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Afghanistan opium survey 2018

Challenges to sustainable development, peace and security

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Ministry of Counter-Narcotics

Prof. Salamat Azimi (Minister), Dr. Javid Ahmad Qaem (Deputy Minister Policy and coordination), Sayed Faisal Hosainy (Deputy Minister Admin and Finance), Sayed Najibullah Ahmadi (Director of Narcotics Survey Directorate), Saraj Ahmad Yousufzai (Deputy Director of Narcotics Survey Directorate), Nasir Ahmad Karimi (Deputy Director of Narcotics Survey Directorate), Mohammad Ajmal Sultani (Statistical Data Analyst), Mohammad Hakim Hayat (GIS & Remote sensing analyst), Ahmad Shabir Tayeeb (GIS & Remote Sensing Analyst), Sayed Shahenshah Sadat (Quality Control and Digit Specialist), Ahmad Mustafa Safi (Database Analysis & Statistics Member), Najeem Alcozai (Database Analysis & Statistics Member), Karimdad Qadari (Database Analysis &Statistics Member), Ahmad Fawad Karimi (Database Analysis & Statistics Member), Sediqullah Sultani (Database Analysis &Statistics Member) and Salma Rezayee (Admin Officer).

Survey Coordinators: Mohammad Yonus Haqdost (Central Region), Mohammed Ishaq Anderabi (North-Eastern Region), Mojir Fayaz (Western Region), Fida Mohammad Noori (Northern Region), Khalil Ahmad Noori (Southern Region) and Abdullah Jan Dawodkhel (Eastern Region).

United Nations Office on Drugs and Crime (Kabul)

Mark Colhoun (Regional Representative), Devashish Dhar (International Project Coordinator), Abdul Manan Ahmadzai (Senior Survey Officer), Noor Mohammad Sadiq (Database Developer)

Remote Sensing Analysts: Ahmad Jawid Ghiasee and Sayed Mehdi Sadat. Ziaulhaq Sidiqi (GIS Associate), Marzieh Noori (Project Associate), Rahimullah Omar (Field survey Officer)

Operation support: Asif Majeed (Administrative Officer), Md. Rezaul Bari Chowdhury (Security Advisor)

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Jean-Luc Lemahieu (Director, Division for Policy Analysis and Public Affairs), Angela Me (Chief, Research and Trend Analysis Branch), Anja Korenblik (Chief, Programme Development and Management Unit), Coen Bussink (Team leader, Illicit Crop Monitoring Programme), Jaqueline Garcia-Yi (Research Officer), Monika Roszkowska (Consultant), Lorenzo Vita (GIS & Remote Sensing Expert), Irmgard Zeiler (Statistician).

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Report review: Noorullah Stanikzai (Deputy President General_ Geo Spatial Affairs), Moh. Shoaib Saboory (Director for Geospatial Information Management, Ghulam Hazrat Amini (National Accounts Director), and Esmatullah Hakimi (Economic Statistics Director).

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Photo credit (cover): Alternative development team, Kabul, Afghanistan

Introduction

The Afghanistan Opium Surveys have been implemented annually by the Ministry of Counter Narcotics (MCN) of Afghanistan in collaboration with the United Nations Office on Drugs and Crime (UNODC). In February 2019, the Ministry of Counter Narcotics was dissolved during the re-organisation of the Afghan government. This report is therefore the last joint MCN/UNODC Afghanistan opium survey report. The opium survey of the 2019/2020 season is being conducted by the Afghanistan National Statistics and Information Authority (NSIA) in partnership with UNODC.

The Afghanistan opium surveys collected and analysed detailed data on the location and extent of opium poppy cultivation, potential opium production and the socio-economic situation in rural areas. The results provide a detailed picture of the outcome of the 2018 opium season and, together with data from previous years, enable the identification of medium- and long-term trends in the evolution of illicit opium poppy cultivation in Afghanistan. This information is essential for planning, implementing and monitoring measures required for tackling a problem that has serious implications for Afghanistan and the international community.

The implementation of the survey would not have been possible without the dedicated work of the field interviewers, who often faced difficult security conditions.

The Afghanistan Opium Surveys 2018 were implemented under project AFG/F98, “Monitoring of Opium Production in Afghanistan”, with financial contributions from the Governments of Japan and the United States of America.

Executive Summary

Opium crop decimated by drought, but remains historically high

During 2017, Afghan farmers gave more land to opium cultivation than at any other time since UNODC monitoring began. A year later, the area under cultivation had plummeted by 20 per cent to 263,000 hectares. As a result, the amount of opium produced also dropped sharply, from roughly 9,000 tonnes in 2017 to an estimated 6,400 tonnes a year later – a 29 per cent reduction. Despite these decreases, the area under poppy cultivation was still at its second highest level since the beginning of monitoring.

The sharp decreases from 2017's record highs came after a sustained lack of rain and snow during the 2017-2018 wet season. A severe drought badly affected crops in more than two thirds of Afghanistan and devastated the agricultural sector, with incomes reportedly falling by half in severely affected rural areas.

The reduction in opium cultivation as a result of the drought varied across the country. In the north, where farmers rely heavily on rain for irrigation, cultivation declined by more than 50 per cent. The crop was almost entirely wiped out in some northern provinces. For example, in Jawzjan, on the Turkmenistan border, the area under cultivation decreased by 90 per cent; further west, in Badghis, the decrease was 72 per cent. However, in the south of the country, where most crops are grown, farmers were able to avoid the worst effects of the drought by using irrigation systems. Poppy cultivation reduced by only 8 per cent in this region.

Impoverished farmers experience bleak year of declining income

While cultivation remained historically high, the amount of money farmers made from opium in 2018 tumbled by 56 per cent from 2017 levels – from US$1.4 billion to US$604 million. The income estimated for 2018 was the second lowest since 2010. In areas where the drought had its strongest impact, many farmers faced a complete loss of income from opium poppy.

The rapid decline in opium poppy income was largely prompted by the reduction in area under cultivation and a fall in the average opium yield – down 11 per cent down on the previous year. Income levels were further dented as opium prices fell and supply remained relatively high. Farmers were getting an average of US$94 per kilo of dry opium at harvest time in 2018, one of the lowest prices ever recorded.

Afghanistan gets only a small share of overall profits from opium production

Along with the fall in cultivation, production and income for farmers, the overall opiate economy in Afghanistan – which includes heroin production and trafficking to the border – contracted sharply between 2017 and 2018. The gross value of the Afghan opiate economy fell by two-thirds, from between US$4.1 and US$6.6 billion in 2017 to between US$1.2 and US$2.2 billion in 2018.[1] The opiate economy was still worth between 6 and 11 per cent of Afghanistan's GDP and it exceeded the value of the country's officially recorded licit exports of goods and services.

For individual Afghans, the poppy has become a crucial element of their livelihoods. Many engage in cultivation, work on poppy fields or are involved in the illicit drug trade. In rural areas, about 35 per cent of all village headmen reported that at least some villagers cultivated opium poppy in 2018, comparable to the 2017 survey results. However, there were huge regional variations. In the Central region, only 2 per cent of villages cultivated opium poppy in 2018, compared with the Southern region where the figure was almost 93 per cent. In Hilmand province, all village headmen reported opium poppy cultivation.

[1] A change in methodology limits the comparability of the values of 2017 and 2018.

The farmers, however, are not the people who benefit most from the opiate economy. By far the largest share of income is generated by opiate transformation and exports to neighbouring countries. Based on seizure and use data of opium and heroin in Afghanistan and neighbouring countries, an estimated two-thirds of the opium available for export was converted into heroin or morphine within Afghanistan and the remainder was exported unprocessed.

Although the amount of money generated by the opiate economy is large relative to the size of Afghanistan's economy, this income is just a tiny share of the profits generated by the trade. In 2015, UNODC estimated the trafficking of opium and heroin on the Balkan route alone was worth US$28 billion. Trafficking from Afghanistan's borders to consumer markets appears to be organized by nationals of other countries, meaning the proceeds generated in the international trade hardly feed into the domestic economy.

Surveys shine a light on the opium workforce underpinning opium cultivation

Although opium can be grown on low-quality land and can thrive in harsh climates, its production is labour intensive, costly and requires workers with specialized skills. In 2018, farmers employed the equivalent of roughly 190,700 full-time workers to help them weed and harvest opium poppy. The actual number of people engaged in the process is likely to be higher as the figure does not include family members engaged in such activities. In 2018, the combined wages for opium poppy labour amounted to US$270 million, or 44 per cent of the farmers' income from opium over the year.

The workers who cut the seedpods of mature poppies and collect the gum that oozes out are among the most vital workers in this process. Yet the role of these workers, known as lancers, has often been overlooked. For the first time, MCN/UNODC surveyed lancers to better understand the extent of their reliance on poppy cultivation, and their impact on the wider economy.

The survey found that some 20 per cent of lancers reported receiving some payments in opium – a practice that is not well documented. Farmers run schemes under which teams of lancers could receive up to one quarter of the harvest, according to the survey. This kind of scheme was relatively widespread in the Southern region, but almost unheard of in the Eastern region. The reasons for the regional variations, the motivations behind this practice and its implications for farmers and lancers will be investigated in future research. The survey did not gather data on opium use by lancers, but it appears to be common practice that they try to find local traders to sell the opium.

On average, lancers reported working for 15 days and harvesting opium for two farmers over the course of the season. They reported an average daily wage of US$12 in 2018, equivalent to US$170 per season. Farmers gave a lower estimate of the pay they offered lancers, at US$7.70 per day, which did not include payments in opium. However, even this lower estimate is almost twice as much as wages for other farming-related jobs, and substantially more than construction workers, who can expect to be paid US$ 4.80. Roughly 16 per cent of farmers reported that they also worked as lancers to earn extra money, another indication of the allure of the opium trade.

Reported incomes for lancers were highest in the Southern region and lowest in Eastern and Western regions, which reflects wider survey data on the availability of workers. Some 80 per cent of farmers in the Southern region said they had difficulty finding labourers, much higher than in other regions. Lancers, just like poppy farmers and other labourers, tend to use their income from opium to buy food, pay debts and settle medical bills. Few invest in property, education or other activities that could offer alternatives to poppy cultivation.

Local markets are vital centres for opium selling

A well-known advantage of opium cultivation for farmers is that traders come to the villages to buy the produce directly. However, data collected from farmers by MCN/UNODC on the selling locations of their crops suggest that this practice was less common than expected.

About two-thirds of opium farmers reported selling their harvest at community and district markets, making these the most common points of sale. Only about 30 per cent of opium farmers said they sold to traders at the farm gate. By way of comparison, some 13 per cent of wheat farmers said they sold directly to traders and more than 80 per cent said they transported goods to local markets.

This suggests the activities of opium farmers are converging with farmers of licit crops, at least in those areas heavily affected by opium poppy cultivation. More broadly, the open sale of opium at markets could be interpreted as a sign that the opium trade is becoming increasingly accepted in rural Afghanistan.

Control by non-state actors strongly linked with opium production and lack of development

Opium poppy cultivation tends to take place in less secure areas and in villages controlled by non-state groups. Some 53 per cent of headmen in opium-cultivating villages told the MCN/UNODC survey they were under the control of insurgents and other non-state actors, compared with just 26 per cent for non-poppy villages.

This bodes badly for the development of poppy villages, because government control is associated with better access to medical and educational facilities, especially for girls and women. Girls had access to a school in 47 percent of government-controlled villages, compared with just 18 per cent of villages controlled by non-state groups, according to surveys of village headmen. Access to female health providers was available in 41 per cent of villages under government control, but only in 13 per cent of villages outside the control of the government.

Government control is also linked with a perception of law enforcement and rule of law. Some 49 per cent of headmen in villages under state control said they believed legal consequences were likely or very likely to follow from opium cultivation. In villages not under state control, the figure was just 18 per cent. These numbers reflect the perceptions of village headmen rather than the actual risk of legal consequences, but the difference between villages under government control and outside is striking. The answers of village headmen outside government control appear to reflect an environment of perceived impunity. This contrasts sharply with answers from those in government-controlled villages, which reflect a stronger presence of the rule of law.

Insurgents and other non-state groups raise some US$29 million from opium taxes

Headmen in 36 per cent of poppy villages said their farmers paid tax at roughly 5 per cent of earnings from opium sales, meaning taxes were levied on about 2,240 tons of opium in 2018. More than half of village headmen said taxes were paid to anti-government groups and 17 per cent referred to the Taliban by name. Roughly US$29 million in taxes was incurred in 2018, of which at least US$3 million went to the Taliban. However, this is likely to underestimate the Taliban's influence as some headmen would almost certainly have included the Taliban under the designation of anti-government group.

