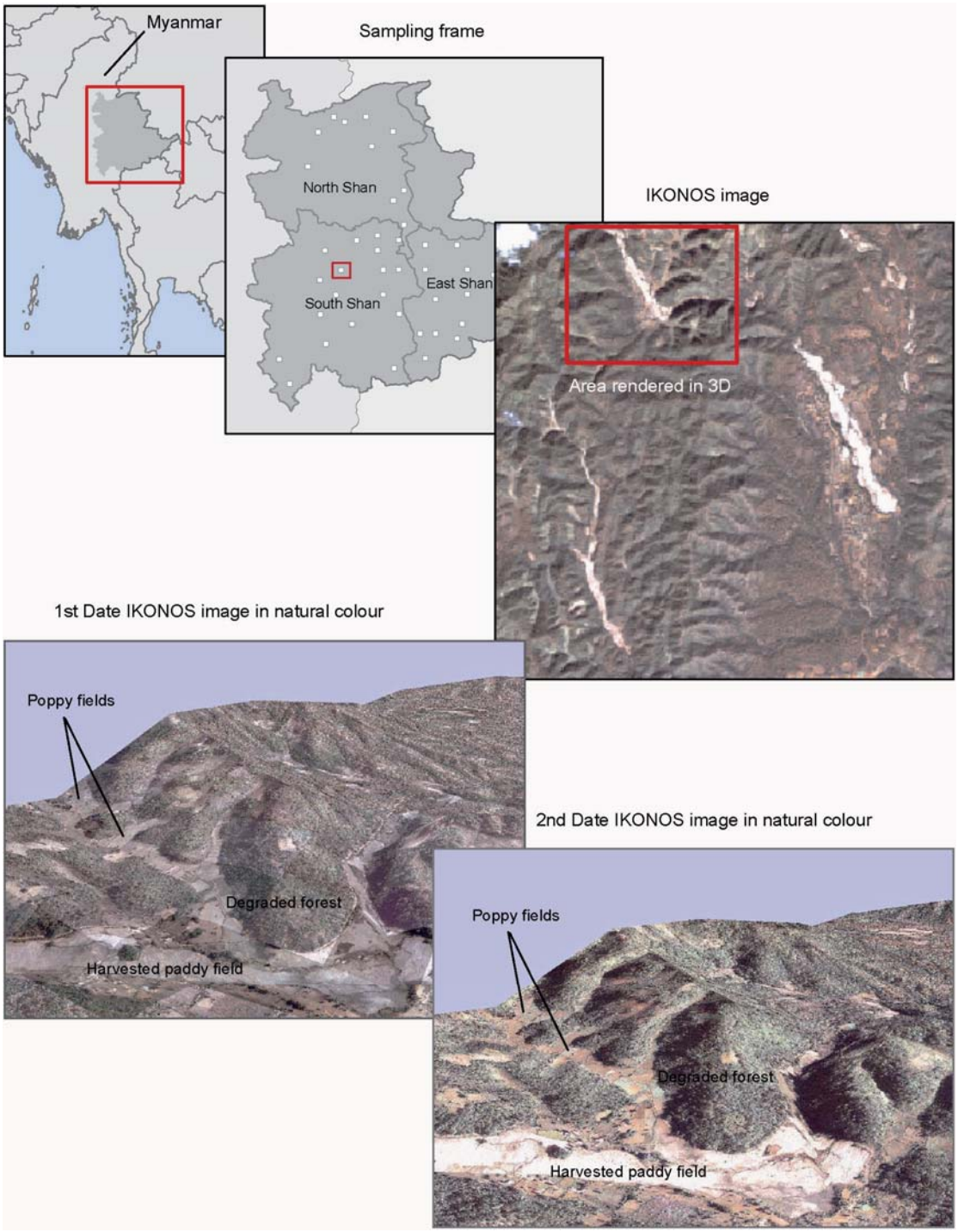
Poppy field irrigated with a basic irrigation system

Figure 4: Opium poppy cultivation in the Shan State (ha), 1995-2009



Poppy fields at a very early stage with drainage groves (South Shan State)

Figure 5: Three dimensional view of opium poppy fields on a satellite image

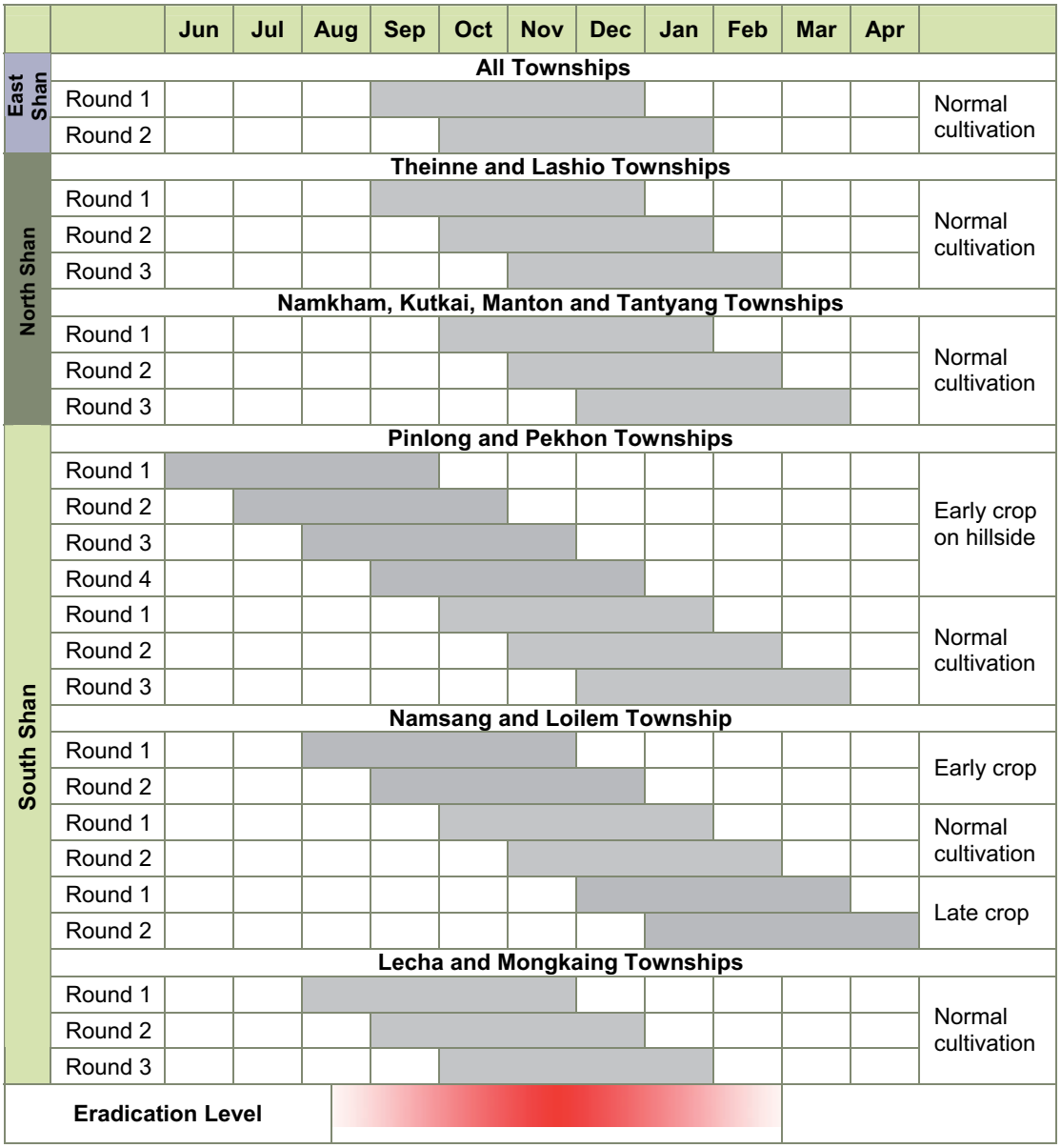


Villages and farmers involved in opium poppy cultivation

It is estimated that a total of 192,000 households (range from 160,000 to 225,400) were involved in opium poppy cultivation in Myanmar in 2009, with an unchanged average area under cultivation of 0.17[5] ha per household. These are rather small numbers, compared to Afghanistan, where the average area under poppy cultivation amounted to 0.5 ha per household in 2009.

The village survey revealed that opium cultivation took place in 32% of villages in the opium risky areas of Shan State, with a higher concentration in East Shan State (50%) and South Shan State (38%). A high concentration of villages cultivating opium was found in two of the five townships surveyed in Kachin State.

Figure 6: Opium poppy cultivation calendar in Shan State



[5] Source: UNODC/CCDAC opium poppy surveys 2001 to 2009.

Practices in opium poppy cultivation in Myanmar

Observations made during the implementation of the socio-economic survey in the opium growing risky areas showed that farmers spread opium poppy cultivation over time to distribute the workload, to avoid the risk of crop loss due to unfavourable weather during germination or harvest, and to minimize the negative factors that may affect their fields. On large slopes, only some fields may be used for off-season opium poppy, e.g. those with good drainage close to thicker vegetation in the upper area of the slope where water run-off can be managed by digging horizontal drainage channels across the fields. The fields used for off-season cultivation may be close to fields where opium poppy is grown at other times of the year. For example, a farmer may cultivate off-season opium poppy in fields from July to October, in the adjacent field from September to December, and in another field from October to January, depending on when and where the conditions at this micro-level are optimal for opium poppy cultivation.

The practice of multistage cropping

Multi-stage cropping is often employed in opium poppy fields where significant eradication campaigns have taken place or where there is a shortage of labour. During multistage cropping, opium poppy seeds are sown twice in the same field within an interval of one to two months. Hence, plants of two different sizes are growing in the same field at the same time.

Even if the plants from the first sowing were eradicated, the plants from the second sowing have a chance of surviving and still may provide sufficient yield, which would compensate for the loss of the first stage plants. The practice of multistage-cropping has been widely applied throughout South Shan State. Past experience has shown that eradication measures are not conducted on the same land twice. Therefore, by using multistage cropping techniques, opium farmers can compensate for some of the eradication losses.

Another practice used by farmers is staggered planting, which consists of sowing opium poppy seeds in different fields at different times in order to spread the harvest over a longer period. The opium poppy plants grow at different stages, and at the time of gum collection in the first field, the other fields will not yet be at the flowering stage, and therefore, labour resources can be better distributed.

Cultivation during the monsoon season

Off-season cultivation of opium poppy, i.e. early cultivation during the monsoon season, was only observed in the South Shan State (like in previous years).

Cultivation of poppy fields during the rainy season (off-season cultivation) takes place *in addition* to the regular winter opium poppy cultivation and only in some specific townships in South Shan State. It is very unlikely that farmers cultivate opium poppy only during the off-season. This year, a survey undertaken during the off-season survey revealed an average of 530 ha cultivated during the monsoons. Due to the different quality of the opium gum and its very low yield, this estimate was not including in the total area cultivated. No yield survey was made for the off-season cultivation but observations of the poppy showed that the plants were rather short and the capsules were tiny indicating that the amount of gum collected during the harvest is much lower than the quantity of opium harvested during the regular season.

Typical off-season poppy field (already harvested). The density of the field is low, the plants are short and the capsules are tiny.

Opium poppy field growing during the rainy season in the course of eradication in August 2009.

2.2 Yield and opium production

In order to extract the opium from the poppy plants, the harvest starts shortly after the flower of the poppy falls. The opium is extracted from the plants by scoring each capsule with a lancing tool hand-crafted with salvaged materials usually from old razor blades. The lancing tool is composed of a small handle on which several pieces of old razor blades are fixed (from 2 to 8 blades). The raw opium (white gum) comes out immediately and it is left to dry. After a day or two, the opium is scrapped off using a self-made flat piece of metal or wood. The same capsule is scored several times for a few days.

The capsule is scored with a hand-made lancing tool. The white gum comes out immediately but will be collected later.

After a day or two the opium turns brown and is scrapped off with a scrapper.

Past research found a clear correlation between the amount of opium gum harvested and the size and density of the poppy capsule . Based on this research a model was developed which is still used to estimate the amount of opium per hectare, based on information on the size of the capsules and the number of yielding capsules in a field. The 2009 estimate for Myanmar was based on capsule measurements in 134 fields across the poppy growing regions of the country.

In 2009, the average volume of a capsule in Myanmar was 8.4 cm^3 (which represent a capsule of about 2.6 cm high and 2.8 cm diameter). This is a rather small volume. For comparison, the average volume per capsule in Afghanistan in 2009 was 36 cm^3 (about 3.9 cm high and 4.2 cm diameter). Moreover, the average number of capsules in Myanmar was 23 yielding capsules per square metre versus 42 capsules per square metre in Afghanistan. As a result of low capsule volumes and only limited numbers of capsules per square meter, opium yields was rather low in Myanmar. The overall opium yield calculated in Afghanistan amounted to 56 kg per hectare in 2009 while in Myanmar the average national opium yield amounted to 10.4 kg per hectare (weighted average), i.e. less than one fifth of the yield in Afghanistan.

Moreover, the yield in 2009 was down from 14.4 kg/ha (weighted average) in 2008, representing a decline of 24% as compared to last year. A number of factors contributed to this decline, including weather conditions, security and eradication. Many poppy fields in South Shan (Namsan, Kunhein, Kyaethi, Monae townships) were damaged this year. Poppy fields in Sisaing township (especially in the plain areas close to the villages) lacked sufficient water and were too dry at the end of January. In other parts of the country, unexpected rains caused a problem, either reducing yields of existing fields or prompting farmers to re-grow opium poppy at a later stage. Lack of security and the eradication campaign also played a role, prompting farmers to shift opium production to less accessible areas and/or to even smaller fields. As poppy fields were moved to such areas, yields declined. In South Shan and in Kayah the surveyors reported difficulties in the accessibility of poppy fields, especially in the Pinlaung and Pekon townships.

In some areas of Myanmar, a few opium poppy farmers sow seeds during the monsoon and then harvested before the end of the rainy season. The gum which is harvested from tiny capsules produces poorer quality opium. This practice, albeit being marginal and prevalent mainly in the South Shan State, also contributes to the overall lower yield.

A very limited quantity of opium was produced in the off-season cultivation mainly in the South Shan State for local consumption. Often, opium cultivated during the off-season yields just half of the amount of the main season crop.

Interviews with farmers revealed differences in the yield according to the type of opium poppy that is being cultivated. Farmers reported that there was a difference between the ‘white seeds’,

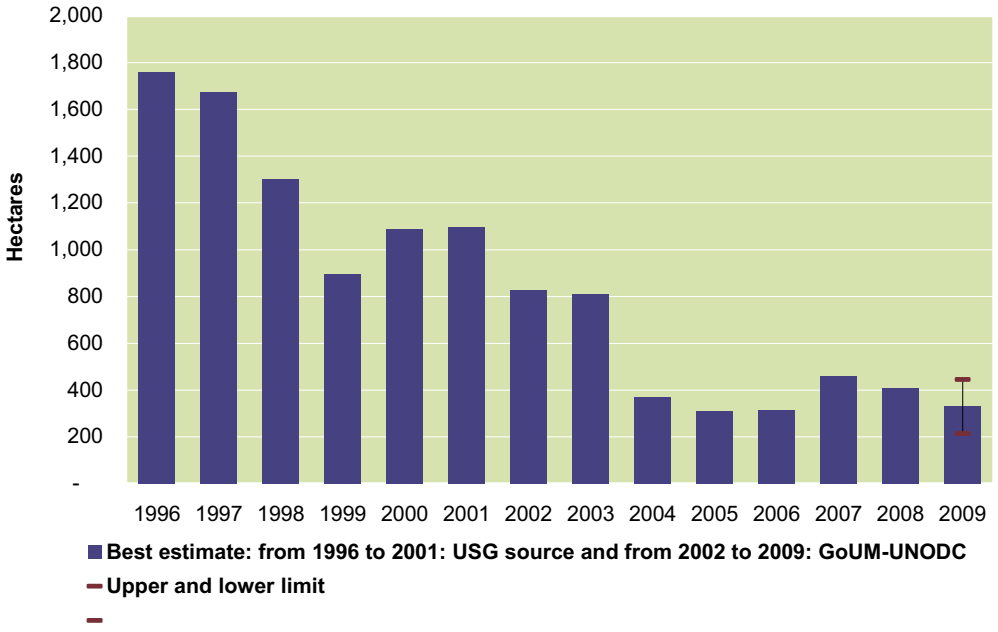
leading to 'white flower poppy', and the 'dark blue seeds' resulting in mixed colour opium poppy, mainly red and violet poppy flowers.