Opium poppy is not the only source of funding for insurgency groups. The MCN/UNODC village survey uncovered evidence that groups including the Taliban fund their activities by collecting ushr, a tithe of about 10 per cent on agricultural produce. Some 84 per cent of all headmen reported that farmers had

paid ushr. The Taliban collected ushr in 10 per cent of all villages, an increase on 2017's figure of 7 per cent. In 2 per cent of villages, other anti-government elements collected ushr.

Understanding time lags between cultivation, sale and transformation helps to shed light on drugs trade

The journey between cultivation of opium poppy in Afghanistan and its availability as heroin in end-user markets – mostly in Europe – is not well understood. While estimates of opium production are largely seen as reliable, there is much less certainty around the amounts transformed into heroin and how long it takes for this to reach end-user markets.

The MCN/UNODC survey pieced together some parts of the jigsaw by asking farmers how much of their produce they sold within the year of harvest. The answers revealed that roughly 20 per cent of 2017's crop went unsold, some 1,800 tons out of almost 9,000 tons. This suggests that 2017's bumper harvest may take time to have its full effect on the supply in end-user markets. The findings also have implications for the value of opium at the farm gate. It appears that some of the value of the opium harvest is not realised in the same year but kept as raw opium for later sale.

Aside from affecting estimates of the opium available for transformation, the large proportion of unsold produce also shows how delays can occur at the earliest stages of the process. Previous studies have used prices of opium as a metric to judge the time lag between opium cultivation and sale as heroin, comparing fluctuations in Afghan opium prices with heroin prices in Pakistan. These studies, carried out between 2009 and 2013, suggested it took two to four months for price changes in Afghanistan to work their way through to heroin in Pakistan. However, this metric would not incorporate the effect of large amounts of unsold opium.

To fully understand the time component of heroin manufacture and trafficking, more qualitative research on heroin manufacture in and outside of Afghanistan is needed. Quantitative research using international seizure data would also be required.

Tackling Afghanistan's opium issues will take a broad, international effort

The drought of 2018 exacerbated many of Afghanistan's difficulties. Already impoverished farmers have seen their crops decimated by drought and their living standards dragged down, potentially making opium cultivation an even more attractive option in the coming years. At the same time, high levels of opium production and trafficking are channelling funds to non-state groups, fuelling instability and insurgencies and hampering development efforts. The size and diversity of the opiate economy brings its own challenges, particularly that a successful intervention in one region may not work as well in another region.

The MCN/UNODC village surveys are building a knowledge base that will enable better strategies. The answers given by village headmen and farmers shed light on the relationship between poppy cultivation, poor governance, and a lack of security, basic infrastructure and services. Broader socio-economic factors, such as lack of employment opportunities, also play a part in propagating poppy cultivation. And the common sale of opium at local markets – another insight revealed in the surveys – shows how pervasive poppy cultivation is in rural societies.

These insights suggest that counter-narcotics policies should be situated firmly in a broader development strategy, taking in all factors that push farmers towards poppy cultivation. Successful strategies can create their own momentum, for example by attracting investment into local infrastructure, thereby increasing opportunities for local communities. But long-term improvements are possible only if alternative development strategies provide viable opportunities for farmers in the licit economy.

More broadly, reducing opium production in Afghanistan requires more than rural development and counter-narcotics policies. Most of the demand for opiates comes from external countries and most of the profit from the trade flows to beyond Afghanistan's borders. As such, it is a shared problem that needs a concerted international effort targeting both supply in Afghanistan and demand in countries of destination.

Part I: Opium poppy cultivation in 2018

After long years of war, Afghanistan is a country in a state of constant, protracted crisis. The security situation remained volatile in 2018, with a consistently high number of security incidents.[2] The Taliban and the Islamic State in Iraq and the Levant-Khorasan Province (ISIL-KP) remained resilient in spite of Afghan and international military operations.[3] In addition, parliamentary elections took place in October 2018 and had a significant impact on the political and security environment from the start of voter registration in April until polling days.[4]

The on-going instability, reduced economic growth and the severe drought that affected the country in 2018 further weakened an already vulnerable population and its ability to withstand economic and environmental shocks.[5] Drought conditions caused large-scale displacement and worsened the living standards and conditions of food insecurity of an already poor and vulnerable population.[6] In the face of the 2018 drought, Afghanistan was forced to rely on foreign aid and humanitarian partners to provide food and assistance to affected populations.

Illicit opium cultivation in 2018 was at its second highest level since the beginnings of recordings, despite decreasing prices and a seemingly saturated opium market. Opiates have become a crucial pillar of Afghanistan's economy that permeated the rural society to the extent that many communities – not only farmers – had become dependent on the income from opium poppy to sustain their livelihoods.

The challenges faced by the country impede the ability to lessen its dependence on income generated from opium, which remains its main export product with well-established markets and trafficking networks. In 2018, the situation was further exacerbated due to the impact of the drought. Afghanistan finds itself in a vicious cycle whereby the reduction of opium poppy cultivation is subject to the achievement of broader development goals and where the cultivation and production of opiates hinders sustainable development.

This report discusses the drivers and consequences of opium poppy cultivation in Afghanistan and provides the evidence for the design and implementation of counternarcotic strategies. It is based on the findings of the Afghanistan opium survey conducted jointly by Ministry of Counter Narcotics (MCN) and UNODC. It builds on socio-economic data collected in more than 5,600 structured interviews in some 1,400 opium-poppy growing and non-growing villages in 2018, which constituted a representative sample of rural areas in Afghanistan.

[2] Report of Secretary-General 6 March 2019: UN General Assembly Security Council (2019), *The situation in Afghanistan and its implications for the international peace and security*, Report of the Secretary General
[3] Report of Secretary-General 6 March 2019
[4] UNAMA and OHCHR (2019), Afghanistan, Protection of civilians in armed conflict, Annual report 2018
[5] World Bank Group (2018), Afghanistan development update
[6] Report of Secretary-General 6 March 2019

The 2018 drought

In 2018, a severe drought affected more than two thirds of Afghanistan and devastated the agricultural sector.[7] Cumulative rain and snowfall was well below average in much of Afghanistan during the October 2017 – May 2018 wet season.[8] Typical sources of food and income were heavily affected in areas where livelihoods depend on rainfed staple production and livestock rearing,[9] with incomes reportedly reduced by half in areas affected by the drought.[10]

The drought showed its full impact over the course of 2018. By fall 2018, it left an estimated four million people in need of life-saving assistance,[11] about 9.8 million people (44 percent of the rural population) were estimated to be in food crisis and emergency,[12] and by November 2018 more than half a million Afghans had been forced to leave their homes due to the drought or conflict.[13] By the end of the year, 3.5 million drought-affected people had received assistance from humanitarian partners while an estimated 0.4 million could not be reached, due to various reasons including insecurity.[14]

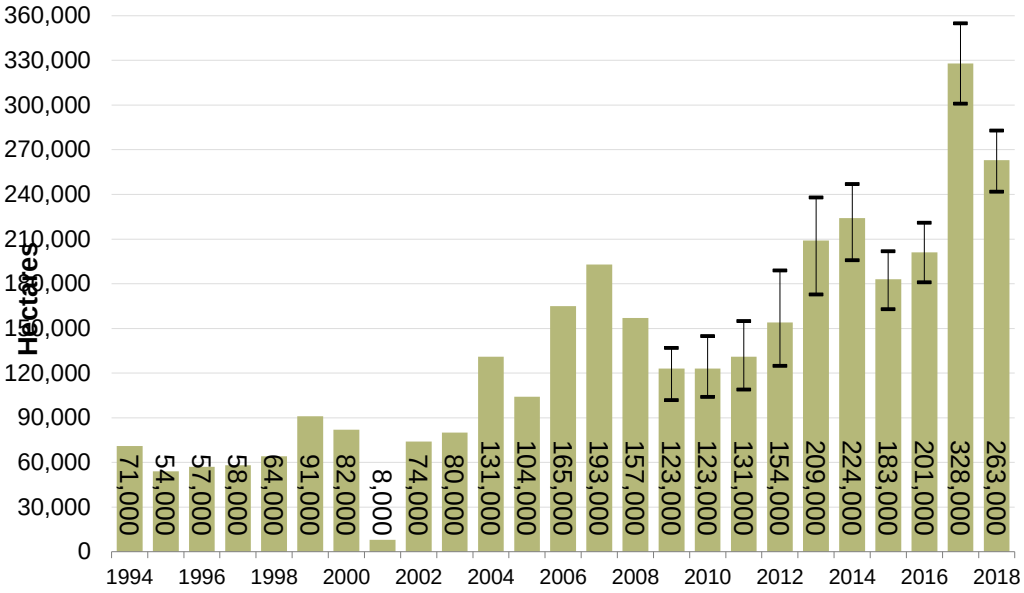
The drought had devastating effects on crops and livestock, which further exacerbated the situation of the already chronically food-insecure population. Licit crops were heavily affected by lower-than-average precipitations, in particular in Western and Northern Afghanistan. The estimated national wheat production for 2018 was 16 per cent lower than in 2017, and 25 per cent lower than the five-year average.[15] The estimated 2018 national barley production declined by 40 per cent as compared to 2017. Both are winter grains harvested around May-June.[16] In addition, 48 per cent of pastoralists reported reduced livestock productivity and/or animal death, and milk production decreased by more than 30 per cent while fodder prices have increased by up to 100 per cent when compared to previous years.[17]

Households impacted by the drought were forced to employ negative coping mechanisms, such as the sale of assets, the reduction of the planting area to conserve water, and the consumption of the seeds intended for planting in the next season, to meet their basic needs.[18] Rural households needed to borrow food or money to sustain themselves until the next harvest season, which will further put their living standards at risk.[19]

At 263,000 hectares, the area under opium poppy cultivation decreased by 20 per cent when compared to 2017. The reduction was mostly attributed to crop failure because of the drought, its impact however, varied greatly across the country. In the Northern region, with large areas of rain-fed land, opium poppy cultivation decreased by more than 50 per cent when compared to 2017. Locally, the impact was even more severe. In Jawzjan, the area under opium poppy cultivation decreased by 90 per cent and in Badghis by 72 per cent when compared to last year. In Afghanistan's main cultivating region, the Southern region, farmers relied heavily on irrigation pumps and opium poppy cultivation reduced by only 8 per cent.

[7] OCHA Afghanistan 2019: OCHA (2019), Humanitarian needs overview, November 2018
[8] Famine Early Warning System, Food Security Outlook, http://fews.net/central-asia/afghanistan/food-security-outlook/june-2018
[9] Ibid.
[10] OCHA Afghanistan 2019
[11] Ibid.
[12] FAO briefing March 2019
[13] OCHA Afghanistan 2019
[14] OCHA Afghanistan, Integrated drought response, December 2018
[15] FAO briefing March 2019
[16] A second wheat harvest also takes place in August-September. See FAO briefing March 2019
[17] Ibid.
[18] OCHA Afghanistan 2019
[19] Ibid.

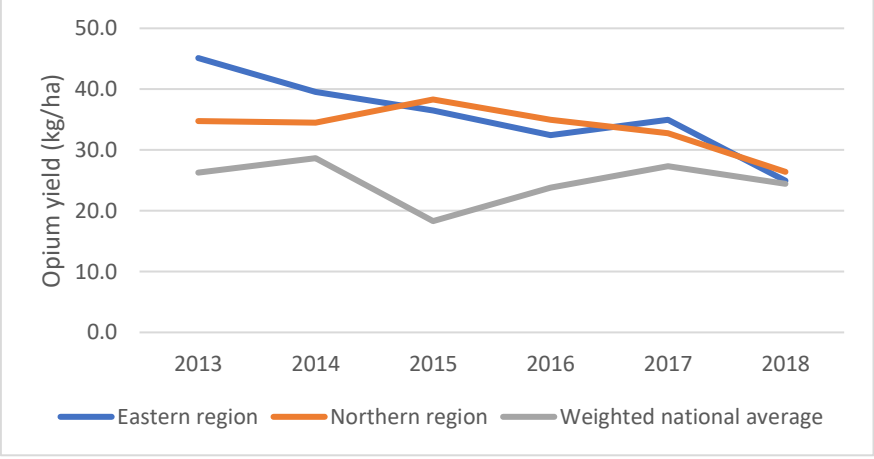
FIGURE 1 OPIUM POPPY CULTIVATION IN AFGHANISTAN, 1994-2018 (HECTARES)



Potential opium production was estimated at 6,400 (5,600 – 7,200) tons in 2018, a decrease of 29% from its 2017 level (9,000 tons). The decrease in production was due to decreases in area under opium poppy cultivation and opium yield per hectare. Yields in the Northern region were 25 per cent lower than the 5-year average, in the Eastern region they were 34 per cent lower. Reductions in yields were most prominent in the Central region, at 49 per cent below the 5-year average (the Central region contributes only little to national production).