Opium poppy field at flowering stage

According farmers, the dark blue seeds need about 4 months to produce the opium poppy, i.e. a longer period than the white seeds (3 months). Such red or violet poppy flowers tend to produce less opium. But they are more resistant to bad weather conditions, such as heavy rain, and tend to be less labour intensive. The white opium poppy grows faster (3 months), provides higher yields but needs more labour input from the farmers and tends to be more affected by adverse weather conditions. Given the poor security situation and the stronger perceived risks of eradication, some farmers shifted from the high-yielding white to the lower-yielding red and violet opium poppy variety. They thus obtained lower yields in exchange for better weather resistance and less labour input.

Figure 7: Petals of opium poppy flowers

Figure 8: Potential opium production (metric tons), 1996-2009

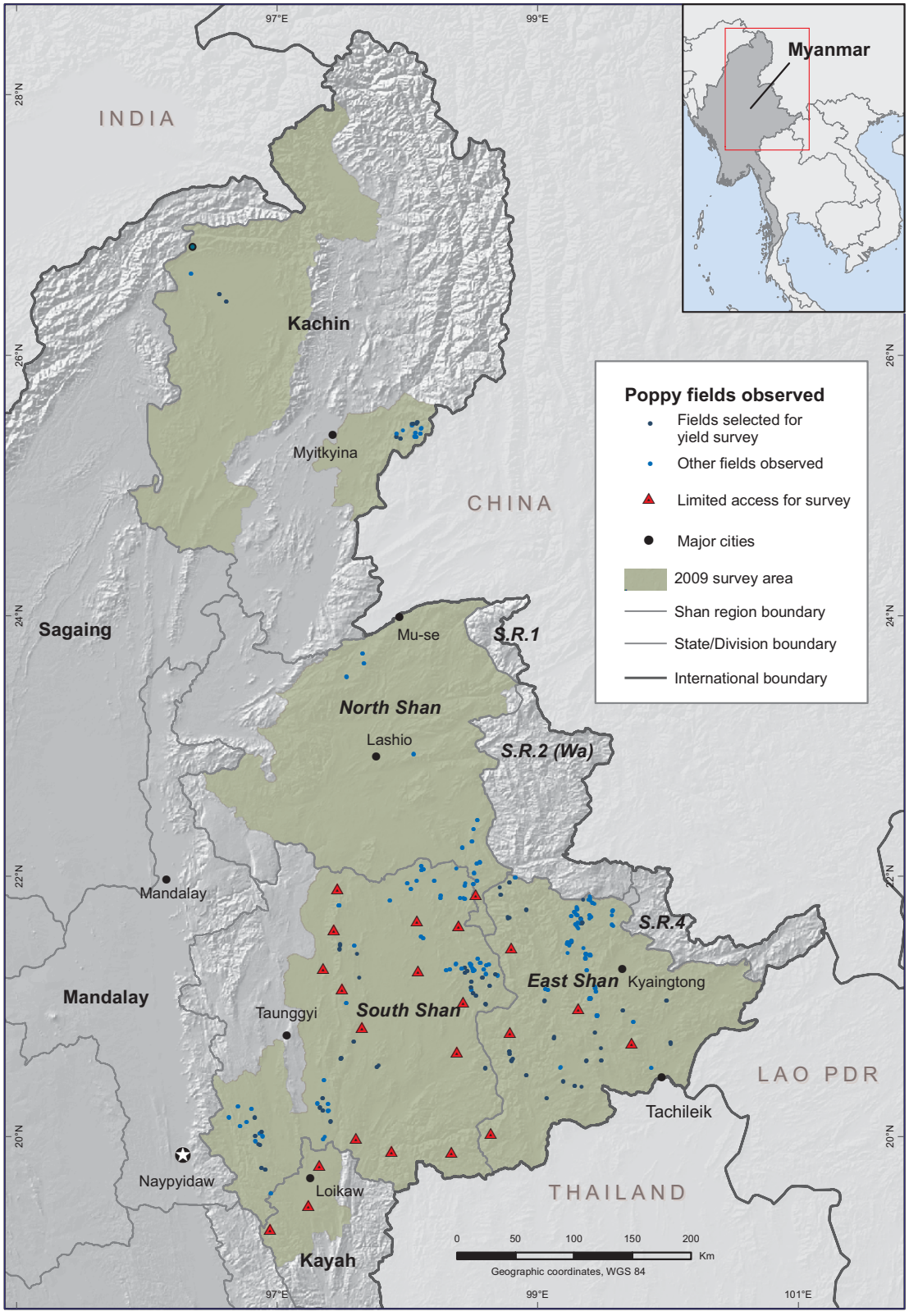


Applying the yield to the areas under poppy cultivation resulted in an output of around 330 tons of opium in 2009 (ranging from 214 to 447 mt), down from 410 tons in 2008. Opium production fell by 19.5% in 2009 and by 28% as compared to 2007. The Shan state accounts for 95% of total opium production in Myanmar. Most of the opium production continues to take place in the South-Shan (172 tons), followed by East Shan (124 tons).

Table 6: Potential opium production by region (mt), 2008-2009

Region	Potential production (mt) 2008	Potential production (mt) 2009
Kachin	25.1	14.6
Kayah	23.2	3.1
East Shan	122.6	123.8
North Shan	10.3	16.7
South Shan	228.0	171.6
Total (rounded)	**410**	**330**

Map 2: Location of opium poppy fields observed during the survey in Kachin and Shan States, Myanmar 2009.



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

2.3 Opium prices

In line with the decline of opium production, opium prices rose in Myanmar in 2009. The average farm-gate price of opium weighted by the estimated area under cultivation was US$ 317/kg in 2009, which represents a 5% increase from US$ 301/kg in 2008 (weighted average).

Fresh opium prices increased across all regions of Myanmar, notably in North-Shan. Fresh opium prices were also highest in the North-Shan, where opium production was limited, and lowest in the South-Shan, where opium production was most widespread. Reflecting differences in the access to supply, the prices in opium growing villages continued being lower than in non-growing villages. Dry opium prices increased across all regions of the Shan State, and mostly in North-Shan. In Kachin and Kayah, however, dry opium prices slightly declined.

Figure 9: Average farm-gate price of fresh opium in poppy growing villages of opium growing risk areas (US$/kg), 2008-2009

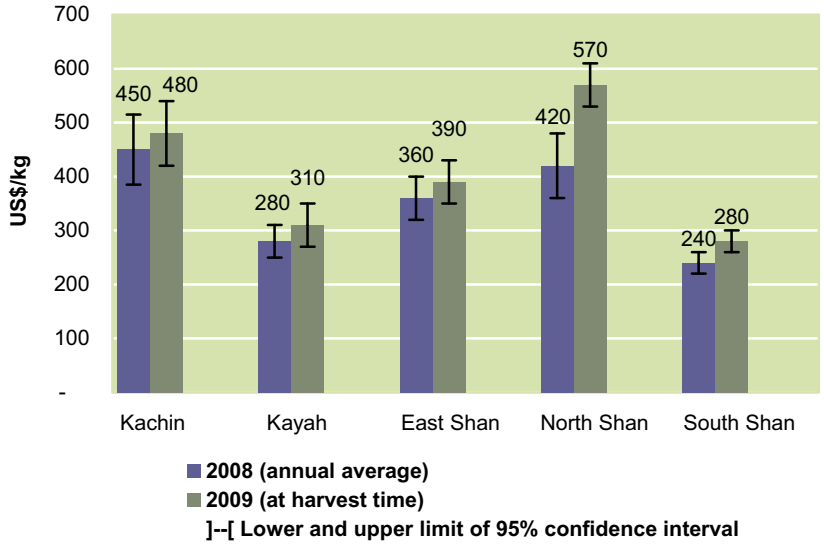
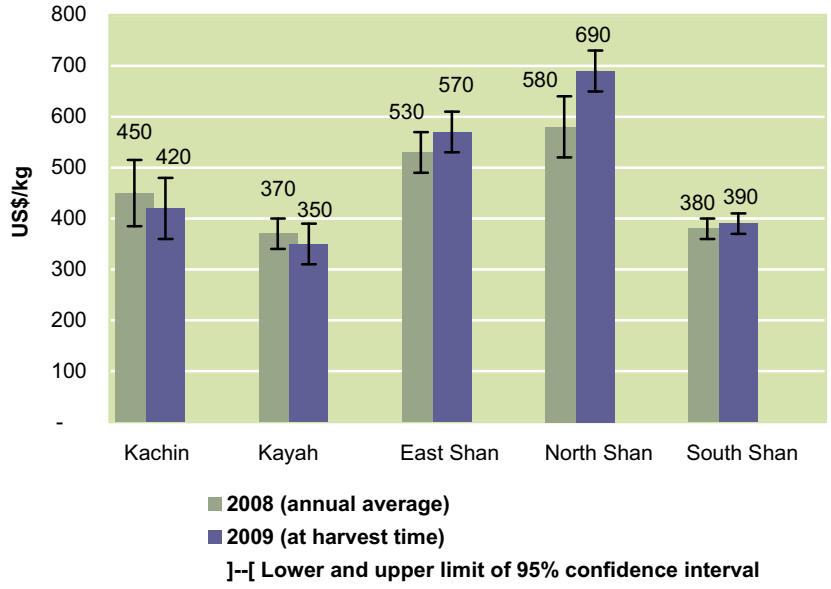
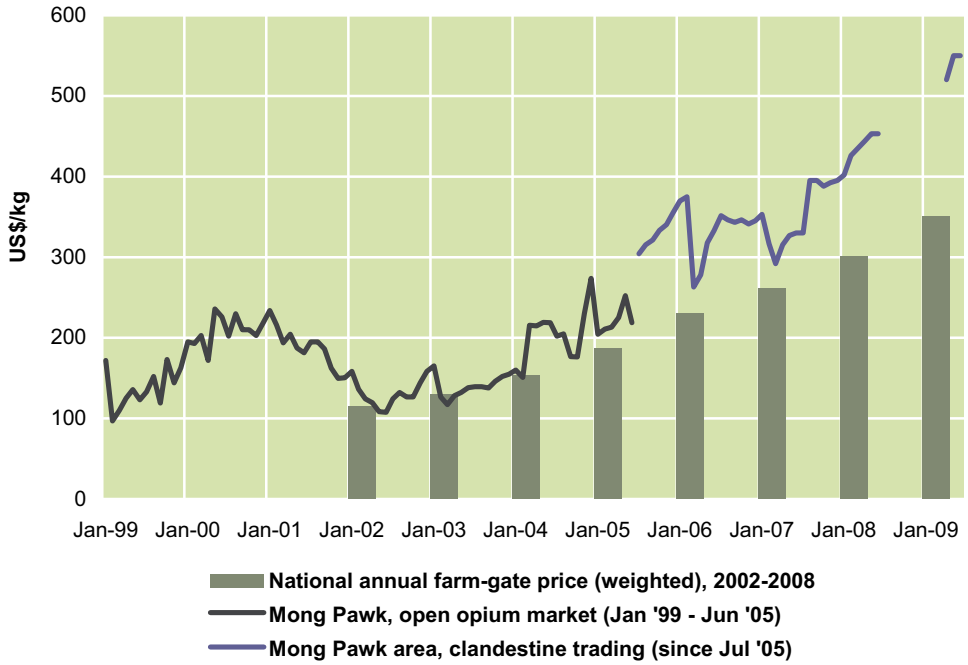


Figure 10: Farm-gate price of dry opium in poppy growing and non growing villages of opium growing risk areas (US$/kg), 2008-2009



One of the best locations to systematically monitor changes in opium prices has proven to be Mong Pawk in the Special Region 2 (Wa) where UNODC – for many years - has been assisting the authorities with an alternative development project. Opium was sold openly and more or less legally in Mong Pawk until June 2005. Despite an effective opium ban in the Special Region 2, which is also adhered to by the farmers, the opium trade as such has not disappeared. Opium continues to be bought and sold in the Wa region - though now illegally. Illegality entails a risk premium. As a consequence, the opium prices in the Wa region are now higher than the national average, and notably higher than prices in the South Shan where opium is still produced in large quantities. Prices in the Wa region are, however, rather similar to opium prices in East Shan, which has close links with the Wa region. In fact, it seems that the Wa region is becoming a platform where opium is bought from various regions in the Shan State to be re-sold abroad for additional profit. One side-effect of this is that trends (as opposed to actual levels) observed in the Wa region are a rather good proxy for trends seen at the national level.

Figure 11: Monthly wholesale prices for dry opium at Mong Pawk, Wa Special region 2, Shan State (US$/kg), January 1999 to September 2009



2.4 Household cash income in opium growing risk areas

Despite a decline in opium production, the average annual cash income of opium producing households saw an increase of 7% from last year and was calculated, on average, at US$ 735 per household (range: $680 to $790), mainly reflecting the rise in the opium prices. Nonetheless, the average annual cash income of non-opium cultivating households, including households that never cultivated and households that stopped opium poppy cultivation, was found to be slightly higher at US$ 745.

Income from opium accounts – on average - for more than a quarter of total cash income among poppy growing farmers. The percentage is higher in Kachin (>40%) and smaller in South Shan (< 15%).

The highest income among growing and non-growing villages was found in Kachin. Like in previous years, data show that in East Shan, North Shan, Kachin and Kayah, the average income of households that never grew opium poppy in risk areas was higher than in villages which grow or used to grow opium poppy. The situation was, however, different in South Shan, the main opium producing region.