Despite of being heavily affected by drought, area under poppy cultivation was at its second highest since beginning of the monitoring, only cultivation levels in 2017 exceeded 2018. The income from opium production of farmers (the farm-gate value of opium), on the other hand, was at its second lowest level since 2010. The combination of low yields and low opium prices in 2018 reduced the farm-gate value by 56 per cent in comparison to 2017. Being so low compared to the area dedicated to opium cultivation is an indication that the situation of already impoverished farmers is likely to have become even more precarious due to the loss of expected income from opium poppy.

FIGURE 2 AVERAGE OPIUM YIELD (KG/HA) IN THE EASTERN AND NORTHERN REGIONS, AND NATIONAL AVERAGE YIELDS, 2013-2018

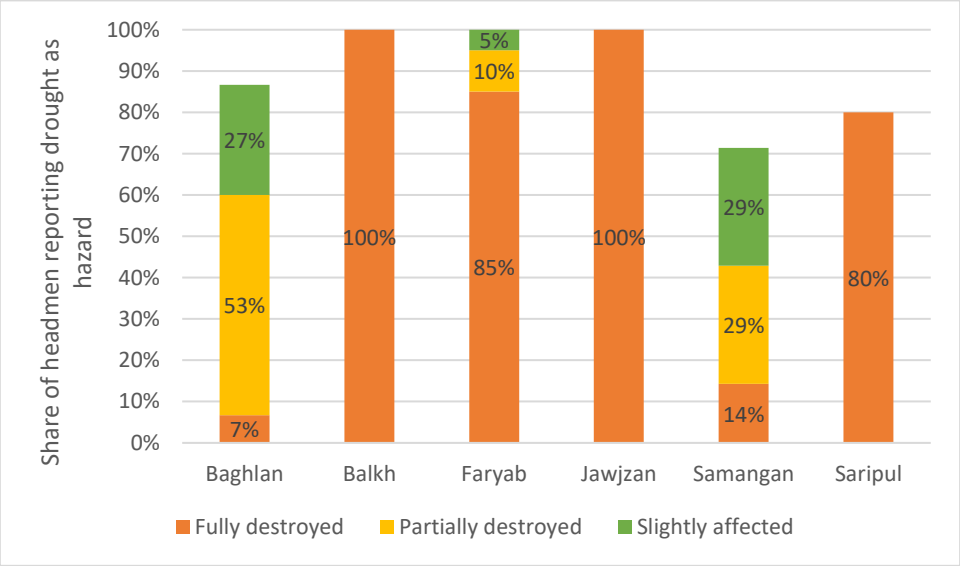


National average is annual opium yields weighted by area under cultivation.

The impact of the drought was also confirmed by the assessment of village headmen in the village survey. At national level almost three quarters (74 per cent) of the headmen interviewed stated that crops in their village had been affected by environmental hazards or disease in 2018. This was most frequently reported in the Northern region (97 per cent of headmen) and least frequently reported in the Southern region (66 per cent of headmen). Out of these headmen, 63 per cent mentioned the drought as having a significant impact on crops and 25 per cent stated the harvest had been destroyed by the drought.

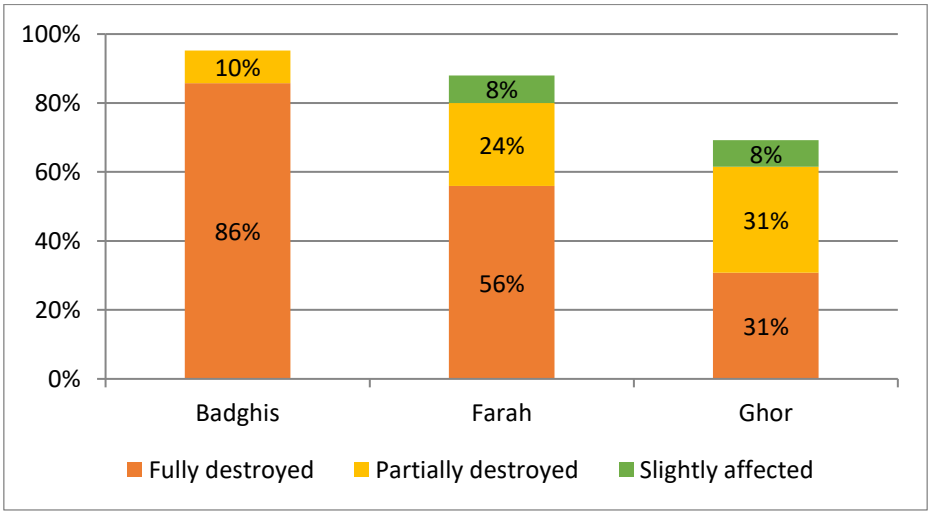
An informal survey among regional coordinators confirmed the importance of opium poppy in rural households, as farmers reported that they diverted already scarce irrigation water from wheat fields to opium poppy fields to save the crop.

FIGURE 3 HEADMEN ASSESSMENT ON DROUGHT AND ITS IMPACT, PROVINCES IN THE NORTHERN REGION, 2018



The graph is to be read as follows: In Baghlan, 87 per cent of all village headmen who reported that their crop was affected by some form of disease or natural hazard, named drought as the significant hazard. Out of these, 7 per cent reported that the crops were fully destroyed, 53 per cent reported a partial destruction and 27 per cent a some impact on the crops. The remaining 13 per cent did not observe an impact of the drought.

FIGURE 4 FIGURE 5 HEADMEN ASSESSMENT ON DROUGHT AND ITS IMPACT, PROVINCES IN THE WESTERN REGION, 2018



The graph is to be read as follows: In Badghis, 96 per cent of all village headmen who reported that their crop was affected by some form of disease or natural hazard, named drought as the significant hazard. Out of these, 86 per cent reported that the crops were fully destroyed and 10 per cent reported a partial destruction. The remaining 4 per cent did not observe an impact of the drought.

Case studies of Badghis, Badakhshan and Hilmand

While the impact of the drought on opium poppy cultivation was visible across the country, it did not affect opium poppy cultivation with the same severity in all provinces. Local climate, agricultural practices and water availability over time took a strong influence on how strongly the drought impacted the opium harvest in the country. Understanding the different risks and vulnerabilities of provinces towards natural disasters helps to shape development policies that aim at sustainably reducing opium poppy cultivation.

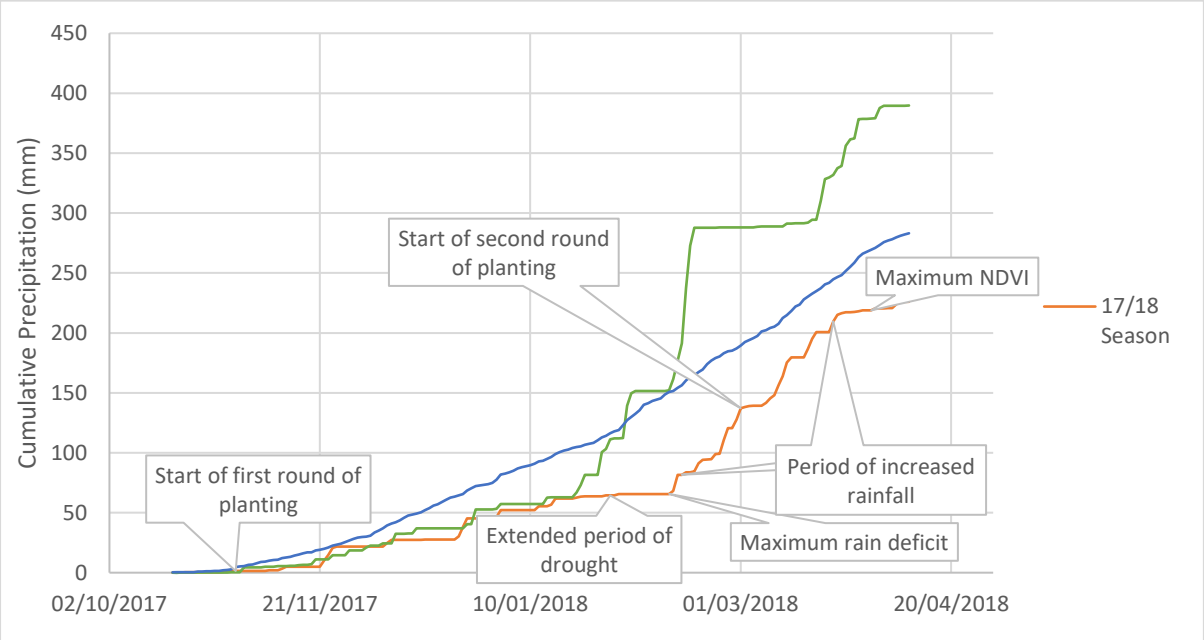
The following takes a detailed look at three different provinces, Badghis in the North, Badakhshan in the North-east and Hilmand in the South, where opium poppy cultivation decreased by 72 per cent, 7 per cent and 8 per cent, respectively. In Badakhshan and Badghis opium poppy cultivation occurs widely on rain-fed land. In Hilmand it relies heavily on irrigation water.

Badghis and Badakhshan: a matter of timing

The extent of the droughts in Badghis and Badakhshan in 2018, as measured in per cent deficits compared with the 30-year average for the period of the 17th of October to the 10th of April, were 21 per cent and 27 per cent respectively. The poppy crop in Badghis was more severely affected than that of Badakhshan, owing to the timing of the lack of rainfall. Badghis had its drought during the early stages of plant development (January, February) and also saw a 21-day delay in the rains compared to the same period in the previous year (Figure 5).

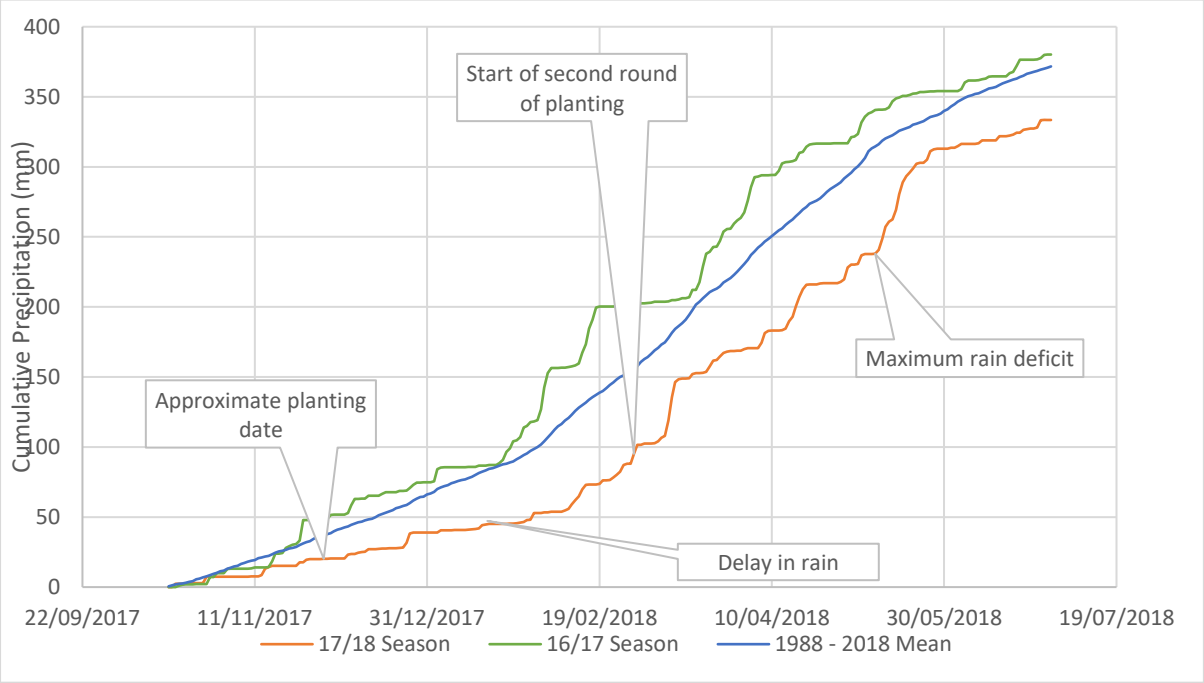
In Badakhshan crops failed less than in Badghis, for two reasons. First, the drought Badghis saw was an almost absolute lack of rain and therefore more severe. While Badakhshan saw less precipitation than usual, it likely had less of an impact because there was not a complete lack of rain. This can be seen in the cumulative average precipitation for Badakhshan in the 17/18 season between the end of 2017 and February 20th, 2018 (see following figures). Second, harvest in Badakhshan occurs later (May/June) than in Badghis (April/May), so the critical stages of plant development missed the worst drought period. The severity of the drought in Badghis can be seen in false colour satellite imagery (see next pages). The following imagery was taken at the harvest times of opium poppy in Badghis and Badakhshan, where the agricultural areas are shown as red. The extensive crop failure in Badghis is visible when comparing imagery from 2017 with the harvest period in 2018. In Badakhshan, on the other hand, the effect of the drought is not visible at harvest time. The crops - which are mainly rain-fed - appear to have the same or even slightly more vigour on the satellite image of 2018. This is mainly due to adequate rainfall during the crop growing season (April-June in Badakhshan).

FIGURE 6 CUMULATIVE AVERAGE PRECIPITATIONS IN BADGHIS PROVINCE, OCTOBER 2017 – APRIL 2018[20]



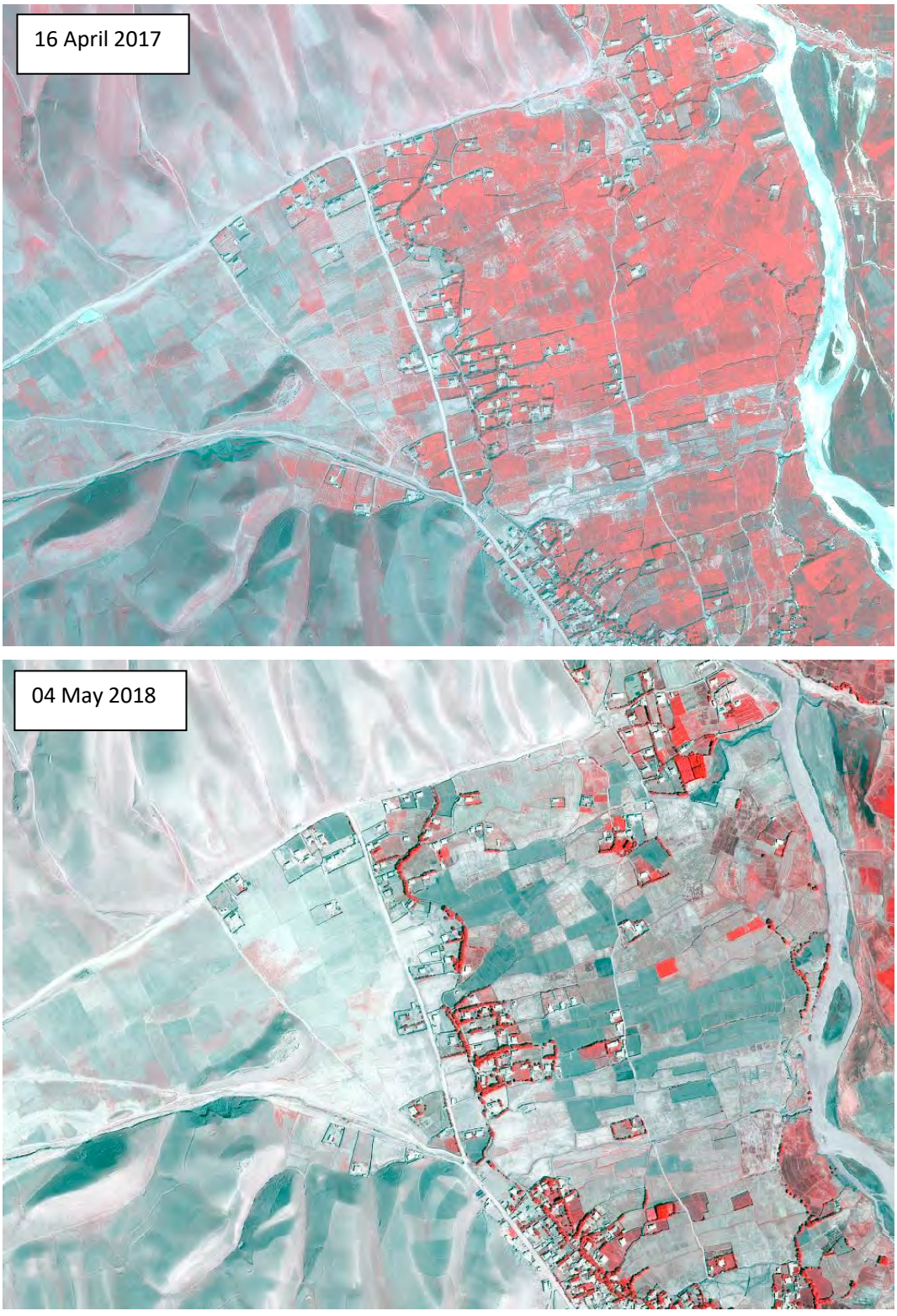
Note: "Maximum NDVI" is the period just before harvest where crop vigour is strongest. The opium poppy harvest takes place in May.

FIGURE 7 CUMULATIVE AVERAGE PRECIPITATIONS IN BADAKHSHAN PROVINCE



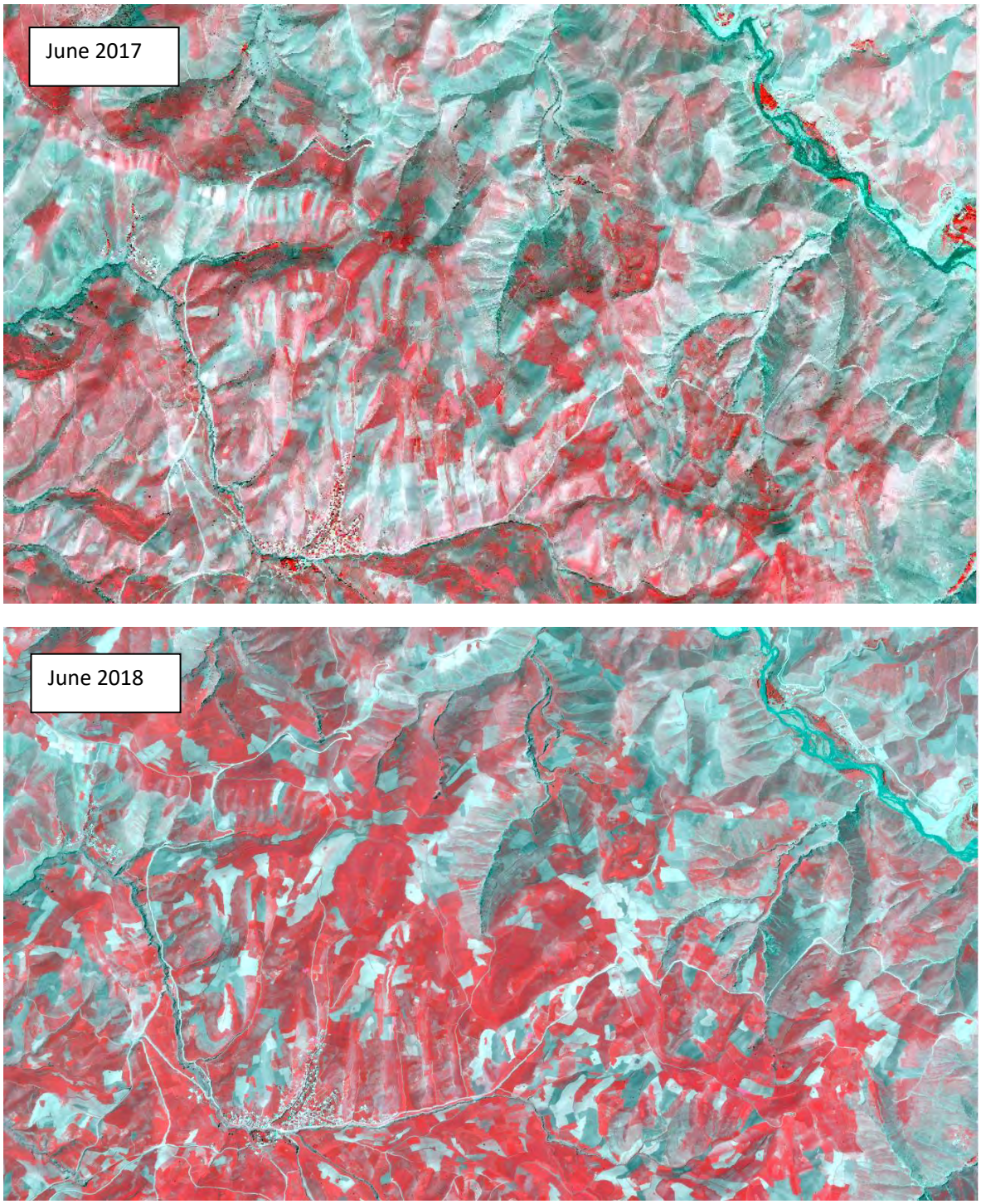
[20]The data used to generate the cumulative precipitation graphs came from the CHIRPS v2.0 dataset:
Funk, C., Peterson, P., Landsfeld, M., Pedreros, D., Verdin, J., Shukla, S., Husak, G., Rowland, J., Harrison, L., Hoell, A. and Michaelsen, J., 2015. The climate hazards infrared precipitation with stations—a new environmental record for monitoring extremes. *Scientific data*, *2*, p.150066.

FIGURE 8 COMPARING 2017 AND 2018 SATELLITE IMAGES (FALSE COLOUR IMAGES) IN BADGHIS, BALAMURGHAB DISTRICT



Agricultural areas are shown in red and include opium poppy fields. The 2018 image shows the strong reduction of rain-fed but also irrigated crops (close to the river) due to drought: Fields presenting themselves as red in 2017 appear green (barren) in 2018.

FIGURE 9 COMPARING 2017 AND 2018 SATELLITE IMAGES (FALSE COLOUR IMAGES) IN BADAKHSHAN

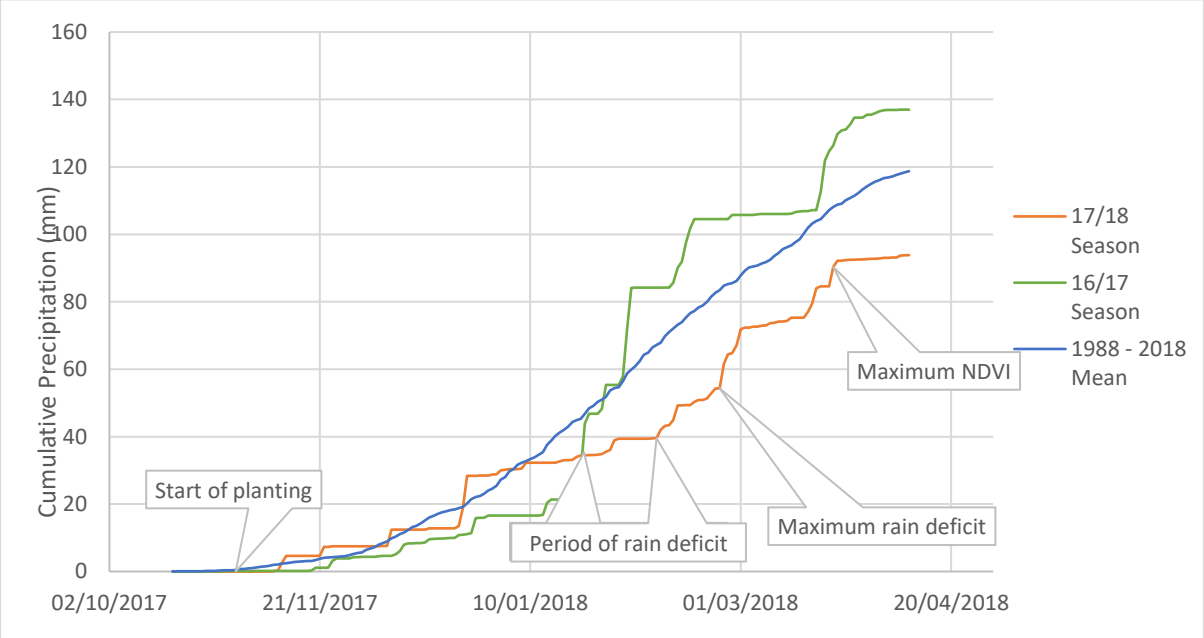


*During 2018 cropping season, the drought appeared to **not** have had a visible effect on crops in Badakhshan. The mainly rain-fed crops appear to have at least the same vigour on the satellite image in 2018 when compared to 2017.*

In the South, irrigation made the difference

In Hilmand province (Southern region), overall precipitation between October and April was reduced by 20 per cent when compared to the 30-year average. The province saw a 17-day delay in rain falls compared with 2016. The drought pattern was similar to that of Badakhshan: There was not a complete lack of rain, but decreased quantities until mid-February (see following figure). Hilmand, however, did not experience crop failure to the same extent. Farmers in Hilmand cultivate almost exclusively on irrigated land and the sophisticated irrigation system appeared to have shielded farmers from the impact of the drought – opium poppy cultivation remained stable in this province when compared to 2017.