Figure 12: Average household cash income (US$/year), 2008- 2009

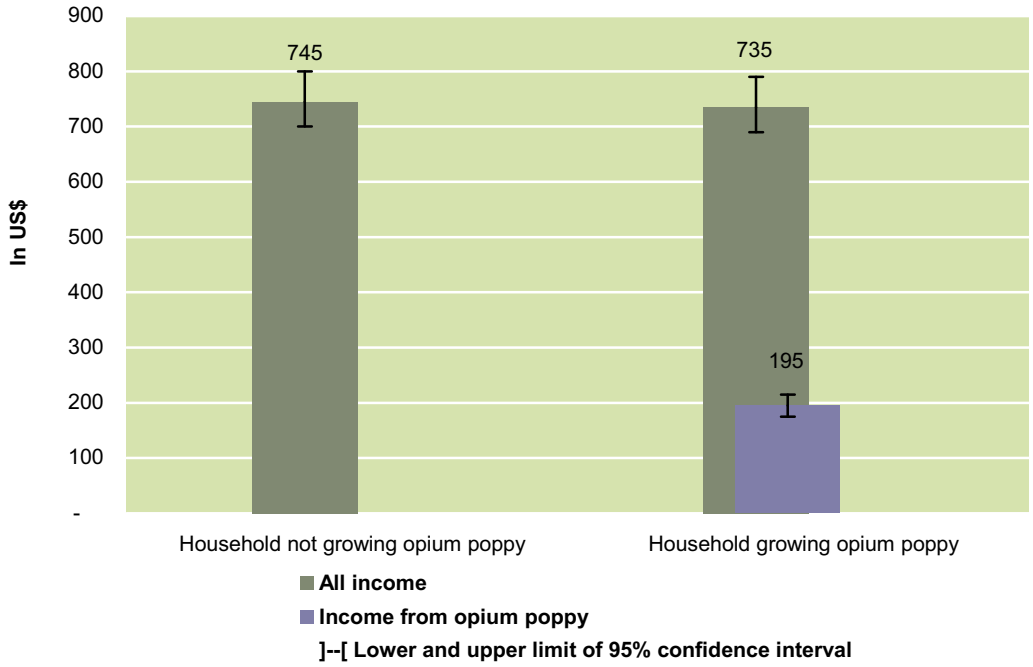
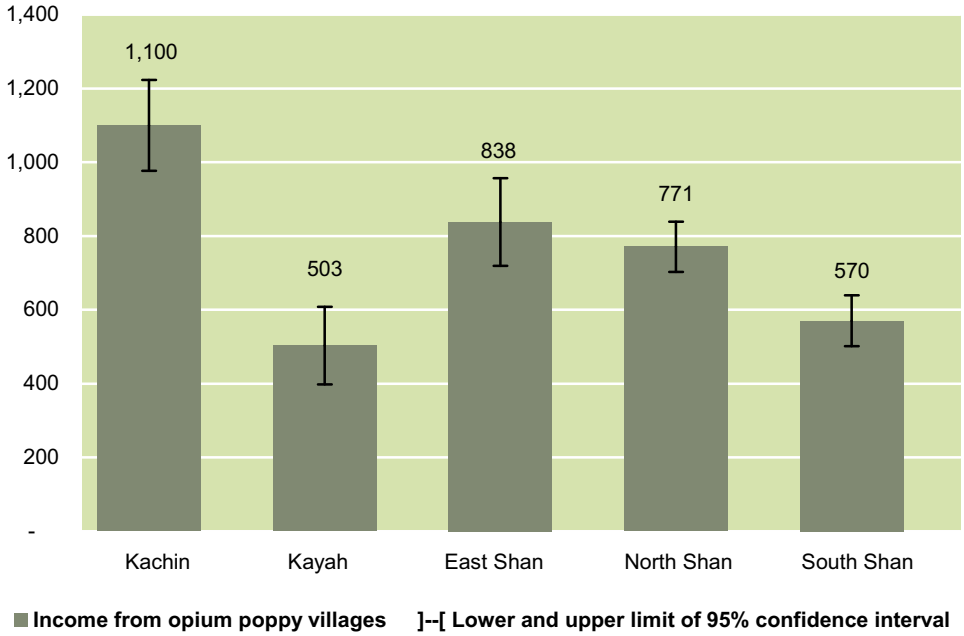


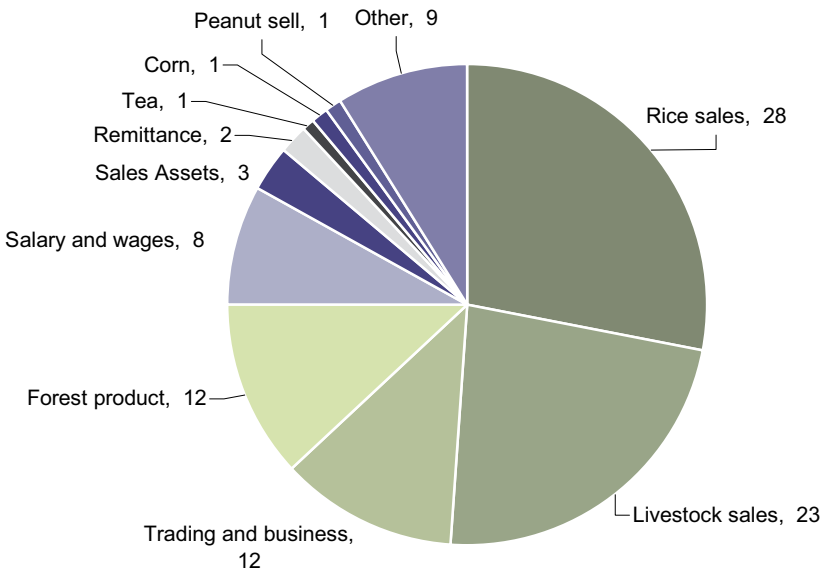
Figure 13: Average household income in non-opium poppy growing villages located in opium growing risk areas (US$/year), 2008-2009



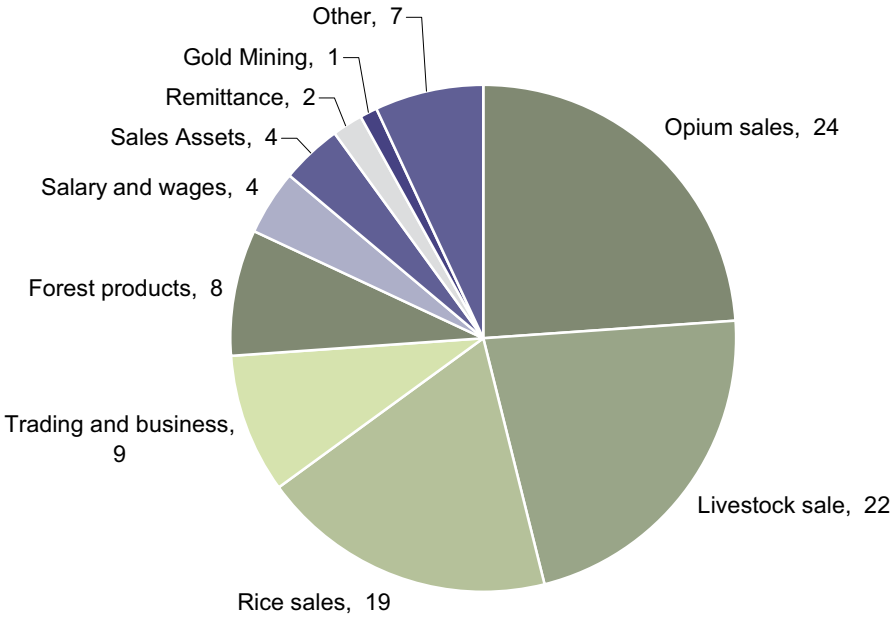
Source of income

An analysis of the different sources of household income shows that rice and livestock sales account for more than 50% of the main source of cash income in non opium poppy growing villages while it is more than 40% in the opium poppy growing villages. Opium sales accounted for almost 24% of household income in opium poppy growing villages. Non-opium growing villages had more rice available for sale, probably due to the availability of paddy land.

Figure 14: Income sources in villages by opium poppy status



Source of income in non-growing poppy villages

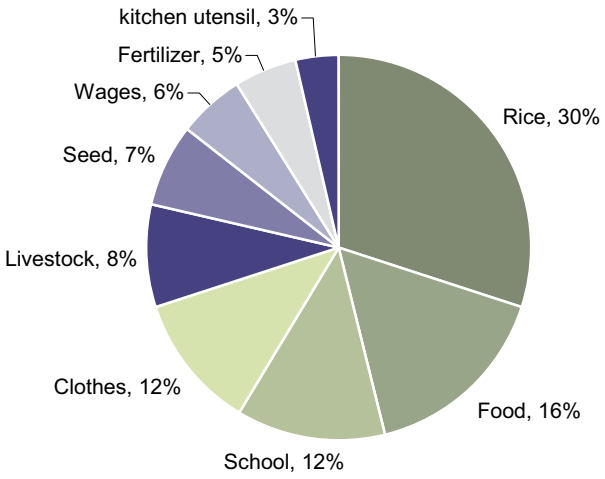


Source of income in growing poppy villages

Distribution of expenditures

A sub-analysis made on information gathered from 97 villages on the different sources of household expenditures showed that rice accounted for 30% of the main sources of expenditure. This percentage is the same regardless of the opium poppy growing status. Other types of food account for 16% of total expenditures. This is followed by clothes and school related expenditures, accounting (each) for 12% of total expenditures.

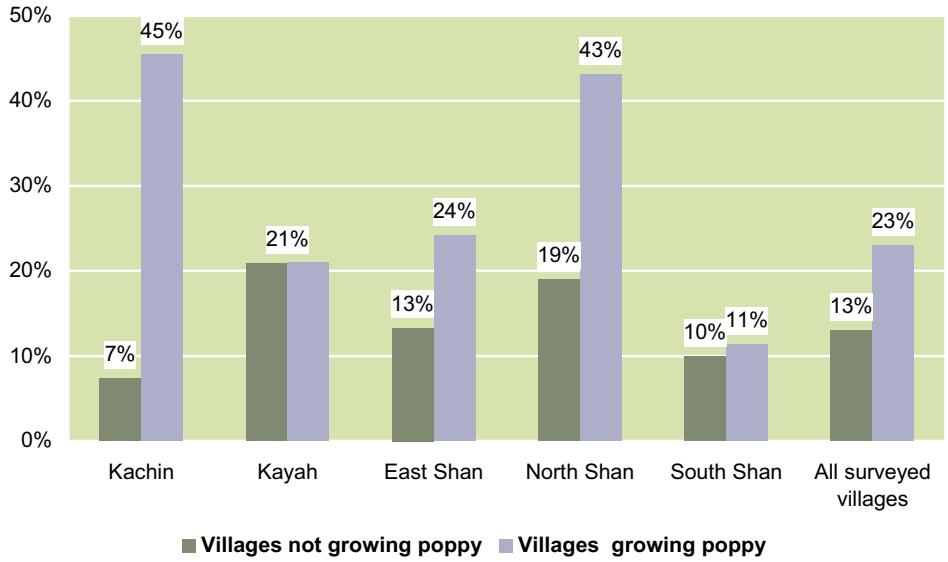
Figure 15: Average distribution of annual household expenditures, 2008 – 2009



Loans

There are more households in debt in opium poppy growing villages than in non-growing villages (23% and 13% respectively) in all opium growing risky areas except for Kayah State (where opium production is limited). A high proportion of indebtedness, exceeding 40% of all households, were reported from Kachin and from the North Shan.

Figure 16: Households with outstanding loans from 2008



2.5 Opium use in opium growing risk areas

Data on opium addiction was collected via interviews with village headmen. The headmen were asked to provide information on the number of drug users in their village. The addicts themselves were not interviewed and no data on their level of consumption was collected. For opium, the number of daily opium users was asked as daily use is considered a sign of opium addiction under local conditions. For other drugs, the number of regular users was asked without further specifying the use frequency.

According to the data reported by the headmen, daily opium use in the Shan State, in Kachin and Kayah affects 0.7% of the population aged 15 years and above. Like in previous years, the prevalence rate was higher in opium growing villages (1.7%) compared to non-growing villages (0.5%). The level of opium use found in North Shan State was the highest (1.9%), followed by the East Shan State (1.2%). Until a few years ago, opium production used to be highest in the North Shan. As in previous years, daily opium use was far more predominant among men (1.4%) than among women (0.1%).

According to the survey data, one out of six daily opium users persons was under treatment. The ratio is better in non-growing villages (4 to 6) than in opium growing villages (8 to 5). Two thirds of the addicted persons are treated in local hospitals; 13% are treated in rural health centres. Traditional healers account for 9%. The relapse rate is, however high (46%). The relapse rate for addicts treated in non-growing villages amounted to 32%, but it rises to 86% in opium poppy growing villages. These results demonstrate how difficult it is to successfully treat opium addicts in villages which still grow opium poppy and where opium is thus more easily available and cheaper than in non-growing villages.

Heroin use affected 0.26% of the population aged 15 and above. Heroin use is thus still less widespread than opium addiction. However, data suggest that heroin use has increased in recent years.

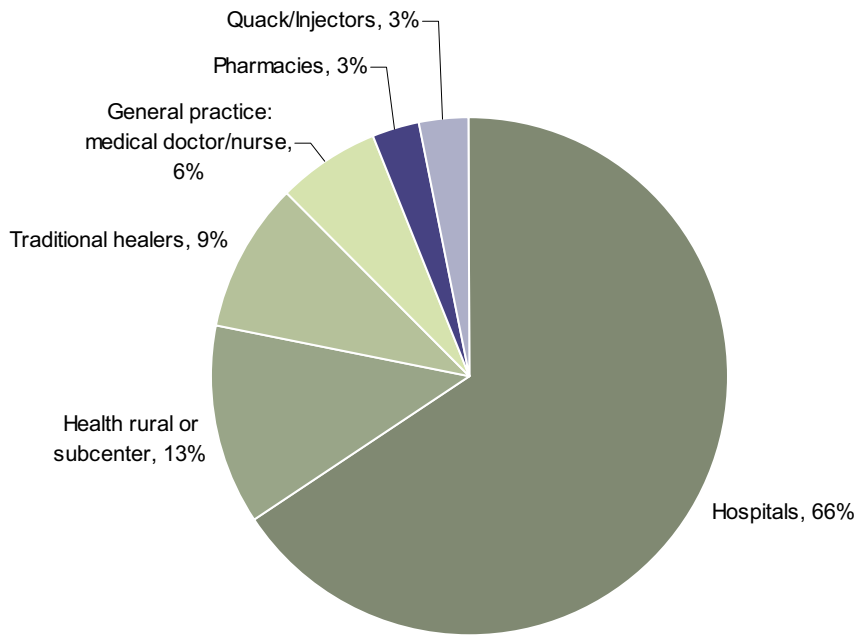
The prevalence rate of ATS users was still very low, affecting just 0.02% of the population in the opium growing risk areas. As noticed in previous surveys, this type of drug use is still at a low level in rural Myanmar. For urban areas other sources indicate far higher rates of abuse.

In general, results on drug use must be interpreted with caution as there might be a reluctance on the part of respondents to report opium, heroin and ATS consumption in the context of the Government's efforts to curb such addiction.

Table 7: Opium, heroin and ATS addiction rates as reported by headmen in 2009 (in percent of the population age 15 and above).

Description	Non-growing	Growing	Total
Opium addiction (men)	1.0%	3.2%	1.4%
Opium addiction (women)	0.01%	0.4%	0.1%
Heroin addiction	0.29%	0.12%	0.26%
ATS addiction	0.02%	0.02%	0.02%
Ratio of treated to untreated addicts	4.60	8.50	5.50
Rate of relapsed addicts	32%	86%	46%

Figure 17: Places where addicted persons were treated



2.6 Socio-economic characteristics of the population living in opium growing risk areas

Food security

Food security (for the purposes of this report defined as 'rice self sufficiency') was slightly better in households that were not involved in opium poppy cultivation than in households which grew opium poppy. In non-poppy growing villages 78% of the households reported to have had sufficient food over the last 12 months; in households growing opium poppy the rate fell to 72%. In other words, 22% of the non-poppy growing households and 28% of the poppy growing households reported a rice (= food) deficit. The difference in food security between opium growing and non-opium growing villages was more pronounced in previous years. The rice (food) deficit among poppy growing villages was most pronounced in Kayah and in East Shan; among non-poppy growing villages it was most pronounced in East Shan, followed by North-Shan.

Table 8: Food security in villages that do not grow opium poppy (in percent of households).

Region	Enough rice for 12 months
Kachin	87%
Kayah	84%
East Shan	60%
North Shan	73%
South Shan	88%
Total	**78%**

Table 9: Food security in villages that grow opium poppy (in percent of households).