FIGURE 10 CUMULATIVE AVERAGE PRECIPITATION FOR HILMAND PROVINCE WITH IMPORTANT POINTS INDICATED



The South of Afghanistan (here Hilmand, Kandahar and Nimroz) has a irrigation system that uses reservoirs and canals along Hilmand river. Hilmand river is the longest river of Afghanistan, it rises in the Hindu Kush mountains west of Kabul, passes through Day Kundi and Uruzgan and ends in an endorheic basin in Nimroz, close to the Iranian border (Hilmand river does not flow into the sea). It gets its water mainly from snowfall in the Hindu Kush mountains, but other rivers, e.g. from side of Kandahar flow into it, too. It is the main source of irrigation for crops in Hilmand, Kandahar, and Nimroz provinces.

The major source of irrigation water for the main Hilmand agricultural area along the Hilmand river is the Kajaki reservoir. In 2018, the Kajaki reservoir held less water than in 2017 (see figure), but the reduced levels of water in 2018 were enough to irrigate the crops along the river in Hilmand.

A similar picture can be seen in Kandahar. The major source of water for irrigation in Kandahar is Arghandab reservoir. The Arghandab river joins the Hilmand river downstream and contributes to irrigation in the Hilmand main valley. In Kandahar the water was enough to shield agriculture from a severe impact of the drought in 2018.

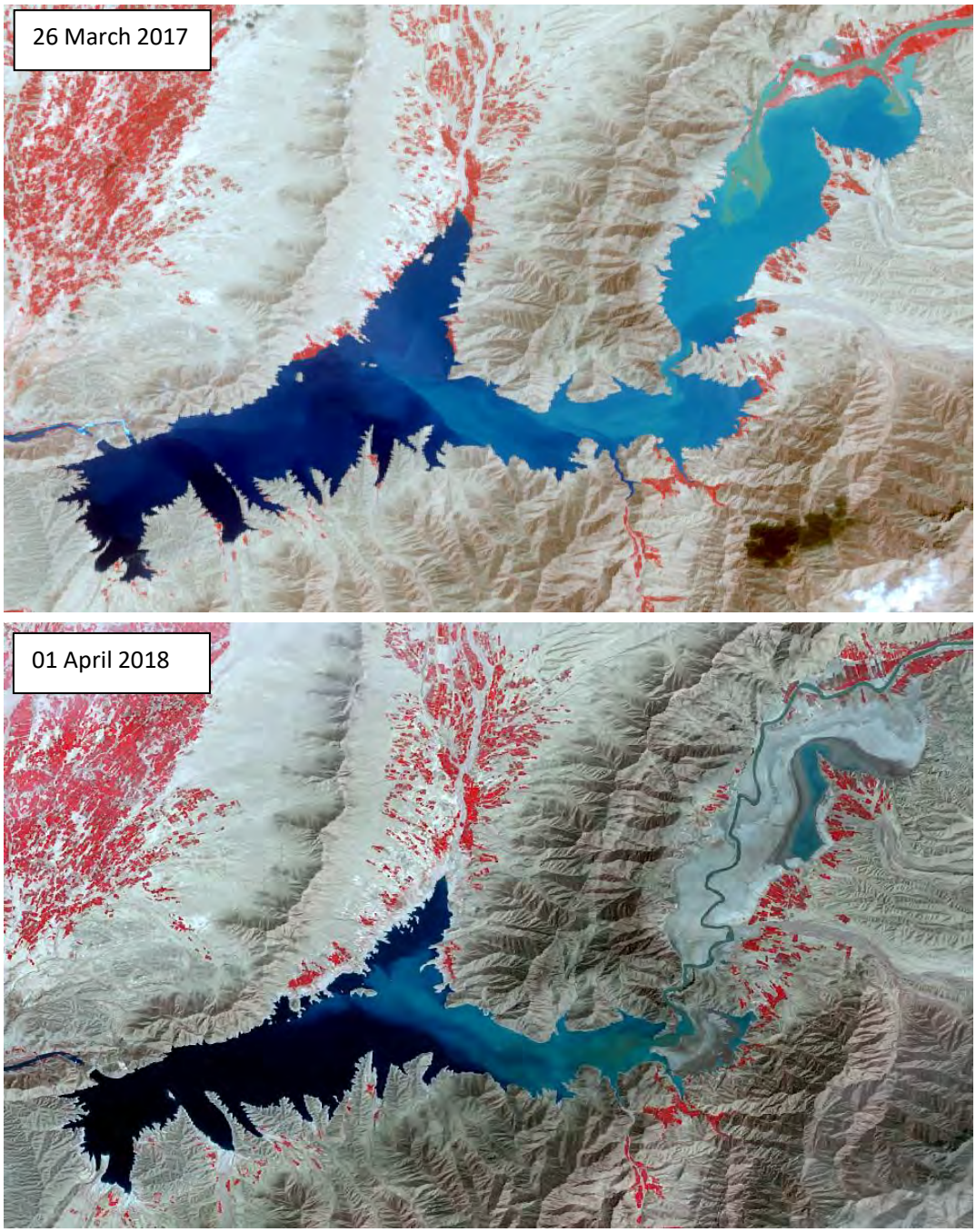
Another situation can be found in the desert areas of Hilmand. The desert areas north of the Boghra canal are not provided with water from Hilmand river, but mainly from deep tube wells supported by solar energy. The water is pumped up from below ground and then stored in small water ponds. On satellite imagery, numerous such water ponds and solar panels can be seen (here, 262 water ponds have been identified within a 5x5km^2 image). In the desert areas of Hilmand, the drought did not have a visible impact, because of this irrigation system.

The situation was different in Nimroz. Nimroz is downstream from Hilmand, and water that is used for irrigation in Hilmand does not reach Nimroz any more (or only to a very small extent). The satellite image of 2018 shows less water in the river than in 2017, and the remaining water was not sufficient to fully sustain the crops (the active agriculture area was visibly reduced).

The following imagery shows (agricultural areas can be observed in red and include opium poppy fields):

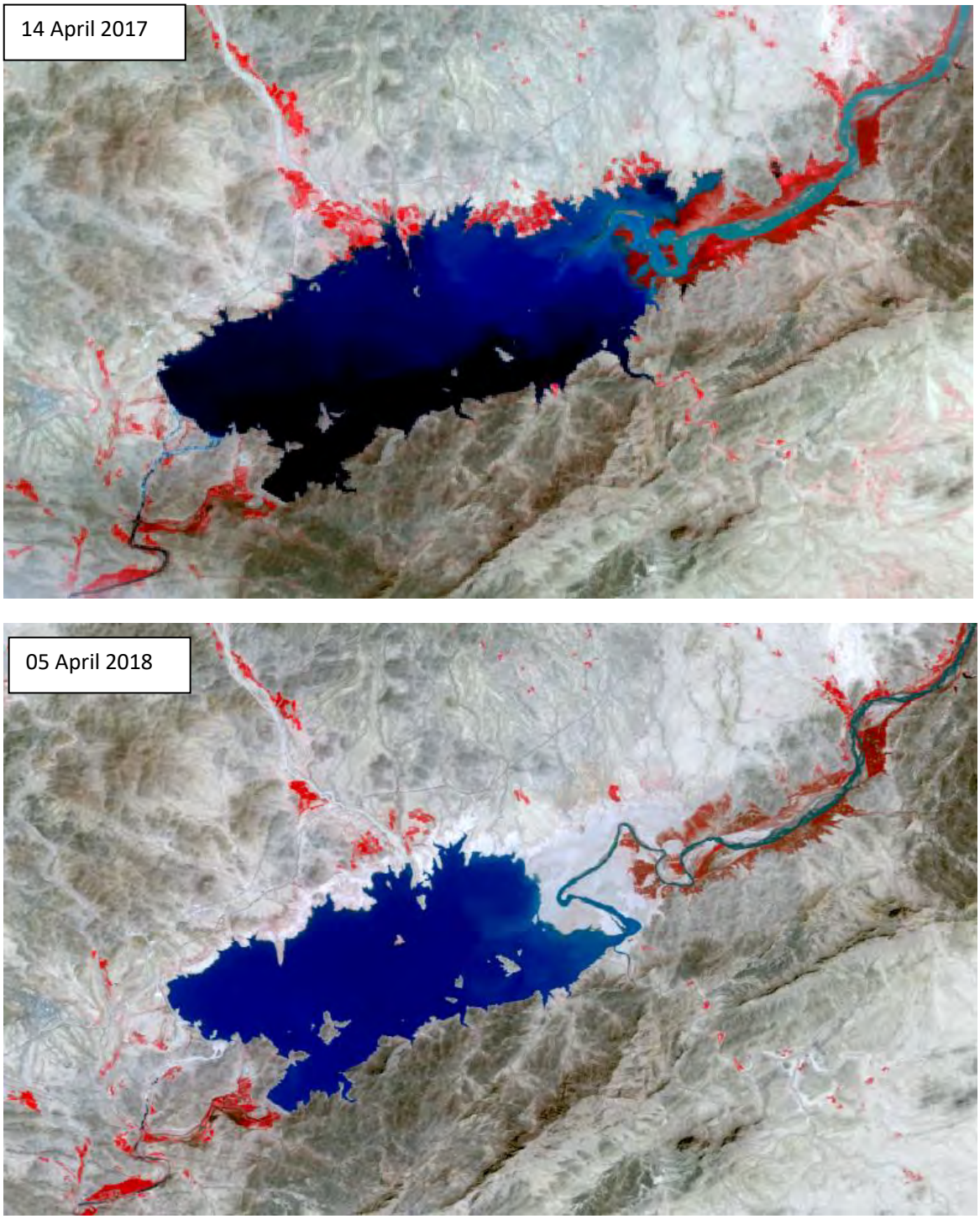
- The Kajaki and Arghandab reservoirs, which both feed into the Hilmand river eventually, and had strongly reduced levels of water in 2018 as compared to 2017 due drought.
- Drought affected areas in Charburjak district of Nimroz province, comparing 2017 and 2018 satellite images (false colour images)
- The impact of the drought along Hilmand river: a comparison of satellite imagery from Hilmand main valley shows only little change in agricultural area. Downstream in Nimroz, however, the impact of the drought is strongly visible.

FIGURE 11 DIFFERENCE IN WATER LEVELS IN KAJAKI RESERVOIR, 2017 AND 2018



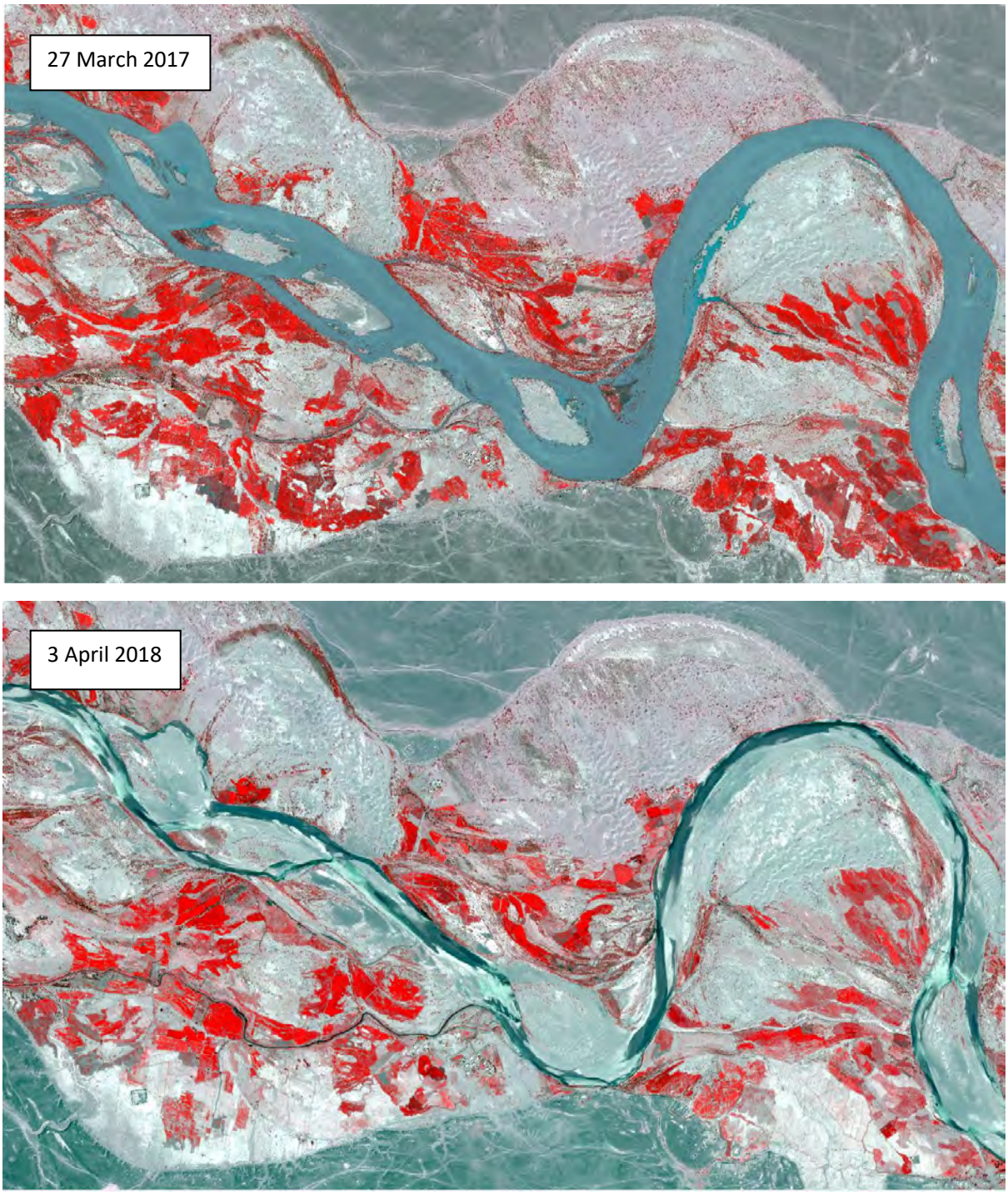
Images show strongly reduced levels of water in the reservoir in 2018 as compared to 2017 (false colour Sentinel satellite images).

FIGURE 12 DIFFERENCE IN WATER LEVELS IN ARGHANDAB RESERVOIR IN 2017 AND 2018: DROUGHT EFFECT



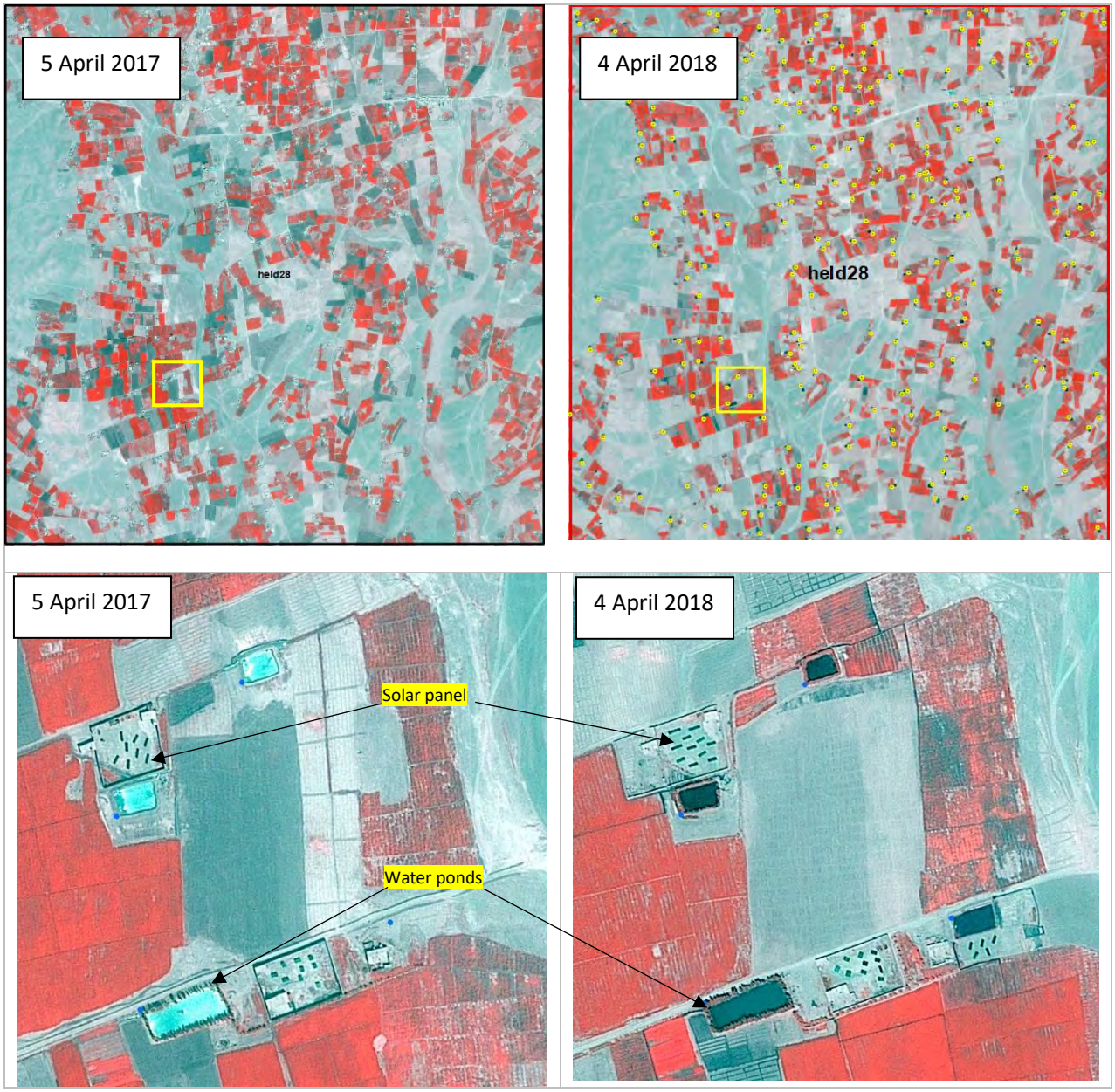
Images show strongly reduced levels of water in the reservoir in 2018 as compared to 2017 (false colour Sentinel satellite images).

FIGURE 13 DROUGHT AFFECTED AREA IN CHARBURJAK DISTRICT OF NIMROZ PROVINCE, COMPARING 2017 AND 2018 SATELLITE IMAGES (FALSE COLOUR IMAGES)



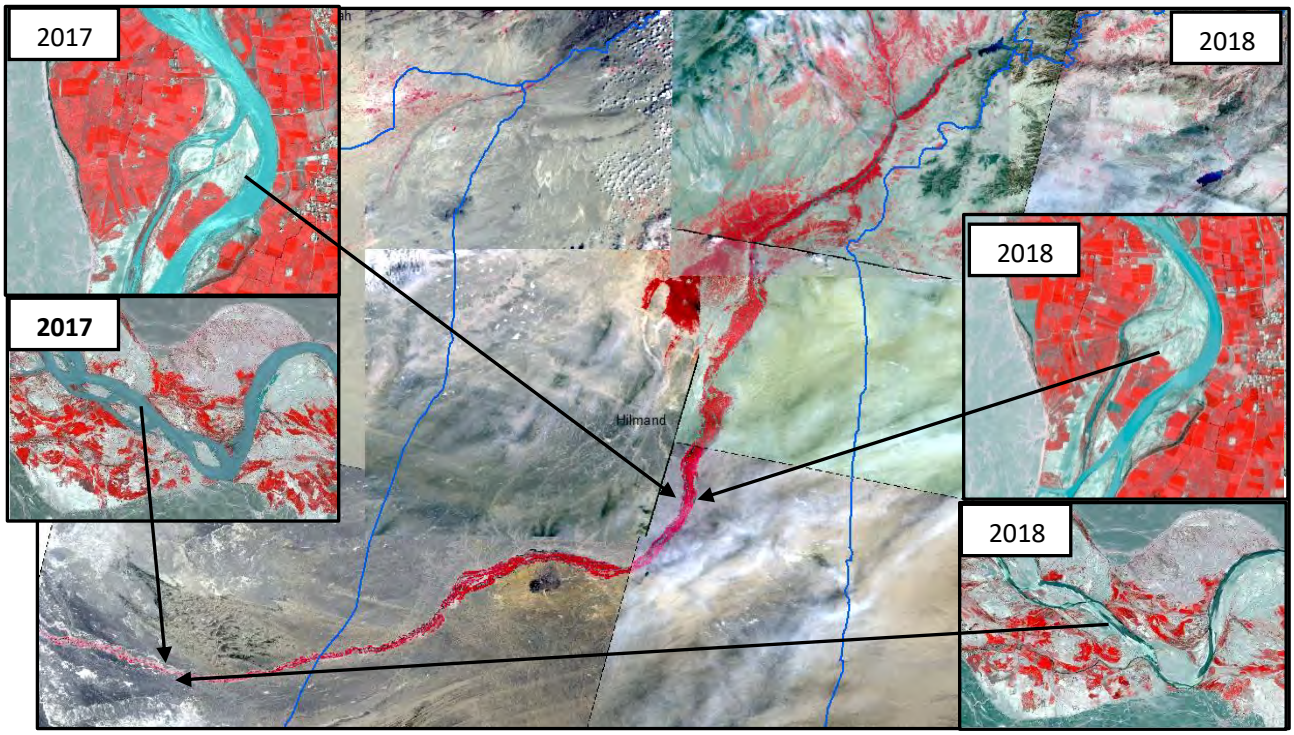
Agricultural areas are shown in red and include opium poppy fields. The 2018 satellite image shows less water in the river than in 2017 and the remaining water was not sufficient to fully sustain the crops: the active agriculture area was visibly reduced in 2018 compared to 2017 (false colour Pleiades satellite images).

FIGURE 14 DEEP TUBE-WELLS SUPPORTED BY SOLAR POWER AND IRRIGATION PONDS IN HILMAND, PROVINCE, 2017 AND 2018



Agricultural areas are shown in red and include opium poppy fields (false colour Pleiades satellite images).

FIGURE 15 IMPACT OF THE DROUGHT ALONG HILMAND RIVER



False colour Pleiades/Sentinel satellite images.

The role of opiates in Afghanistan's economy

The opiate economy contracted drastically when compared to 2017

The decrease in the opium production by 29 per cent from 2017 to 2018 led to a contraction of the illegal opiate economy when compared to previous years. The gross value of the Afghan opiate economy was estimated to be US$ 4.1-6.6 billion in 2017 and US$ 1.2-2.2 billion in 2018, [21] which means a decrease of around 27 to 51 per cent between 2017 and 2018.

Being worth between 6 to 11 per cent of GDP, the value of opiates, including revenues from heroin production and trafficking to the border, remained of considerable size when compared to Afghanistan's licit economy, and exceeded the value of its officially recorded licit exports of goods and services in 2017 (estimated at 4.3 per cent of GDP).[22] It was also worth between 29 and 53 per cent of the licit agricultural sector of the country, which constituted 18.8 per cent of GDP in 2017/2018.[23]

The contraction was prompted by a combination of factors. Area under opium poppy cultivation decreased by 20 per cent and the average opium yield by 11 per cent when compared to the previous year. This resulted in a 29 per cent reduction in the potential opium production. In reaction to the to the continuing high levels of supply, the average farm-gate price of opium decreased by about 40 per cent since last year.[24] The farm-gate price of dry opium at harvest time fell to an average of 94 US$/kg in 2018, which is one of the lowest prices ever recorded (after adjusting for inflation). In addition to that, the calculation of the export value of Afghan opiates was adjusted, which contributed to the reduction of the value of the opiate economy, too.

The low yields and low prices affected the income earned from opium cultivation by farmers. At US$ 604 million (530 – 680 million), equivalent to roughly 3 per cent of Afghanistan's estimated GDP,[25] the farm-gate value of opium production decreased by 56 per cent[26] when compared to past year (estimated at 1.4 billion US$) and is at its second lowest level since 2010.

The average income earned from opium poppy cultivation in Afghanistan was thus less than half of what was earned in the previous year. In certain areas, where the drought had its strongest impact, many farmers faced a complete loss of income from opium poppy.

[21] It should be stressed that despite ongoing improvements in the estimates of the opiate economy through additional information-gathering activities, economic calculations remain far less robust than estimates of the area under cultivation, opium yield and opium production. The calculations presented here are intended to provide reasonable orders of magnitude of the income generated rather than exact amounts.

[22] National Statistics and Information Authority (NSIA) of the Government of the Islamic Republic of Afghanistan.

[23] NSIA, Afghanistan. These estimates of the agricultural sector do not include the farm-gate value of opium poppy.