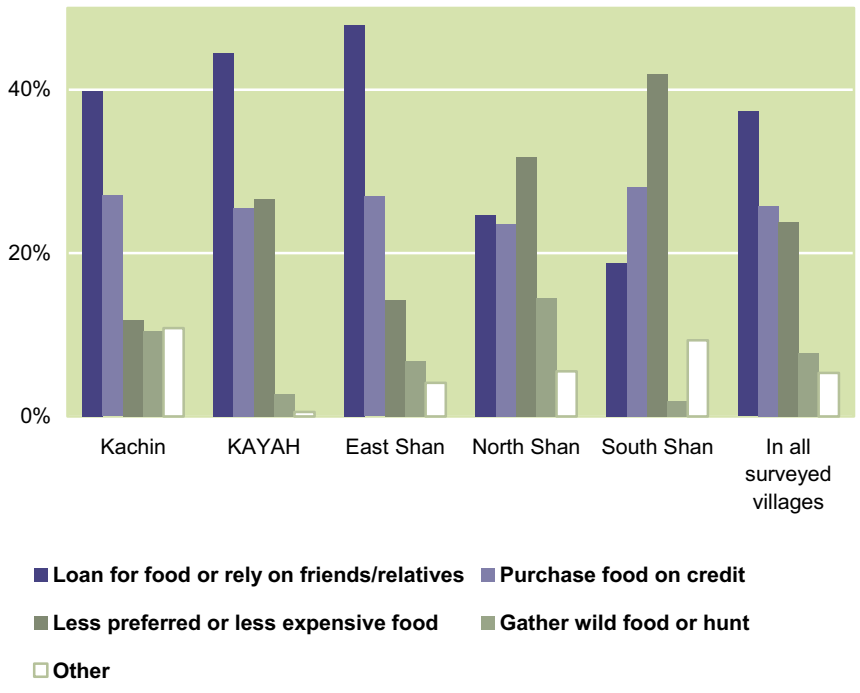
Region	Enough rice for 12 months
Kachin	72%
Kayah	49%
East Shan	53%
North Shan	64%
South Shan	83%
Total	**72%**

Coping strategies after stopping opium poppy cultivation

In villages that stopped opium poppy cultivation in recent years, households expanded their agricultural activities by growing more maize, rice and other licit crops to compensate for the lost income from opium. Wage labour also played a role. But farmers also followed some problematic strategies such as selling their livestock, selling their household assets, taking children out of school, or subscribing loans, all of which indicate a deterioration of the economic situation of individual households and a long-term erosion of its human and economic assets.

The most frequently mentioned coping strategies, across all regions, were: assistance from friends and loans for food. Contrary to previous years, farmers have been more inclined to utilize rice banks to overcome their food deficits. Rice banks are village committees that, on behalf of member farmers, receive paddy or seeds from farmers with surpluses and lend them to needy farmers at an appropriate interest rate. The collected interest is used as a village fund.

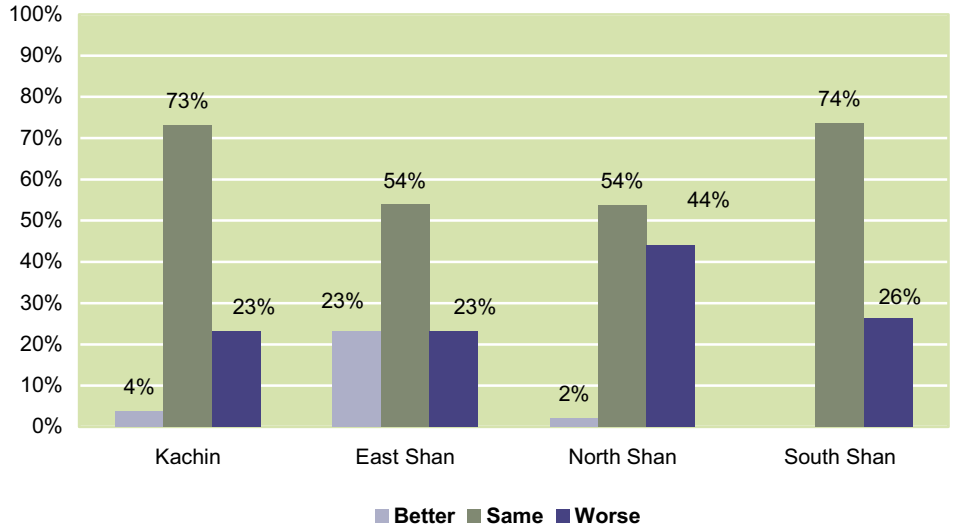
Figure 18: Coping strategies in households that stopped opium poppy cultivation



Food situation after stopping opium poppy cultivation

Among the majority of villages (>50%) that had stopped opium poppy cultivation (mostly in 2006) the food situation remained largely unchanged. In a few villages it improved, mostly in the East Shan (23% of the villages) and to a lesser extent in Kachin (4%) and in the North Shan (2%). At the same time, the food situation deteriorated in 23% of the villages that had stopped growing poppy in the East Shan and in Kachin, in 26% of the villages in the South Shan and in 44% of the villages in the North Shan. This suggests that the overall food situation deteriorated in the Shan State and in Kachin following the end of opium poppy cultivation, even though a majority of villages succeeded to cope with the loss of income from opium.

Figure 19: Change in food situation in villages which stopped opium poppy cultivation



Paddy land availability

Like in previous surveys, households in non-opium poppy growing villages showed a higher ownership of paddy land compared to households in the opium poppy growing villages. In opium poppy growing villages just 32% of the households owned a paddy field while in non-opium poppy growing villages the percentage rose to 43%.

The average size of paddy-land owned by farmers amounted to 2 ha in non-opium poppy growing villages while it amounted to just 0.7 ha in opium poppy growing villages. This reflects again the fact that opium production is concentrated among poorer households and villages in Myanmar. The difference was less pronounced in the Shan State.

Table 10: Percentage of paddy land owners and average area of paddy fields per household and per region in 2009

Region	Non-poppy growing villages		Opium poppy growing villages	
	% of owners of paddy land	Average area of paddy fields in ha owned per 'paddy household'	% of owners of paddy land	Average area of paddy fields in ha per 'paddy household'
Kachin	51%	3.0	34%	1.1
Kayah	43%	1.2	66%	0.5
East Shan	59%	0.8	53%	0.7
North Shan	25%	1.1	25%	1.0
South Shan	27%	0.8	19%	0.8
All surveyed villages	**43%**	**2.0**	**32%**	**0.7**

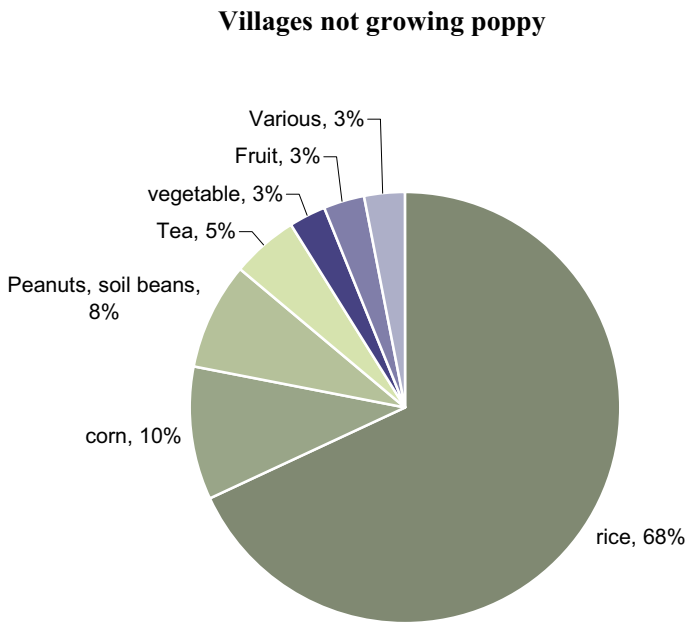
If the total area under cultivation in the villages is divided by the total number of households in the villages (i.e. land owning and non-land-owning households) the average area under cultivation per household amounted to 1.4 hectares in non-poppy growing villages, and is thus twice as high as the average land ownership in opium poppy growing villages (0.7 hectares). The regional variation in the land-ownership seems to be more pronounced in non-poppy growing villages than in opium poppy growing villages. In the case of opium poppy growing villages the regional averages range from 0.6 ha per household in South Shan to 1.0 ha in Kachin and Kayah. In non-poppy growing villages the ranges are from 0.6 ha per household (East Shan and South Shan) to 2 ha (Kachin).

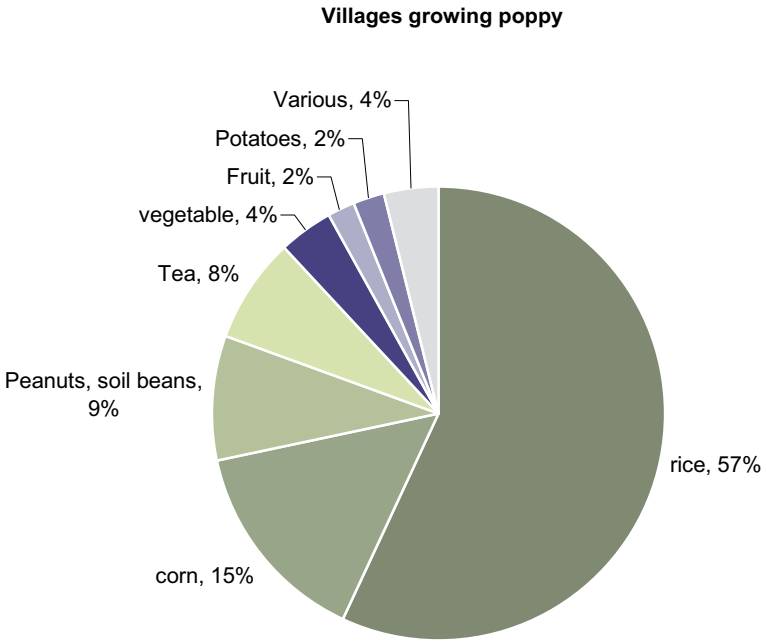
Table 11: Average cultivated land in the village per households in 2009.

	Kachin	Kayah	East Shan	North Shan	South Shan	National average
Not growing poppy	2.0	1.2	0.6	1.3	0.6	1.4
Growing poppy	1.0	1.0	0.8	0.7	0.6	0.7
All surveyed villages	1.9	1.2	0.7	1.2	0.6	1.3

The crops cultivated in the villages were found to be rather similar in villages cultivating and in those not cultivating opium poppy. Rice is – by far - the most important crop, accounting for almost two thirds of all cultivation of crops in the surveyed areas of the Shan State, Kachin and Kayah. In villages that do not grow opium poppy 68% of the crop cultivated was rice; in opium poppy growing villages the proportion of rice amounted to 57% (excluding the agricultural land dedicated to opium poppy). The next main crop cultivated in the villages was corn (10% and 15%, respectively in poppy growing and non-growing villages), followed by peanuts and soil beans (9% and 8%) and by tea (8% and 5%). Other types of cultivation found in the surveyed areas were mainly vegetables (4% and 3%), fruits (2% and 3%) and potatoes (<2%).

Figure 20: Crops grown in the surveyed villages (excluding opium poppy) in 2008-2009





Irrigation

Except for low-land cultivation which receive natural water, land is not very often artificially irrigated in opium growing risk areas. The equipment necessary to irrigate, such as sprinklers, is almost non-existent.

Only 18% of the total land was reported to have been irrigated; 23% of the households reported to have irrigated land. Irrigation is particularly low in Kachin. Just 9% of the land in Kachin is irrigated. In contrast, 41% of the land in East Shan was irrigated.

Opium poppy growing villages have, on average, 21% of the land irrigated, slightly more than non-poppy growing villages (17%). The difference is due to more irrigation of poppy cultivating villages in South Shan and in North Shan. In contrast, opium poppy growing villages are less often irrigated than non-poppy growing villages in East Shan and in Kayah.

Table 12: Percentage of irrigated land per household and region, 2009

	Non-growing villages		Growing villages		All villages	
Region	**% HH having Irrigated land**	**% of Irrigated land**	**% HH having Irrigated land**	**% of Irrigated land**	**% HH having Irrigated land**	**% of Irrigated land**
Kachin	10%	10%	4%	3%	10%	9%
Kayah	38%	38%	64%	32%	39%	38%
East Shan	38%	47%	46%	34%	41%	41%
North Shan	20%	16%	34%	18%	22%	16%
South Shan	29%	16%	17%	20%	23%	17%
All surveyed villages	**22%**	**17%**	**26%**	**21%**	**23%**	**18%**

Cultivation on 'low-land' and on 'high-land'

In general, opium poppy growing villages have a more difficult land to cultivate than non-poppy growing villages. Opium poppy growing villages are more likely to cultivate 'high-land', which results in lower yields, than farmers in non-poppy growing villages where 'low-land' areas with higher yields are more common (see also subsequent sub-chapter on rice yields). Almost half (47%) of the farmers in the poppy growing villages reported to have their land in the 'up-land' and only 26% in the 'low-land'. The opposite pattern is found for non-poppy growing villages. There, 45% of the farmers have their land in the 'low-land' and only 30% in the 'up-land'.

It may be also interesting to note that in the South Shan, which has the highest level of opium production, the least land is available. Just 55% of the farmers in the poppy growing villages of the South Shan reported to have land available for cultivation versus a 76% in the other three states that were investigated (Shan State, Kachin and Kayah).

Table 13: Percentage of households cultivating on "low land" and "high land"

	Non poppy growing villages		Opium poppy Growing villages		Total	
Region	**Low land**	**Upland**	**Low land**	**Upland**	**Low land**	**Upland**
Kachin	54%	12%	34%	44%	53%	15%
Kayah	45%	57%	71%	68%	46%	57%
ES	58%	28%	54%	64%	56%	41%
NS	26%	50%	49%	46%	29%	50%
SS	28%	21%	19%	36%	24%	29%
All surveyed villages	**45%**	**30%**	**26%**	**47%**	**43%**	**33%**

Rice yield on 'low-land' and on 'high-land'

The average rice yield in opium growing risk areas was 2.4 metric tons of rice per hectare of cultivated 'low land' and 1.3 metric tons per hectare of cultivated 'high land'. This average was roughly the same in villages cultivating poppy and villages not cultivating poppy.

Rice yields were highest in the South Shan (2.9 metric tons/ha in the low-land and 1.6 metric tons/ha in the up-land), where there was the highest level of opium poppy cultivation.

Table 14: Average paddy field yield of cultivated rice (kg/ha), 2008-2009

Region	Low land	Up land
In villages not growing poppy		
Kachin	2,700	1,520
Kayah	1,690	1,180
East Shan	2,700	1,520
North Shan	2,080	1,030
South Shan	2,900	1,550
Total in villages not growing poppy	**2,370**	**1,300**
In villages growing poppy		
Kachin	1,590	1,140
Kayah	1,600	1,140
East Shan	2,430	1,780
North Shan	1,650	1,070
South Shan	2,830	1,800
Total in villages growing poppy	**2,220**	**1,540**
Total in all surveyed villages	**2,330**	**1,370**

Use of fertilizers on 'low land' and on 'high-land'

Fertilizers (other than animal manure) in non-poppy growing villages were used more on 'low land'(use by 24% of the households) than on 'high land'(11%). In opium poppy growing villages The use of fertilizers was more widespread on 'high land' (32%) than on 'low land'(18%). Use of fertilizers in opium poppy growing villages is particularly widespread in the South Shan, which – as a result – has also the highest (rice) yields per hectare.

Average households using fertilizers:

Table 15: Percentage of households using fertilizers (other than animal manure)

Region	Non-poppy growing villages		Opium poppy growing villages	
	Upland	Low land	Upland	Low land
Kachin	1%	17%	-	1%
Kayah	28%	35%	23%	69%
East Shan	3%	35%	2%	4%
North Shan	17%	19%	5%	25%
South Shan	9%	26%	31%	20%
All surveyed villages	**11%**	**24%**	**17%**	**18%**

Processing and sale of agricultural products

There is overall not much difference between opium poppy growing and non-growing villages in terms of further processing of their agricultural products to increase the value-added. Just 10% of the farmers in opium poppy growing villages and 9% in non-growing villages reported to be engaged in such activities. An example of processing agricultural products would be processing sugar cane into brown sugar.

The percentages are above average in the South Shan, for both poppy growing (18%) and non-growing villages (19%). An even higher percentage in non-poppy growing villages is encountered in East Shan where 27% of the farmers reported to be engaged in some further processing of their agricultural product. In contrast, just 2% of the famers in poppy growing villages in East Shan have been trying to improve their income through further processing activities.

Households in opium poppy growing villages are less likely to sell licit agricultural products than households in non-poppy growing villages. While 33% of farmers in non-poppy growing villages sell their products on the market, just 23% of farmers in poppy growing villages are in a position to sell their licit agricultural products on the market. Ironically, the highest percentage of farmers (>40%) selling licit agricultural products are found in the South Shan, the main opium producing region. All of this suggests that market access, by itself, is not a protective factor against opium poppy cultivation.

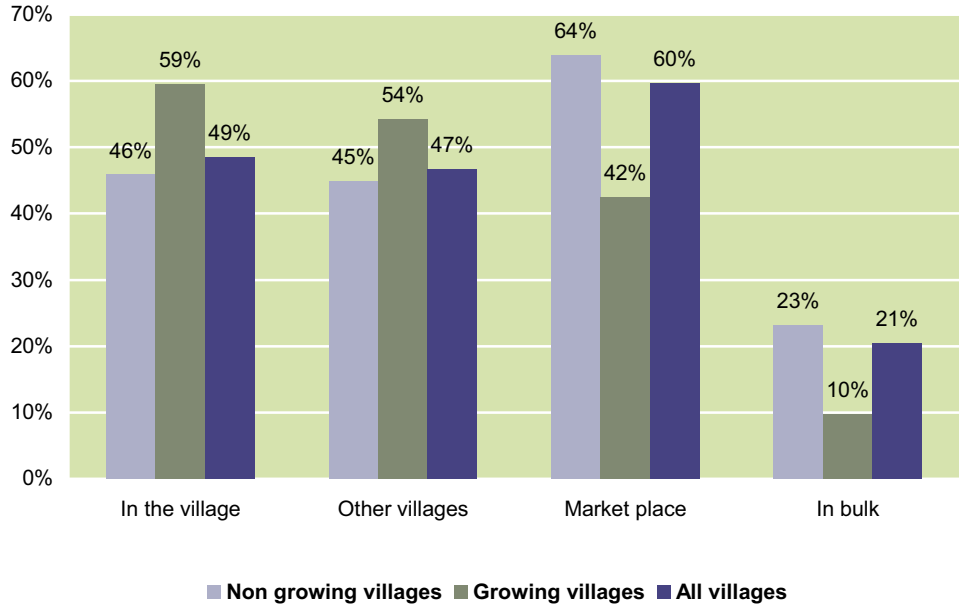
Table 16: Households processing their agricultural products to add value

Region	Process their agricultural product		Agricultural products sold	
	Non-growing	Growing	Non-growing	Growing
Kachin	10%	-	39%	21%
Kayah	5%	10%	25%	31%
East Shan	27%	2%	26%	10%
North Shan	9%	6%	35%	9%
South Shan	19%	18%	44%	46%
All surveyed villages	**9%**	**10%**	**33%**	**23%**

Location of the sale of agricultural products

Agricultural products were mainly sold close to where they grow, either in the same village, in a neighbouring village or in markets within the area. Only small amounts of the products were sold in bulk deliveries to a nearby city. This is mainly due to the lack of an efficient road system. In non-poppy growing villages 33% of the farmers were in a position to sell their products on a nearby market. Market access was far more limited to farmers in opium poppy growing villages. Just 42% of such farmers were in a position to sell their produce on a nearby market. The difference was even more pronounced when it came to bulk sales to a town. While 23% of the farmers in non-poppy growing areas reported such sales (which usually lead to higher levels of income), only 10% of the farmers in poppy growing villages succeeded in selling their produce to customers in a town.

Figure 21: Places where agricultural products were sold



Other activities besides farming

Fish-farming was the most widespread activity outside farming, pursued by more than a quarter of the households in the villages. Fish farming was as widespread in poppy growing as in non-poppy growing villages. In contrast, more coalmen, blacksmiths, wood carvers, brick makers and gold pan makers were found in poppy growing villages while more lime-miners and stone cutters were found in non-poppy growing villages.

Table 17: Other activities and skills in the villages beside farming

Type of activities/skills	Type of village		
	Growing	Not growing	All villages
Fish farming	28%	27%	28%
Coalman	26%	15%	23%
Lime stone miner	15%	20%	16%
Blacksmith and wood carver	10%	4%	9%
Stone cutter	7%	13%	8%
Other activities (brick maker, gold pan maker)	11%	3%	10%

In terms of labour income, 10% of farmers in poppy growing villages and 10% of farmers in non-poppy growing villages reported to derive some or all of their income from wage-earning activities. While in non-poppy growing villages 7% of the children, age 11-15, were de-facto forced to earn wages to bring home some money for the family, the percentage reached 10% in opium poppy growing villages while no such child labour was reported in non-poppy growing villages.

Table 18: People working as a wage-earner.

Region	Kachin	Kayah	East Shan	North Shan	South Shan	All villages in risk areas
In villages not growing poppy						
People working as a wage-earner	11%	8%	10%	17%	5%	10%
Of which children between 11 to 15 years old	4%	11%	11%	6%	11%	7%
Of which people over 15 years old	96%	88%	89%	94%	89%	93%
Number of months they work per year	5	7	4	4	3	5
In villages growing poppy						
People working as a wage-earner	9%	20%	2%	1%	5%	10%
Of which children between 6 to 10 years old	-	-	13%	-	1%	1%
Of which children between 11 to 15 years old	2%	13%	19%	21%	12%	10%
Of which people over 15 years old	98%	87%	68%	79%	86%	88%
Number of months they work per year	2	7	2	6	3	3
In all surveyed villages						
People working as a wage-earner	11%	9%	7%	15%	5%	10%
Of which children between 6 to 10 years old	-	1%	1%	1%	1%	1%
Of which children between 11 to 15 years old	4%	12%	12%	6%	11%	7%
Of which people over 15 years old	96%	88%	87%	93%	88%	93%
Number of months they work per year	5	7	3	4	3	4

School situation in villages

Access to education is a major problem in rural Myanmar. Overall, 35% of the surveyed villages do not have a school in their proximity. The villages growing opium poppy have less schools than villages not growing poppy. While in non-poppy growing villages, 33% of the villages do not have a school, the percentage rises to 43% in opium poppy growing villages. A primary school is found in 58% of the non-poppy growing villages, but only in 50% of the opium poppy producing villages. A secondary school is found in 9% of the non-poppy producing villages and in 7% of the opium poppy producing villages. Lack of education can be a serious impediment for efforts made to promote alternative development in opium poppy producing villages and, in more general terms, to improve the living conditions of the people in rural Myanmar.

Table 19: Percentage of schools in the villages

School situation	Type of school		
	None	Primary	Secondary
In villages not growing poppy			
Kachin	48%	48%	3%
Kayah	19%	66%	15%
East Shan	10%	75%	15%
North Shan	57%	40%	3%
South Shan	39%	58%	3%
Total in villages not growing poppy	**33%**	**58%**	**9%**
In villages growing poppy			
Kachin	61%	35%	4%
Kayah	13%	85%	3%
East Shan	25%	63%	13%
North Shan	53%	37%	11%
South Shan	34%	55%	11%
Total in villages growing poppy	**43%**	**50%**	**7%**
Total in all surveyed villages	**35%**	**56%**	**8%**

Primary school in a village. In spite of the simple building, the education provided in the schools is good.

Migration

During the growing season, people growing poppy tend to leave the village more than people not growing poppy (4 people out of 1000 for villages not growing versus 12 people for villages growing poppy). For a period of less than a year, 8 people against 3 people for villages not

growing and people in villages growing poppy tends to leave the village. For a longer period, people leaving the village in growing areas are twice more as villages not growing poppy.

The villages non growing poppy tend to accept more people than villages growing poppy. 12 people out 1000 went to villages not growing poppy against 4 people out of 1000 went to villages growing poppy. This data shows that villages not growing offer more possibilities to get a better life than poppy growing villages.

Table 20: Out-migration rates in the sampled villages in 2008-2009 (12 months period)

Region	Periods they left		
	During the growing season	For less than one year	For more than one year
In villages not growing poppy			
Kachin	0.6%	1.5%	0.3%
Kayah	0.1%	1.3%	0.5%
East Shan	0.1%	0.2%	0.2%
North Shan	0.7%	0.5%	0.2%
South Shan	0.1%	-	0.3%
Total in villages not growing poppy	**0.4%**	**0.8%**	**0.3%**
In villages growing poppy			
Kachin	4.7%	0.7%	-
Kayah	5.8%	-	0.1%
East Shan	0.1%	0.3%	1.3%
North Shan	0.2%	0.7%	-
South Shan	0.3%	-	0.1%
Total in villages growing poppy	**1.2%**	**0.3%**	**0.6%**
Total in all surveyed villages	**0.6%**	**0.7%**	**0.4%**

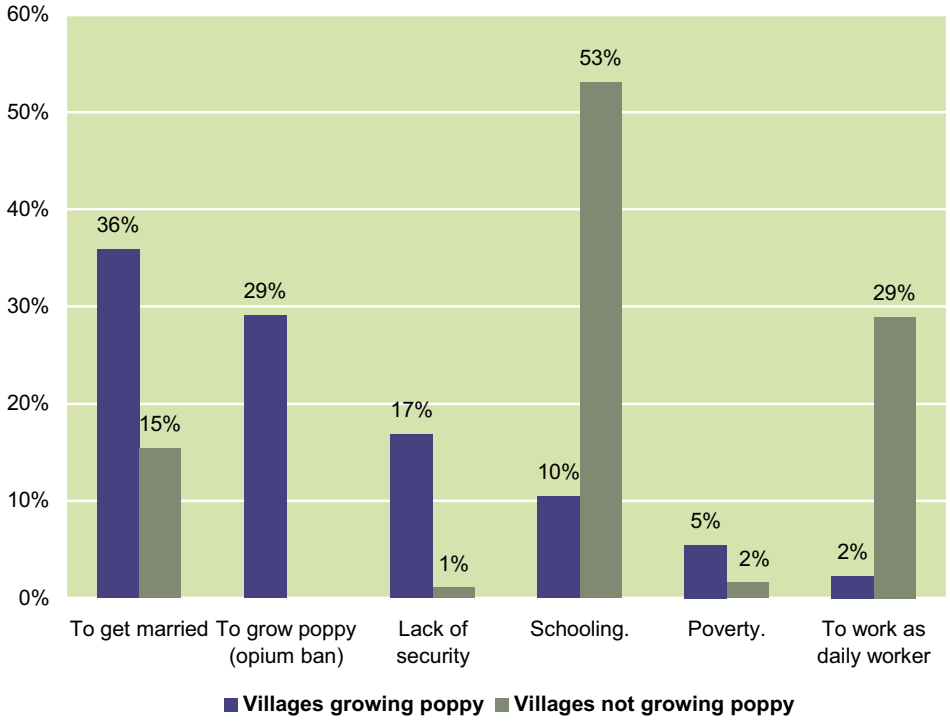
Table 21: Migration rates into the sampled villages in 2008-2009 (12 months period)

Region	Migration rate
In villages not growing poppy	
Kachin	1.9%
Kayah	0.7%
East Shan	0.5%
North Shan	0.8%
South Shan	0.1%
Total in villages not growing poppy	**1.2%**
In villages growing poppy	
Kachin	1.0%
Kayah	0.6%
East Shan	0.7%
North Shan	0.1%
South Shan	0.1%
Total in villages growing poppy	**0.4%**
Total in all surveyed villages	**1.0%**

Reasons for migration into other villages

Schooling was the most important reason for immigrating into a non-poppy growing village (53%). The main reason to emigrate to a poppy growing village was 'to get married' (36%). 'To grow poppy' was the next strongest reason to shift location and emigrate to a poppy growing village (29%).

Figure 22: Reasons for people from other villages to come to the village



Services

18% of the surveyed villages did not have electricity nor any sort of electric appliance such as radio, telephone or television. 34% of the surveyed villages do not have access to any kind of medical or veterinary facilities nor to technical advise in agriculture which can limit the possibilities to increase the yield of licit agricultural products.

Water supply, in contrast, is less of a problem. But modern irrigation system cannot be performed because of a lack of equipment.

Electricity

Electricity in the surveyed areas is still a major problem even though it may be – in principle - available. In the surveyed villages only 19% had access to electricity provided by the Government. Supply of electricity, in general, does not work the whole day. Cuts are common and prevent people to effectively use refrigerators or deep freezers. 35% of the households had access to electricity produced by a hydropower unit. It is usually a small unit producing some kilowatts and installed in the course of a river. It supplies light bulbs for a few households in the village. 28% of the households had access to a gasoline generator. This is, however, rather expensive and loud but it enables farmers to use electric tools.

Table 22: Origin of the electricity in the surveyed villages, 2009

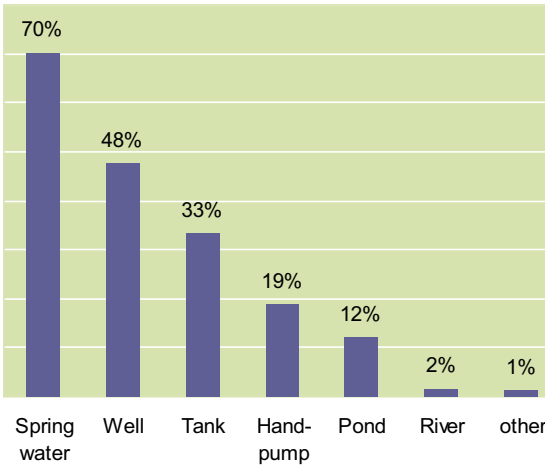
Region	Electricity		
	Provided by the State	Gasoline generator	Hydropower
In all villages (growing and not growing poppy)			
Kachin	20%	37%	27%
Kayah	19%	26%	9%
East Shan	10%	27%	54%
North Shan	19%	20%	43%
South Shan	15%	28%	41%
Total	**19%**	**28%**	**35%**

In the surveyed areas only a few villages have electricity provided by the Government. When the village is crossed by a stream, farmers can buy hydropower system (left) which provides between one to five KW. The price varies from $50 to $200 depending on the power needed and can last up to 5 years if this equipment is well-maintained. Electricity can also be obtained from a gasoline generator whose prices are similar to hydropower but the maintenance is more costly. For both of these systems, the price is in general too high to be afforded by a single household.

Water

Water supply for domestic use, was found good in the surveyed areas. The majority of the water in the village comes from springs (70%) and wells (48%), except for Kachin where the hand pump is more common than in the other regions.

Figure 23: Origin where the potable water is obtained



Drinking water is not reported to be major problem in the surveyed villages.
In some areas, rain water is captured in storage tanks .

Medical services

Only 3% of the villages reported to have access to a hospital and only 17% had access to a dispensary. Some basic medical facilities were available in 40% of the villages. The situation is below average in the South Shan (32% of the villages) and above average in Kachin (51%).