[24] UNODC, Afghanistan Opium Survey 2018, Cultivation and Production

[25] Estimated at USD 20.4 billion excluding opium for the Afghan year 2017-2018. Source: NSIA, Afghanistan

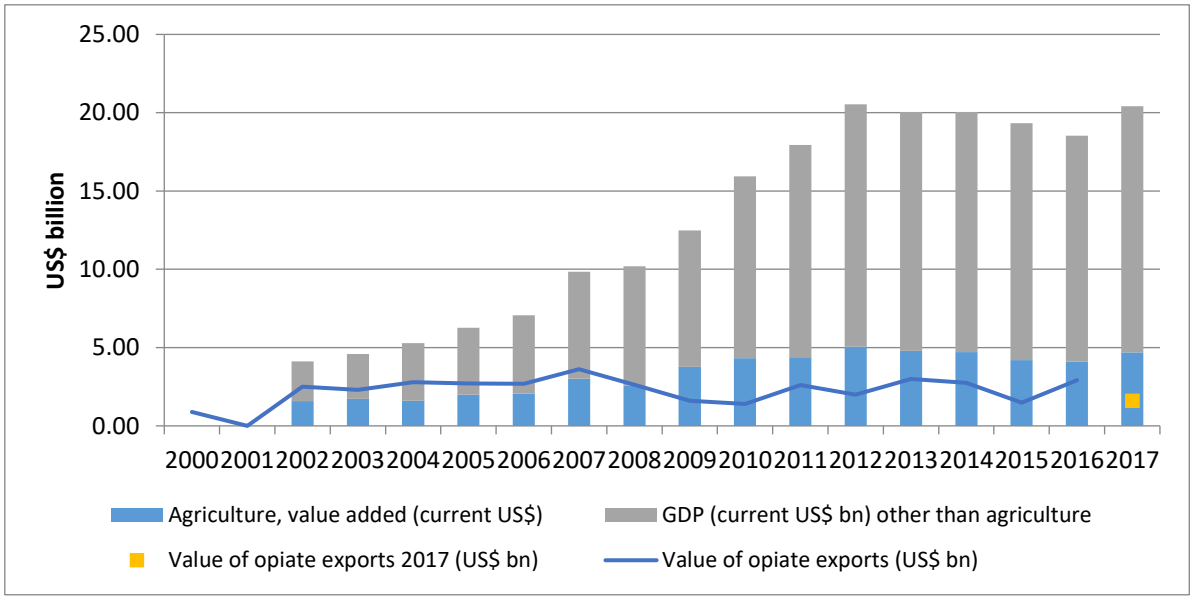
[26] Without adjustment for inflation. Figures are rounded; calculations are based on raw values.

TABLE 1 ESTIMATED GROSS AND NET VALUES OF THE OPIATE ECONOMY, 2018

	Gross value US$ (rounded)	Value in relation to GDP
Value of opiate economy (gross)	1.2 – 2.2 billion	6 – 11%
Value of opiates potentially available for export	1.1 – 2.1 billion	5 – 10%
Value of domestic use market	90 million	0.45%
Value of imported precursor substances	90 – 190 million	0.46 – 0.94%
Farm-gate value of opium	604 million (530 – 680 million)	3%
Value of production and trafficking after farm-gate to the border (net)	0.5 – 1.3 billion	2 – 7%

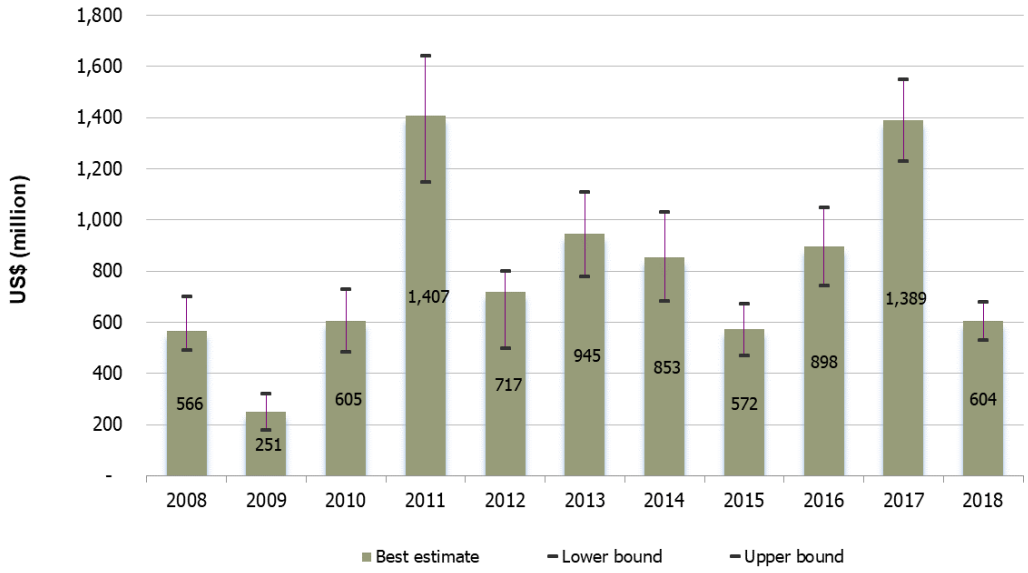
Note: Ranges are calculated based on different assumptions on the conversion of opium to morphine/heroin within Afghanistan and on the purity of the exported products. "Value of the opiate economy (gross)" is the sum of the value of the domestic market and the value of opiates believed to be exported, including the value of the imported precursor substance acetic anhydride. The net value of the opiate economy excludes the value of imported precursor substances. Details on the calculation and the underlying assumptions are provided in the methodology section. "Value of production and trafficking after farm-gate to the border (net)" is the value added in the opiate economy after the farm-gate value with costs for imported precursor substances subtracted. Figures are rounded; calculations are based on raw values.

FIGURE 16 GDP, BY VALUE ADDED OF THE AGRICULTURAL SECTOR AND OTHER SECTORS, AND ESTIMATED GROSS VALUE OF OPIATE EXPORTS, AFGHANISTAN, (US$ BILLION) 2000-2018



Source: MCN/UNODC Afghanistan opium surveys (value of opiate exports); World Bank (GDP and value added of the agricultural sector, 2002-2015); CSO/NSIA Afghanistan (GDP and value added of the agricultural sector, 2015/16, 2016/17 and 2017/18). Note: The gross value of opiate exports is shown because of data availability prior to 2011. For comparison with GDP, the value of the opiate economy without the costs for imported precursor substances is more appropriate. Due to a change in methodology, the estimates for 2016 and 2017 are not directly comparable.

FIGURE 17 FARM-GATE VALUE OF OPIUM PRODUCTION IN AFGHANISTAN, 2008-2018 (MILLION US DOLLARS)



Opium poppy cultivation as economic factor in rural Afghanistan

Opium poppy has become a crucial element in the livelihoods of many Afghans who engage in cultivation, work on poppy fields or partake in the illicit drug trade. In rural areas, a considerable share of the rural population was economically benefiting from opium poppy cultivation in 2018, as about 35 per cent of all village headmen reported that at least some villagers cultivated opium poppy. This share remained stable when compared to 2017.

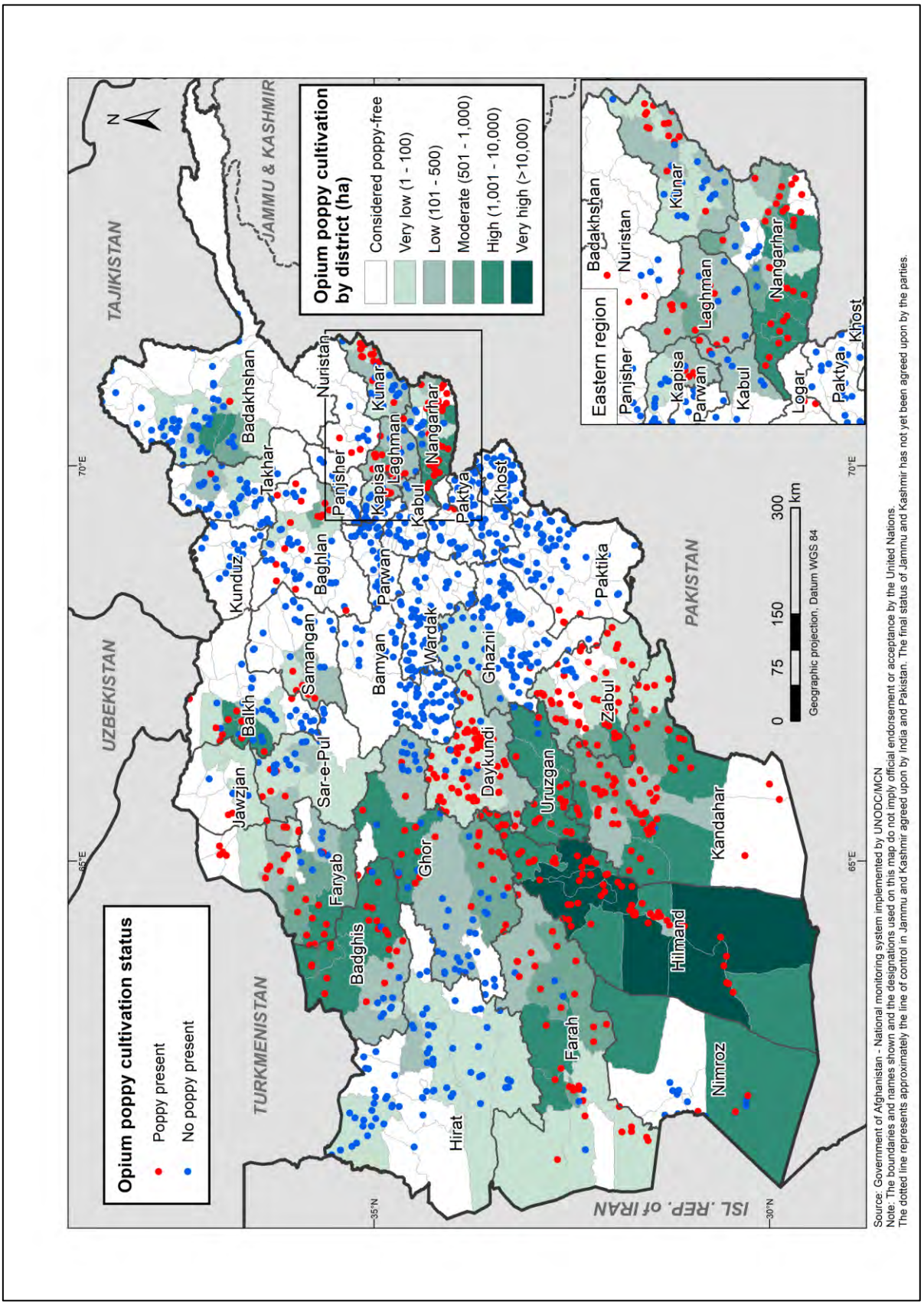
The national average hid large regional differences. In the Central region only 2 per cent of villages cultivated opium poppy in 2018. In other regions the concentration was much higher. In the Eastern region, more than half of the villages partook in opium poppy cultivation; in the Southern region it was almost 93 per cent. In Hilmand province, the randomly selected villages did not include a single village without opium poppy cultivation.

The role opium poppy plays in the economy of a household is not fixed and can change from year to year. Cultivating opium poppy is one of the many coping strategies that a rural household may employ for securing its livelihood.[27] Livelihood strategies adopted by a household – poppy growing or others – are not constant and change over time in response to changed circumstances, such as increased monetary needs or adverse weather conditions in the crop growing season. Thus, the decision to cultivate opium poppy can change from one year to the next.

Opium poppy farmers of 2018 were asked if they had cultivated opium poppy in the five years prior to 2018. Despite the overall decrease in cultivation levels, six per cent of all opium poppy farmers reported that they had cultivated opium poppy for the first time or took up cultivation in 2018 after stopping for at least five years. The survey did not estimate the share of farmers who quit in 2018 after cultivating in 2017.

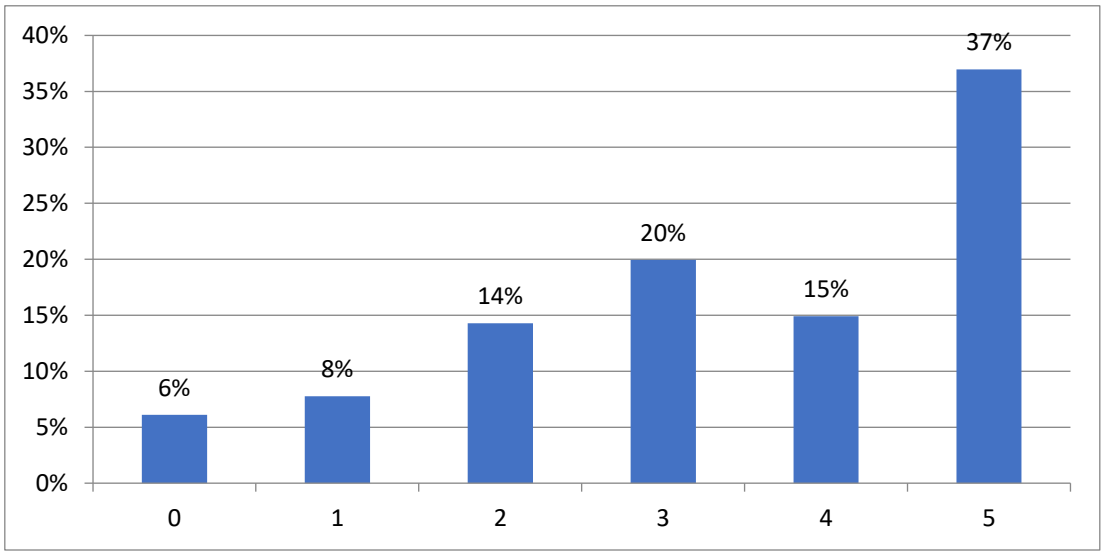
[27] Livelihood is understood as all activities and decisions that enable members of a household to sustain their living.