Table 23: Medical, paramedical, and veterinary services as well as agricultural technical advise in the surveyed villages.

Access to services	Kachin	Kayah	East Shan	North Shan	South Shan	National average
Medical and paramedical services						
Mid wife	47%	66%	28%	30%	38%	42%
Medical facility	51%	37%	42%	38%	32%	40%
Dispensary	37%	18%	8%	7%	17%	17%
Doctor visiting the villages	17%	14%	18%	5%	5%	12%
Hospital	5%	4%	3%	2%	2%	3%
Veterinary service	52%	32%	28%	42%	22%	36%
Agricultural technical advise	25%	22%	47%	36%	43%	33%
No services as above	25%	22%	47%	36%	43%	33%

Access to market places

25% of the villages in opium growing risk areas did not have access to market places. This percentage is slightly higher for opium growing villages (28%) than for non-growing villages (24%). 90% of the villages in South Shan State had access to markets. The distance to go the market varies from, on average, 18 km in Kayah to 4 km in Kachin with an overall average of 9 km. This is a rather long distance as farmers have to go by foot to the market. Goods are transported either on the back of an animal or public services are used to transport the good on a trailer by a “tolaji” (motorized cultivator).

Tractors are very rare in the surveyed villages, animals (mainly water buffalos) are used to work in the field. In South Shan States, farmers employ delay laborer to plough the fields. They earn an average of Ks 3,200 per hour (about US$ 32)

The "tolaji" is a versatile vehicle. It transports goods and people and also is used in the fields. Not everyone in the village owns a tolaji but some villages have at least one tolaji which is shared among the villagers. It costs between about US$ 2,000 to US$ 4,000 equivalent

Access to agricultural chemicals and seeds

The use of chemicals fertilizers, herbicides, pesticides and the purchase of seeds is still rare in Myanmar. In villages growing poppy, half of the villages do not have access to any of the above against 26% in villages that do not grow poppy. Access to chemicals and seeds is much lower in villages growing poppy

Table 26: Access to chemical fertilizers, herbicides, pesticides and seed in the surveyed villages

Region	Fertilizers	Herbicides	Pesticides	Seed	Nothing
In villages not growing poppy					
Kachin	56%	48%	60%	68%	26%
Kayah	77%	55%	65%	54%	22%
East Shan	48%	40%	43%	45%	48%
North Shan	72%	55%	58%	69%	25%
South Shan	87%	65%	75%	67%	13%

Tractors are very rare in the surveyed villages, animals (mainly water buffalos) are used to work in the field. In South Shan States, farmers employ delay laborer to plough the fields. They earn an average of Ks 3,200 per hour (about US$ 32)

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Region	Fertilizers	Herbicides	Pesticides	Seed	Nothing
In villages not growing poppy					
Kachin	56%	48%	60%	68%	26%
Kayah	77%	55%	65%	54%	22%
East Shan	48%	40%	43%	45%	48%
North Shan	72%	55%	58%	69%	25%
South Shan	87%	65%	75%	67%	13%

Total in villages not growing	69%	53%	61%	61%	26%
In villages growing poppy					
Kachin	18%	13%	20%	13%	75%
Kayah	70%	30%	40%	40%	30%
East Shan	10%	11%	10%	19%	76%
North Shan	68%	26%	26%	63%	32%
South Shan	94%	62%	72%	65%	5%
Total in villages growing poppy	43%	28%	32%	35%	50%
Total in surveyed villages	62%	47%	54%	55%	32%

Table 27: Average distances and average time to go to the market places in the surveyed villages

Region	Villages not growing poppy		Villages growing poppy	
	Distance in km	Time to go in hour	Distance in km	Time to go in hour
Kachin	4	1:00	3	0:30
Kayah	18	2:20	22	3:40
East Shan	9	2:00	20	2:45
North Shan	8	2:00	9	2:20
South Shan	8	1:15	4	2:00
In surveyed villages	**9**	**1:45**	**14**	**2:20**

Roads

Roads were found very under-developed in the surveyed areas. In 2009, only 14% of the surveyed villages were accessible through a tar road (5% in opium poppy growing villages, 17% in non-opium poppy growing villages). The resulting isolation may help opium poppy growing villages to remain engaged in illicit cultivation.

Table 28: Type of regional road network in the surveyed villages in 2008-2009

Region	Type of roads			
	All weather road	Mud road	Tarmac road	No roads
Kachin	39%	43%	18%	-
Kayah	27%	52%	21%	1%
East Shan	18%	60%	12%	10%
North Shan	15%	57%	19%	3%
South Shan	25%	54%	10%	9%
Total for non growing villages	**25%**	**55%**	**17%**	**4%**
Kachin	23%	67%	5%	5%
Kayah	-	88%	13%	-
East Shan	5%	75%	2%	18%
North Shan	16%	84%	-	-
South Shan	35%	54%	9%	2%
Total for growing villages	**17%**	**69%**	**5%**	**9%**
All surveyed villages	**23%**	**58%**	**14%**	**5%**

Most of the rural roads are not usable during the rainy season and the villagers have a great deal of difficulty to go to the market or to school

Assistance

The proportion of villages that received assistance was about 38% regardless of the status in opium poppy cultivation. The highest proportion of assistance was reported for villages in Kachin. Villages received health assistance, education and rice especially in Kachin and North Shan. Rice was distributed more in villages that cultivate poppy.

Table 29: Percentage of villages that received assistance in 2008-2009

Region	Never received assistance	Received assistance
In villages not growing poppy		
Kachin	41%	59%
Kayah	57%	43%
East Shan	73%	27%
North Shan	69%	31%
South Shan	80%	20%
Total in villages not growing poppy	**62%**	**38%**
In villages growing poppy		
Kachin	15%	85%
Kayah	67%	33%
East Shan	88%	12%
North Shan	74%	26%
South Shan	51%	49%
Total in villages growing poppy	**62%**	**38%**
Total in all surveyed villages	**62%**	**38%**

Table 30: Kind of assistance received in the village in 2008 (n = 360)

Type of assistance	Kachin	Kayah	East Shan	North Shan	South Shan	All surveyed villages
In all surveyed villages						
Health assistance	55%	52%	74%	17%	32%	46%
School	47%	23%	55%	17%	64%	38%
Rice distribution	69%	1%	3%	45%	16%	29%
Road	13%	23%	32%	16%	39%	23%
Water sanitation	29%	20%	11%	17%	27%	22%
Loan	48%	22%	16%	3%	2%	21%
Livestock	25%	16%	-	-	-	11%
Fertilizer	22%	9%	-	-	2%	9%
School nutrition program	2%	6%	16%	6%	4%	6%
Hydropower	1%	1%	5%	6%	20%	5%
Food for work	4%	2%	3%	9%	5%	4%

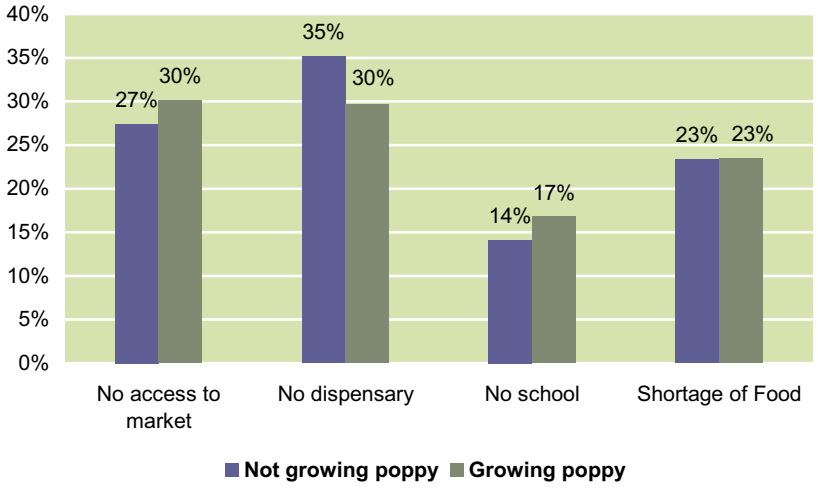
Table 31: Type of assistance received in the villages in 2008-2009

Type of assistance	Villages not growing poppy (n = 271)	Villages growing poppy (n = 89)
Health assistance	48%	40%
School	33%	52%
Rice distribution	23%	46%
Road	20%	31%
Water sanitation	23%	18%
Loan	25%	11%
Livestock	13%	8%
Fertilizer	11%	-
School nutrition program	5%	8%
Hydropower	3%	11%
Food for work	3%	8%

Difficulties faced by the farmers

One of the main difficulties identified by the households in rural Myanmar was the lack of health centers. These difficulties were identified in both villages cultivating or not cultivating opium poppy. The next most importance challenge was the lack of market places where farmers can sell their goods, followed by food shortage. Almost a quarter of the households (23%) in both poppy growing and non-growing villages identified food shortage as a major problem.

Figure 24: Main difficulties faced by the households



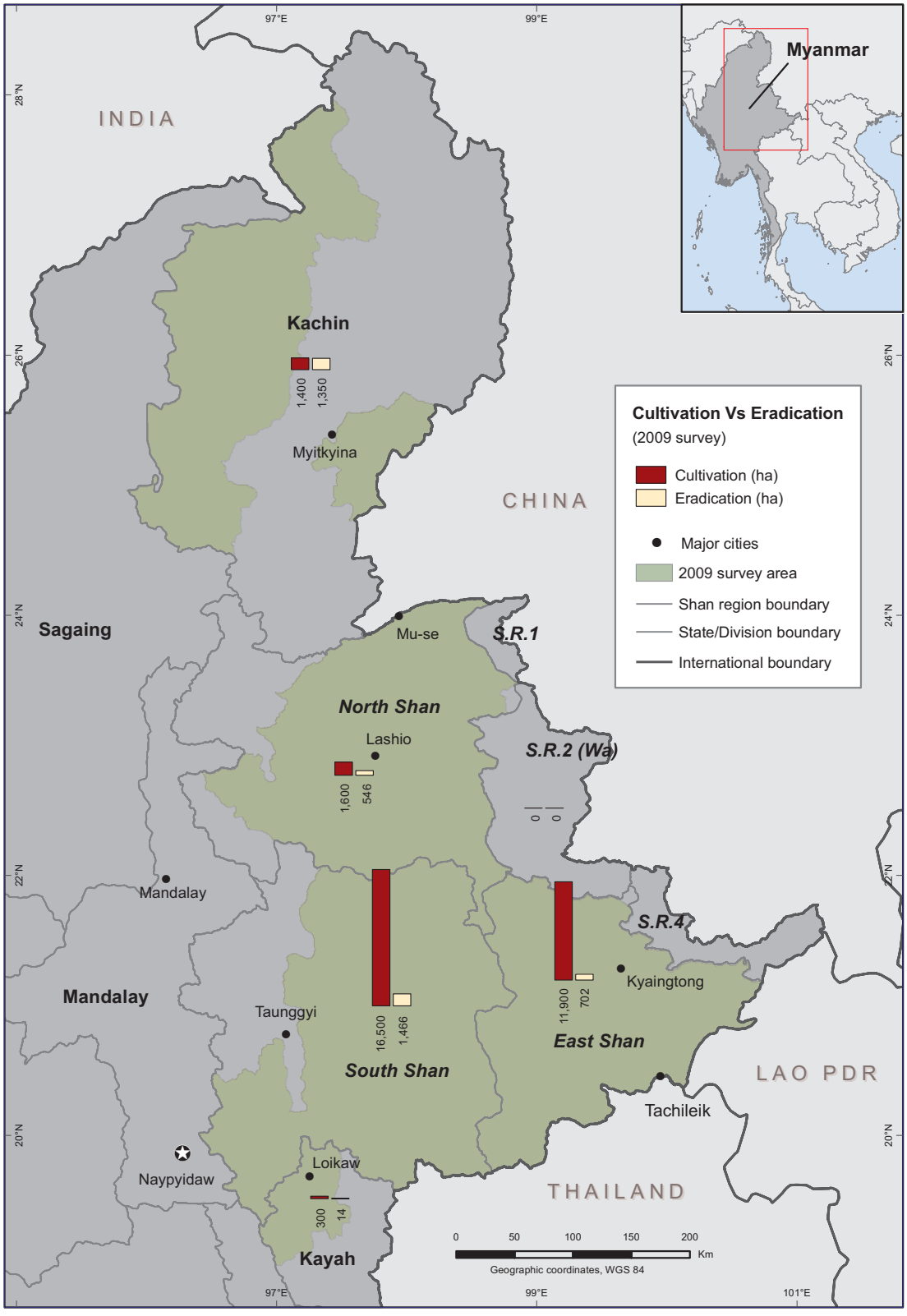
2.7 Reported Eradication

According to the Government of Myanmar, a total of 4,087 ha were eradicated in the 2008-2009 opium season, which signals a decrease of 15% as compared to the eradication in 2007-2008 when 4,820 hectares were eradicated. Most of the eradication continued to take place in the Shan State (66% of the total), notably in South Shan. Nonetheless, eradication decreased by 31% in the Shan State compared to a year earlier. Eradication amounted to 11% of the area under poppy cultivation (prior to eradication) in 2009 which was still a far higher proportion than in Afghanistan (4%).

Table 32: Eradication by region (in ha) from 2004 to 2009

Region	2004	2005	2006	2007	2008	2009
East Shan	195	124	32	1,101	1,249	702
North Shan	172	1,211	76	916	932	546
South Shan	2,170	1,203	3,175	1,316	1,748	1,466
Shan State Total	**2,537**	**2,538**	**3,283**	**3,333**	**3,929**	**2,714**
Kachin	126	1,341	678	189	790	1,350
Kayah	83	8	0	12	12	14
Total within the surveyed area	**2,746**	**3,887**	**3,961**	**3,534**	**4,731**	**4,078**
Magwe	0	0	0	45	0	1
Chin	0	3	0	10	86	5
Mandalay	0	0	9	0	3	2
Sagaing	74	17	0	9	0	1
Other States	74	20	9	64	0	0
All surveyed villages	**2,820**	**3,907**	**3,970**	**3,598**	**4,820**	**4,087**

Figure 25: Opium cultivation area vs. areas eradicated by region in 2009



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

Similar to previous years, survey teams observed the re-growth of opium poppy plants in previously eradicated fields. This indicates that farmers might have practiced multistage

cultivation or even replanted their fields after eradication. Those fields were, however, much less productive compared to non-eradicated fields.

Replanted poppy fields in Waingmaw

Some fields were re-planted after eradication in Sadone area in Waing Maw Township. Farmers used plastic sheets to cover the fields from heavy dews and used sprinklers for irrigation. After this treatment plants were more vigorous.

Eradication in Myanmar must be also seen in a broader political context. Under the cease-fire agreements, ethnic groups have a certain degree of autonomy and self governance. In the main opium poppy cultivation areas in South Shan, the Government was able to assert a certain degree of control, and some local authorities agreed to phase out opium poppy cultivation, such as the Paoh National Organization. However in most of the areas under poppy cultivation, no alternative sources of income were made available by the local authorities or the international community.

3 METHODOLOGY

3.1 Description

This is the seventh year the Central Committee for Drug Abuse Control (CCDAC) of the Union of Myanmar collaborates with the United Nations Office on Drugs and Crime to implement the annual Myanmar Opium Survey.

The pattern of opium poppy cultivation continued to change in Myanmar: Some areas became opium free while some others increased their level of cultivation. In South Shan State, the opium poppy crop calendar changed and new patterns such as multi-cropping were observed. Opium fields generally moved further away from the villages and, in certain regions, were subject to eradication. In addition, cultivation possibly shifted to areas already considered opium free or to climatically less favourable regions. In 2008, all these considerations, combined with reduced accessibility and the expected change in cropping pattern, influenced the survey methodology and the sampling procedure for the estimation of the planted area and other socio-economic indicators.

Considerable efforts have been made over the last two years to improve various methodological details and to adapt to the evolving conditions of cultivation. This survey integrated the ground data collection component and combined the use of satellite remote sensing with field surveys and interviews.

The 2009 opium poppy survey was composed of three parallel components:

1. A cultivation estimation survey throughout the three regions of the Shan State (North, South, East), the Kayah State and the Kachin State. The survey was based on the use of satellite remote sensing as the primary source of data for East and South Shan State. In these two regions, satellite remote sensing was supplemented by field surveys to provide ground truthing and to support the interpretation of opium poppy fields. In the remaining regions, the estimate of the planted area was derived from the socio-economic survey described below;

2. An opium yield survey in the three regions of Shan State, and Kachin;
3. A socio-economic survey in 1,000 villages randomly selected in Shan State, Kayah State, and Kachin State based on interviews with village headmen and other people who play an independent role in the life of the villages.
4. Rapid assessment survey.

Sampling procedure for village survey

The planning of the surveys started with the definition of the sampling frame. The sampling frame is composed of the complete village listing provided by the Central Committee for Drug Abuse Control in Myanmar. The village listing includes names of villages, regions, township names and codes, village tract codes and, in some cases, opium poppy growing history. This listing is regularly updated with information obtained through previous surveys to reflect changes in village location or name, village mergers and relocations, and to delete double entries. For many village entries, GPS positions have been added, which facilitates the unique identification of each village. The more information is available about the population, the easier it is to devise a sample that will lead to more accurate estimates.

The definition of the sample size was influenced by a number of requirements and constraints. The main requirement was the level of accuracy considered acceptable for the estimates, whereas the constraints were either economical or logistical.

It was agreed that the socio-economic survey would be conducted with a sample size of 1,000 villages. This is approximately 7% of the 13,049 villages listed by the General Administrative Department. The village database may not be as accurate as desired despite efforts to update it. Thus, a contingency plan was developed at the time of the sample selection. Additional names of villages were selected and added to the list. Nonetheless, the sample size had to be reduced as in

several cases neither the originally sampled villages nor the replacement villages could be identified on the ground. The stratification structure of sample, however, was kept intact.

A total of 700 villages in the Shan State, 100 villages in Kayah State and 200 villages in Kachin State were selected, out of which 931 villages could be surveyed.

Table 33: Composition of the sample of the village survey

Particulars	North Shan	South Shan	East Shan	Kayah	Kachin	Total
Projected number of villages to be surveyed	200	200	200	200	200	1,000
Actual number of villages surveyed	198	170	193	198	191	950

The ethnic composition of the regions of the Shan State is possibly the most diversified in the whole of the Union of Myanmar. The sampling of this year reflects major ethnic groups present in each surveyed region.

During the socio economic survey interview, the surveyors gather the headman of the village together with a group of people representative of the village

3.2 Survey Organization

The surveys were coordinated by the UNODC/ICMP office in Yangon and, as in previous years, operationally implemented in close collaboration with Myanmar official institutions.

The ground survey to measure opium yield and socio-economic indicators were supervised and implemented by CCDAC, while UNODC/ICMP provided technical support, coordination and supervision with national and international staff throughout the survey. The rapid assessment survey, as well as the assessment of opium ban in Shan Special Region 2 (Wa), was implemented directly by UNODC/ICMP in close collaboration with CCDAC and Wa local authorities that participated in the field supervision. The other rapid assessment surveys in Shan Special Region 1 (Kokang), Shan Special Region 4 and Chin State were carried out by UNODC/ICMP. A similar rapid survey was programmed for Sagaing but could not be implemented after access to the field had been denied.

The area estimation was conducted in collaboration with the Remote Sensing and GIS Section of the Forest Department, Ministry of Forestry. Three teams, each comprising of two surveyors from the Remote Sensing and GIS Section, visited the field with printouts of the satellite images. Once they reached the area represented in each single scene, they annotated the print with the land use classes and relative boundaries proceeding along with specific transect itineraries. Back in the office, the ground truth data were used to classify the satellite images combining digital and visual interpretations. The results were subject to quality control by an international remote sensing expert at UNODC Headquarters.

3.3 Field Operations

Field operations for the village survey started in the first week of December 2008 and continued until mid-February 2009 for Shan and Kayah States and up to March 2009 for Kachin State. Only 5% of the villages could not be visited by field surveyors.

All 40 satellite image locations ground truth data were collected. For the village and field surveys, 168 surveyors carried out the field work from 21 December 2008 to mid-February 2009. In Kachin State where opium is harvested later, the date was extended up to the end of March 2008. The surveyors were organized in 56 teams (14 teams for North Shan, 16 teams for South Shan, 12 teams for East Shan, 6 teams for Kayah State and, 8 teams for Kachin State). In each team, there was one surveyor from the Myanmar Police Force, one from the General Administrative Department and one from the Settlement and Land Records Department or the Myanmar Agriculture Service from each township. Work was coordinated by a head supervisor and three regional national supervisors. Additionally, one UNODC international officer monitored the entire field work. The survey teams were all involved in interviews with the village headmen and heads of households, as well as in field measurements for the collection of yield estimation variables.

Three survey teams were assigned to each of the three townships with a heavier workload (Pinlaung in South Shan State, Kyaingtong in East Shan State and Waingmaw in Kachin State), and two teams were assigned to another eight townships (Demosso in Kayah State, Lashio, Tant Yang and Thibaw in North Shan State, Mongpyin and Metmang in East Shan State and Putao and Moenyin in Kachin). One survey team was assigned to each of the sub-townships such as, Naungtayar and Pinlon in South Shan State, Tarmonyae in North Shan State, Mongkoe in East Shan State.

The field work survey started on 15 December 2008 in South Shan and Kayah States with all 22 teams and finished on 15 February 2008. 12 teams in East Shan State started working on 1 January 2009 and finished field work on 15 February 2009. Likewise, 14 teams in North Shan State started working on 21 December 2008 and finished on 15 February 2009. The teams in Kachin State (6 teams) started survey work on 21 February 2009 and continued until 31 March 2009. The supervision teams met with all the teams during the field survey to assess

the progress of the survey and ensure quality control. The duration of the main ground survey was 8 weeks, and operations were wrapped up with a debriefing by the end of March 2009.

As the majority of opium gum collection takes place between early September and late December, it was of vital importance that surveyors commence their work as early as possible, in order for them not to miss the opportunity to measure the opium poppy capsules.

For the third time a limited survey in two townships in South Shan State was conducted from early September until early third week of September prior to the normal season's ground survey in order to study the extent of off-season opium cultivation and to get information on poppy cultivation for the next season.

Table 34: Socio economic survey fact for the 2009 opium poppy survey

	North Shan	South Shan	East Shan	Kayah	Kachin	Total
Start Date	21-Dec 2008	15-Dec 2008	01-Jan 2009	15-Dec 2008	21-Feb 2009	15-Dec 2008
End Date	15-Feb 2009	15-Feb 2009	15-Feb 2009	15-Feb 2009	31-Mar 2009	31-Mar 2009
Survey Teams	14	16	12	6	8	56
Targeted Village Tracts	174	113	87	53	93	516
Surveyed Village Tracts	173	106	87	49	93	507
% of Village Tracts	99%	94%	100%	92%	100%	98%
Targeted Villages	200	200	200	200	200	1000
Surveyed Villages	198	170	193	198	191	950
% of Villages	99%	85%	97%	96%	99%	95%
Households covered	10288	13054	7085	14086	26668	71181
% of Households	2%	3%	4%	22%	10%	5%
Population covered	54109	68695	39581	75342	157867	395594
% of Population	3%	3%	4%	22%	10%	5%

3.4 Area estimation procedures

In 2009, for the first time, North Shan was added to the area where the poppy cultivation area estimate is performed with remote sensing techniques. In this region and in the South and East Shan very high-resolution satellite images were purchased after a random selection throughout the study area.

At 40 selected locations, Ikonos images with 4-meter resolution (4 bands) were acquired. The number of images was defined by the availability of the budget, but for 2009 this was the highest number of sample locations of the last 4 surveys. For every location, images at two different dates were purchased with a 5 weeks interval (December/January and February/March). Two date images facilitate the identification of the opium poppy, taking into account the different crop calendars for every region obtained from the former surveys.

The two other regions, Kayah and Kachin required a different approach, as their level of opium poppy cultivation is much lower. In Kayah the area estimate was done on the base of a village survey. In Kachin, the area estimate was partly based on the village sample survey and partly on an additional medium-high resolution image in one township (Tanai) in Kachin. In Tanai township the opium poppy cultivation was concentrated in one region that could be measured on a SPOT5 satellite image.

Sampling frame for the selection of satellite image locations

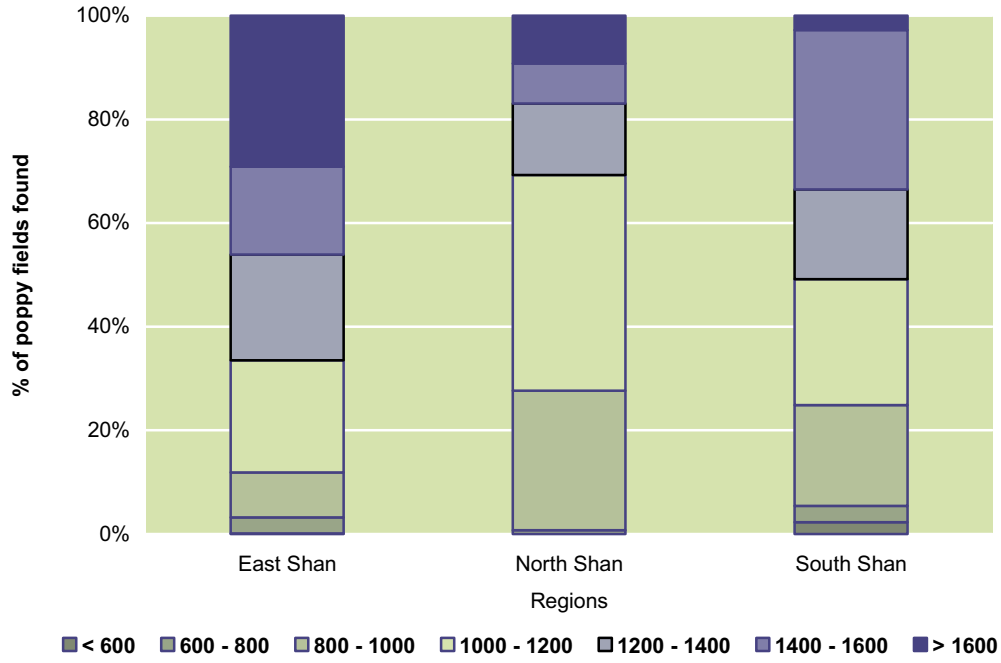
To select the sample locations of the satellite images, the sampling frame of last year's survey was improved and adjusted with new information. The sampling frame was developed by the combination of the following factors:

- Land cover map
- Altitude/slope
- Opium poppy free areas according to ground information.

The *land cover map* was developed by classifying 6 Landsat-5 satellite images taken in February/March 2005. From this map, the large agricultural areas were extracted and considered as poppy free, since the cultivation of opium poppy is practised in small agricultural areas, often surrounded by natural vegetation. Wetlands and settlements were also excluded. The other land use classes were considered as potential for opium poppy growing. The land cover map is still valid to be used for this survey since only the class with large agricultural areas were used.

Altitude was taken as a factor since former surveys had revealed that 95% of the opium poppy was cultivated at altitudes between 800-1800 meters. However, for East Shan the lower altitude was adjusted to 600 meters based upon the former survey. Some large, flat areas were excluded, since the accessibility of these areas is very high, with very low chance to find poppy cultivation.

Table 35: Altitude ranges (meters) of the opium poppy fields found in the satellite images 2009



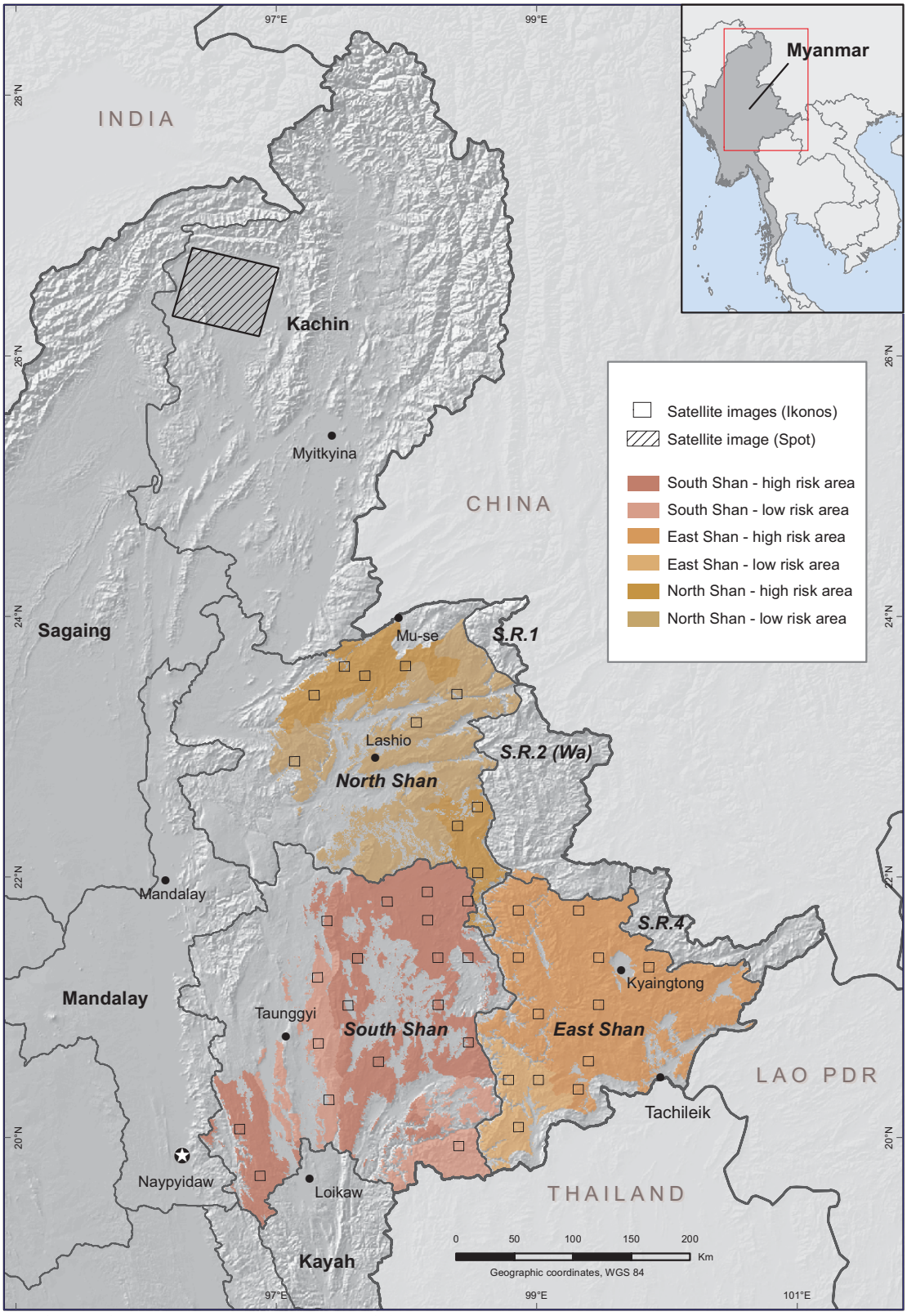
From information on the ground, several *opium poppy free areas* were identified: Special Region 4 and the townships Maingyang, Kalaw, Pindaya, Taunggyi and Ywangan as well as a 10-km buffer zone along the border with Thailand. These areas were excluded from the sampling frame.

These factors were combined in a Geographic Information System to calculate the sampling frame. North, East and South Shan were analyzed separately. Every region the area to be surveyed was stratified into two risk classes (high/low), based upon ground information on differences in the intensity of opium poppy cultivation.

A grid with 8 by 8 kilometer cells was put on top of this sampling frame to select the image locations. Half of the locations that were sampled last year were selected again, if they matched

the selection criteria. For North Shan, all locations were new since there was not a satellite survey in the former surveys. The rest of the images were selected randomly systematic within the sampling area, i.e. within determined clusters a random selection was made. In total, 45 locations were selected but only 40 images were successfully acquired for both dates.

Map 3: Sampling frame area and satellite image locations in Myanmar, 2009



Source: Government of Myanmar - National monitoring system supported by UNODC
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

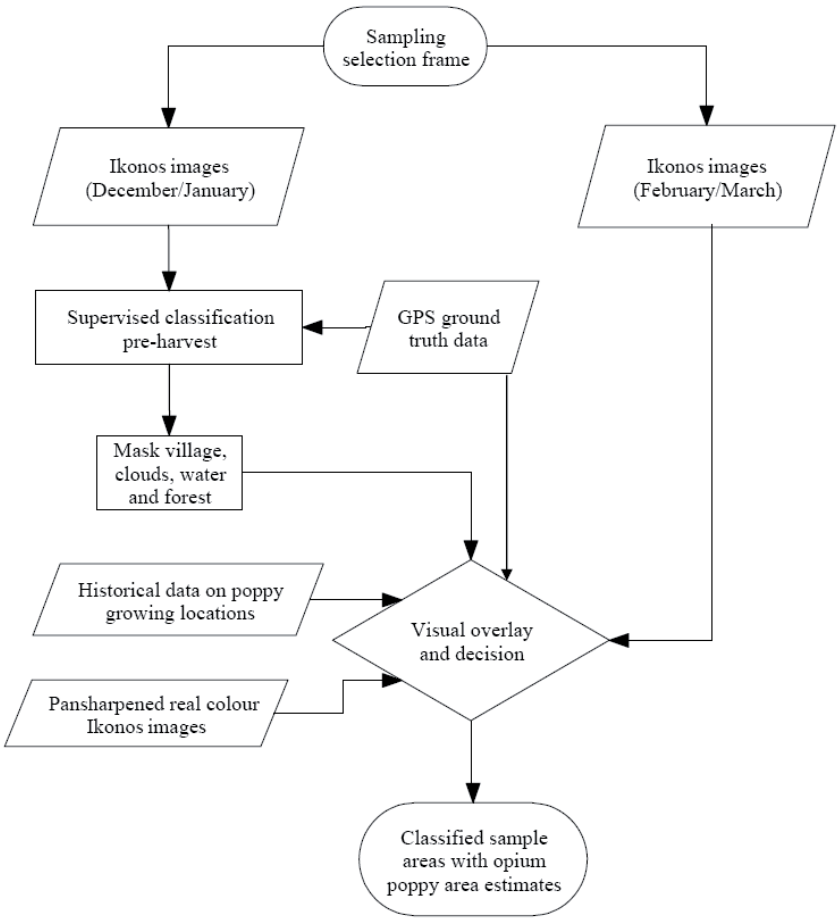
Table 36: Sampling frame area for the North, South and East Shan

Region	Strata	Area (km²)	% of total area
South Shan	High risk	19,311	13
	Low risk	7,384	5
East Shan	High risk	3,550	2
	Low risk	22,323	16
North Shan	High risk	7,467	5
	Low risk	14,070	10
North, South and East Shan	Opium poppy free	69,683	48
Total		143,787	100

Processing of the satellite images

The classification procedure of the Ikonos images is illustrated in the following flow chart.

Flow chart of the satellite images processing steps in North, South and East Shan



The satellite images were classified with the ground truth data collected by the ground control teams. For the first collected images, supervised classifications with maximum likelihood rules were applied to obtain maps that identified different land cover classes as forest, scrubs, grass, agricultural land and possible poppy areas. The second collection images were used to observe changes in the possible poppy areas. If there was an apparent change which corresponds to the harvesting of the poppy, it was used to confirm that the field was indeed a poppy field. This was done in a visual manner, since the images were not geometrically corrected and automation was

not possible due to the displacements of the fields. The rules can vary by region and stage of the poppy crop, however the most commonly applied rule was that potential poppy in the first classification, classified as bare soil in the second classification means that it was opium poppy. Historical data on poppy cultivation and real colour, pansharpened (very high resolution images) visualization was used to facilitate the decision making.

Area estimation formulae for satellite imagery

North, East Shan State and South Shan State

A ratio estimate approach was used in order to provide the most accurate approximation of the extent of the opium poppy cultivation in North, East Shan State and South Shan State.

The estimation of opium poppy cultivation for each segment has been calculated as follows:

$$\bar{p} = \sum_{1}^{40} x/G$$

where
P = Proportion of poppy cultivation in selected area
x = Total opium poppy identified in each segment
G = Total agricultural area in each segment

Estimation of the total opium poppy cultivation:

$$X = \sum_{1}^{6} p^{*} N_A$$

where
X = Total opium poppy in Shan state
P = Average extent of poppy cultivation in selected area
N_A = *Sampling Frame in region*

The above estimation was later refined by the bootstrap method with 10,000 iterations. Bootstrapping is recommended when the sample observations have different sizes, which was the case during this survey.

Bootstrapping consists of sampling with replacement from the original sample with multiple iterations, composed in this case of the total poppy areas of the selected segments. After each iteration, a mean value is estimated and scored. At the end, a distribution of means can be observed, producing a mean estimate and a confidence interval for the mean. Bootstrap with 10,000 iterations revealed that there was a 95% probability that the extent of the opium poppy cultivation estimated from satellite images for the East Shan State ranged from 8,100 hectares to 15,000 hectares with a mean estimate of 11,900 hectares. The 95% bootstrap confidence interval for South Shan State ranged from 10,900 hectares to 22,600 hectares with a mean estimate of 16,500 hectares. North Shan gives an estimate between 390 and 2,900 hectares with an average of 1,600 hectares.

Area estimation formulae for Village Ground Survey Data

Kachin State, and Kayah State

During the village ground survey, information on the number of households involved in opium cultivation, total number of households and average size of cultivated poppy fields were collected for each selected village. Estimates of areas under opium poppy cultivation were derived and extrapolated to the sampling frame in the Kachin State and the Kayah Satate. For Kachin state this was only done for Waingmaw township, whereas the other growing township was covered with a medium-high resolution (SPOT5) image. In the image area 540 hectares of poppy was found. The estimates in Kayah for 2008 and 2009 are not directly comparable due to a change in methodology.

Area estimates of 2009 were calculated using the following formula:

T= Total number of households growing poppy in the sample

n= Sample size, number of villages

$\overline{X}_{Hh}$ *= T/n= Average number of households growing poppy per village*

Ns= Total number of villages in the sampling frame

Kh= Average size of opium poppy fields

c = 2.9 = Correction factor for underreporting of poppy area compared to satellite images in South and East Shan

$A = \sum Ns * X_{Hh} * k_h * c$ *= Total area under opium poppy cultivation*

The confidence intervals were calculated using the bootstrap method with 10,000 iterations. The 2009 area estimates and confidence intervals for Myanmar are presented in the table below. It has to be noted that upper and lower estimates do not lie symmetrically between the mean estimates because of the different statistical tools used to arrive at the most robust regional estimates.

Table 37: Area estimates with 95% confidence interval (in ha), 2009.

Region	Area estimate	Lowest estimate	Upper estimate
East Shan State	11,900	8,100	15,000
North Shan State	1,600	390	2,900
South Shan State	16,500	10,900	22,600
Kachin	1,400	1,100	1,700
Kayah	300	60	700
Total	**31,700**	**20,500**	**42,800**

Opium poppy cultivation status by townships

The table below indicates the poppy growing status according to different sources, either from the remote sensing analysis, or from the socio-economic survey or from the eradication campaign.

Table 38: Poppy growing status in 2009 by township and source

Region	In Satellite image location	During the socio-economic survey	Eradication campaign
East Shan			
Mong Yawng			X
Tachileik		X	X
Mongkhat	X	X	X
Mongpyat	X	X	X
Metmong	X	X	X
Mongpyin	X	X	X
Mongsat	X	X	X
Mong Tong	X	X	X
Kyaing Tong	X	X	X
Total	7	8	9
North Shan			
Kyaukme			
Lashio		X	X
Mongyai			X
Theinne			X
Thibaw			
Moemeik			X

Muse			
Naungcho			X
Manton			X
Tant Yang	X	X	X
Kutkai	X		X
Namkham	X	X	X
Total	3	3	9
South Shan			
Kalaw			X
Maukmai			X
Mongpan	X		X
Hopong	X		
Kyaethi	X	X	X
Leacha	X	X	
Linkhe			X
Kunhein	X	X	X
Loilem	X	X	X
Hsigseng	X	X	X
Namsang(S)	X	X	X
Pinlaung		X	X
Pekhon	X	X	X
Moegnea	X	X	X
Mong Kaing	X	X	
Mongshu	X	X	X
Nyaung Shwe			X
Total	12	11	14
Kayah			
Loikaw			
Demosso		X	X
Fruso		X	
Total	0	2	1
Kachin			
Moenyin			
Pharkant			X
Putao			X
Waing Maw		X	X
Tanai	X	X	X
Total	1	2	4
Grand total	23	26	37

Jade mine in Pharkant Township.

Gold mine in Pharkant Township.

Bad weather low opium poppy yield in 2009 survey, East Shan State

Opium poppy fields in Tan Yang Township, North Shan State.

Early growing stage opium poppy mixed with garlic next to a harvested poppy field being eradicated

Opium poppy mixed with garlic at difference stages next to each other (early stage and flowering stage)

Irrigated opium poppy field (l) and mixed crops fields (r) in Hsihseng township of South Shan State

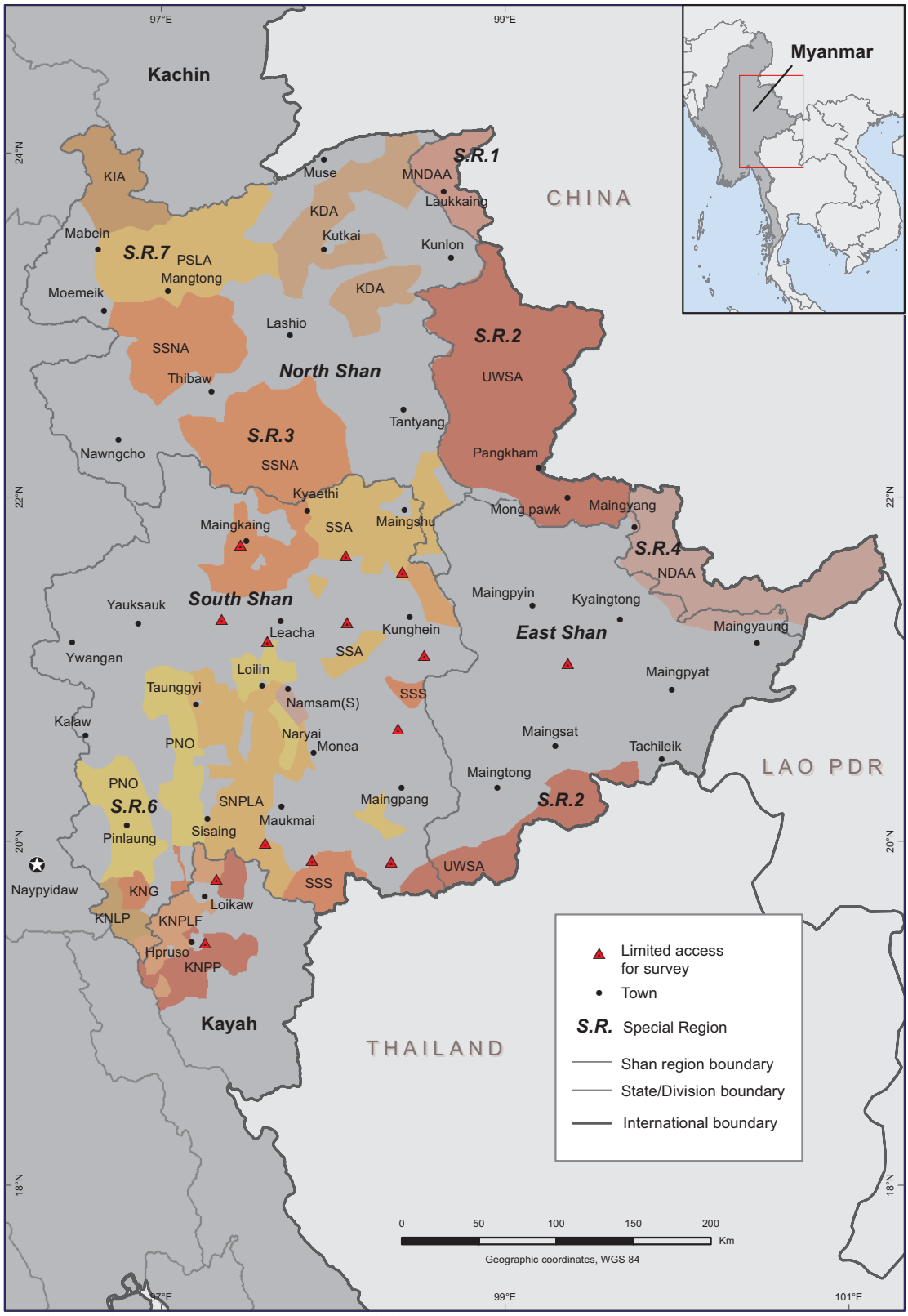
Opium poppy Cultivation among banana plants by the river bank in a clearing of Tanai area (Kachin State)

Rapid Assessment survey in Special Region 1 (Kokang) and Special Region 4 (Monglar)

There was no evidence of opium poppy cultivation in these areas this year. Special Region 4 has been opium poppy free since 1997 and Kokang since 2003. This year ICMP teams didn't have change to *Rapid Assessment Survey in Special Region 1 (Kokang), Special Region 2 (Wa) and Special Region 4.*

There was no evidence of opium poppy cultivation in these areas this year. Special Region 4 has been opium poppy free since 1997, Kokang since 2003 and Special Region 2 Wa since 2005.

Special regions and armed ethnic groups who have returned to the legal fold in Shan and Kayah States



Source: Government of Myanmar - National monitoring system supported by UNODC
The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.

The survey found that opium poppy cultivation took place in areas controlled by insurgency and by ceasefire groups. Peace and security is essential to reduce opium poppy cultivation in those areas prior to be able to provide some alternative livelihood to poor farmers.

ANNEX

Abbreviations used for armed groups in Shan and Kayah States

KDA	Kachin Defense Army
KIA	Kachin Independent Army
KNG	Kayan National Guard
KNLP	Kayan New Land Party
KNPLF	Karenni State Nationalities Peoples' Liberation Front
KNPP	Karenni National Progressive Party
MNDAA	Myanmar National Democrat Alliance Army
NDAA	National Democratic Alliance Army
NarYai	Naryai Group
PNO	Pa-O National Organization
PSLA	Palaung State Liberation Army
SNPLA	Shan State Nationalities People's Liberation Army
SSA	Shan State Army
SSNA	Shan State National Army
SSS	Shan State South company (Homong Region Development and Welfare Group)
UWSA	United Wa State Army