MAP 1 SURVEYED VILLAGES BY OPIUM POPPY CULTIVATION, 2018



Source: Government of Afghanistan - National monitoring system implemented by UNODC/MCN
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The dotted line represents approximately the line of control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

FIGURE 18 FREQUENCY OF OPIUM POPPY CULTIVATION BETWEEN 2012 AND 2016 OF FARMERS WHO CULTIVATED OPIUM POPPY IN 2018



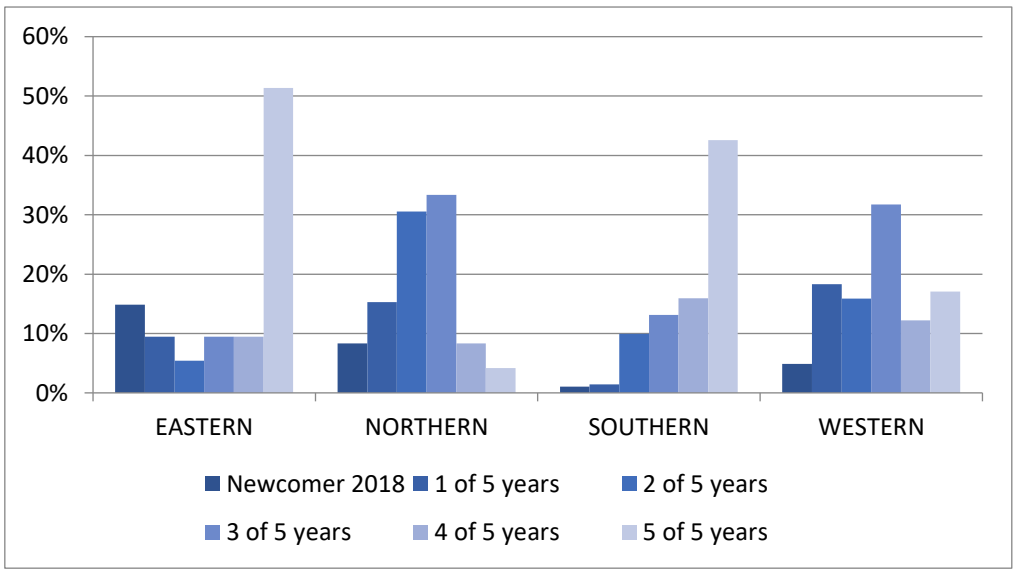
Note: Farmers who cultivated opium poppy were asked if and when they had cultivated opium in the past five years.

A share of 37 per cent of opium poppy farmers reported to have cultivated opium poppy each year between 2013 and 2017 (in addition to 2018). The remaining 57 per cent of farmers cultivated opium poppy in between one and four years out of the past five years.

The largest share of newcomers was found in the Eastern region, where 15 per cent of all interviewed farmers cultivated opium poppy for the first time in 2018. The lowest share of newcomers was in the Southern region where one per cent of all interviewed farmers cultivated opium poppy for the first time in 2018. The share of farmers who cultivated 5 out of 5 years was the lowest in the Northern region (4 per cent) and the highest in the Eastern region (51 per cent).

During the survey work 'active' opium farmers of 2018 were interviewed during harvest time. The survey did not capture the views of farmers who attempted to cultivate opium poppy in 2018 but did not do it because of the drought.

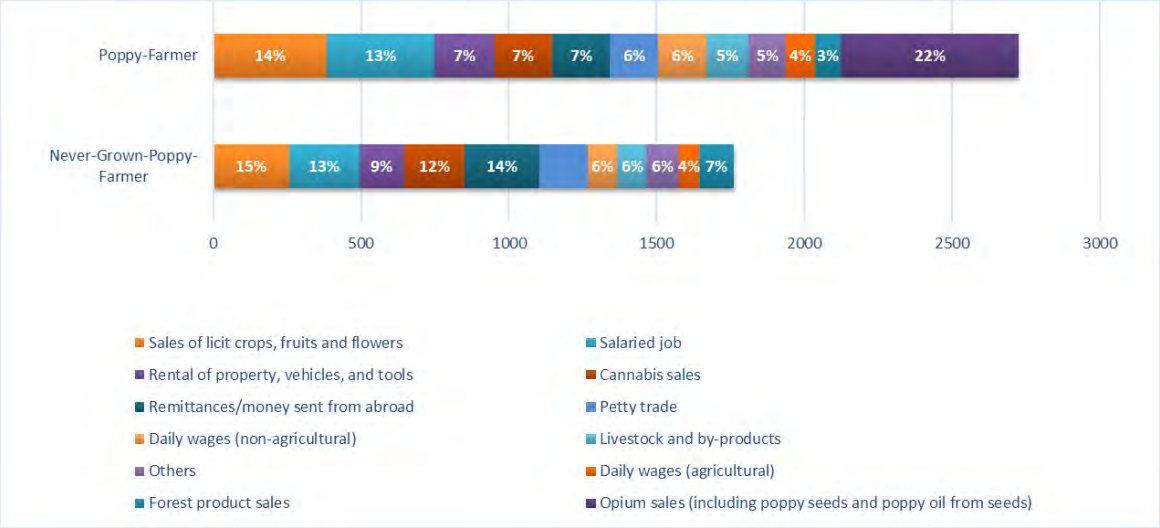
FIGURE 19 FREQUENCY OF OPIUM POPPY CULTIVATION BETWEEN 2013 AND 2017 OF FARMERS WHO CULTIVATED OPIUM POPPY IN 2018, SELECTED REGIONS



One indicator of the relevance of opium poppy in a household is the share of household income it provided to farming households. For opium poppy farmers, sales of opium poppy and derivatives constituted the main source of income in the year before the survey. On average, such sales accounted for 22 per cent of the annual household income of poppy farmers.

In terms of absolute household income, farmers who cultivated opium poppy reported a higher income than farmers who reportedly never had cultivated opium poppy. However, excluding income from opium poppy cultivation reversed the order. Once opium had been excluded, the main sources of income for poppy farmers were sales of licit crops, salaried jobs and rental of property, vehicles or tools. The main sources of income for farmers who had never grown poppy were revenue from the sale of licit crops, remittances and salaried jobs.

FIGURE 20 SHARES OF TOTAL ANNUAL INCOME PER INCOME-GENERATING ACTIVITY BY TYPE OF FARMER IN AFGHANISTAN, 2018



Since the decision to cultivate opium poppy can change from one year to the next, an absolute divide of farmers into opium-poppy and non-opium-poppy growers is an oversimplification. A farmer might cultivate opium poppy in one year and abstain in the next – depending on the fluctuating economic needs and opportunities.

MCN/UNODC research on infrequent and frequent opium poppy farmers[28] indicated that infrequent opium poppy farmers appear to have a higher non-poppy income than frequent opium poppy farmers, which is an indication that their livelihoods do not rely as much on opium poppy as the livelihoods of those who cultivate poppy more frequently. Farmers who had never cultivated opium poppy reported the average lowest income of all types of farmers – indicating that income is not the only factor that influences whether farmers cultivate opium poppy.

Using household income to measure standards of living or livelihood opportunities has its limitations. In poor rural economies with a substantial variability of income associated with seasonality and high degrees of self-consumption, standards of living also depend on other household assets, such as livestock and size of landholdings, as well as on local costs of living.

[28] Farmers were classified as frequent poppy farmers if they cultivated opium poppy in at least four out of the five previous years and as infrequent farmers if they cultivated opium poppy in less than four years in that time period.

Opium poppy lancing as a significant source of income and labour

Opium poppy cultivation provides access to daily wage labour for a large number of farmers and temporal workers, as it is work intensive. Over a period of 8 to 12 days, lancers visit the fields, lance mature opium poppy capsules and return on the next day to manually collect the opium gum that had oozed out overnight.

The work force hired by farmers for harvesting opium was substantial. In 2018, opium poppy weeding and harvesting provided the equivalent of up to 190,700 full time[29] jobs to local and migrant workers hired by farmers.[30] Family labour, e.g. labour by members of an opium poppy cultivating household, is not included in this estimate.

In 2018, MCN/UNODC village surveys conducted interviews with opium poppy lancers.[31] On average, lancers reported they worked for 15 days and harvested opium for two farmers during the past season.

The daily wages reported by lancers are considerable when compared to earnings from licit activities. At the national level, the average daily wage of a lancer interviewed in the survey was US$ 12 in 2018, which would mean an average income of US$ 170 per lancer per season. The wages of lancers varied strongly across regions. Incomes were lower in the Eastern and Western regions (US$ 94 per lancer per season) and highest in the Southern region (US$ 194 per lancer per season).

The regional disparities are consistent with the information collected about the difficulty to find labourers for poppy opium lancing and weeding: 80 per cent of farmers in the Southern region stated they had difficulties finding labourers. The share was much lower in the Western and Eastern region with respectively 41 per cent and 59 per cent of farmers stating having had difficulties in finding labourers for opium poppy weeding and lancing. Overall some three-quarters of farmers reported at least some degree difficulties in finding labourers.

The higher wages for lancing were also confirmed by information provided by farmers. The daily wages for lancing reported by farmers were US$ 7.7 in 2018, almost twice as much as wages for other farming related jobs (US$ 4) and almost 40 per cent more than non-farming jobs (US$ 4.8), e.g. construction work on roads. In 2018, the combined wages for opium poppy labour amounted to US$ 270 million, or 44 per cent of the farm-gate value of opium that year.

Hired labourers are not only paid in cash: almost all farmers and lancers reported that labourers were provided with daily food and 20 per cent of lancers reported being paid in opium.

According to the interviewers in the field,[32] there is a scheme for paying teams of lancers with opium. Depending on the amounts harvested all opium lancers would receive a certain portion of the harvest (one fourth appeared to be the most common share, but one third or one fifth has been named, too) instead of a cash payment.

Payments in opium were most common in the Southern region, where 22 per cent of lancers reported this practice. In the Eastern region, on the other hand, only one per cent of lancers reported being paid in opium.

Those lancers who were paid in opium reported to receive about half a kilogram of opium on average (with the smallest amounts in the Eastern region and the largest amounts in the Southern region). The village survey did not collect enough details to calculate an average amount of opium per lancer or per farmer. The amounts reported seem, however, account for a substantive proportion of the annual opium harvest

[29] Full time job assumed to have 200 working days a year.

[30] Opium farmers where asked how many persons they employed for poppy weeding and harvesting in the previous year. The average number of labourers employed per hectare was extrapolated to the area under cultivation in 2018. The estimated number of full-time jobs (equivalent to 200 working days a year) refers to labour created in addition to the income it provides to farming households.

[31] Given that this is the first year lancers were interviewed, the data can not be compared to previous years.

[32] Based on qualitative interviews with a small number of lancers and interviewers with local knowledge.

that is paid out to lancers. It appears to be common practice that lancers try to find a local trader to sell the opium to, as keeping the opium is deemed to be risky (fear of seizures through law enforcement). [33]

The survey did not collect any data on opium consumption by lancers. However, there is well-established link between opium poppy cultivation and illicit drug use in Afghanistan. The rates of opiate use are considerable in Afghanistan, specifically in rural areas. Previous research has shown that drug use affected 31 per cent of households at the national level and 39 per cent of rural households.[34] While drug treatment capabilities remain limited, opium poppy was reportedly used for relieving pain and against tiredness.[35]

Lancers are not only daily wage labourers, but as well opium farmers who earn and additional income from lancing. A share of 16 per cent of all farmers interviewed (poppy and non-poppy farmers) indicated that they worked as lancers for other farmers. More than a quarter of farmers from the Eastern region (28 per cent) worked as lancers while only 4 per cent of famers in the Northern region did so.

Among farmers who cultivated opium poppy themselves, some 20 per cent report to have worked as lancers. A certain share of farmers who have never grown opium poppy are directly earning income from the opium poppy economy: out of these farmers, 13 per cent reported to have worked as lancers.

Use of poppy income farmers and lancers

The MCN/UNODC village survey asked poppy farmers about their use of the income from opium. Food, medical expenses, and paying debt were the three most common uses of opium income reported by farmers. Investment in property, education, or other activities that have potential in building alternatives to opium poppy cultivation, were reported by fewer farmers. The findings of the 2018 village survey confirmed the findings of previous years.

Similar to farmers, lancers also indicated food, medical expenses and paying debt as their main uses of income.

[33] Ibid.
[34] UNODC, Sustainable development in an opium production environement, Afghanistan opium survey report 2016
[35] Ibid.

FIGURE 21 MOST IMPORTANT USES OF INCOME FROM OPIUM POPPY AS REPORTED BY POPPY FARMERS IN 2017, (REPORTED IN 2018)

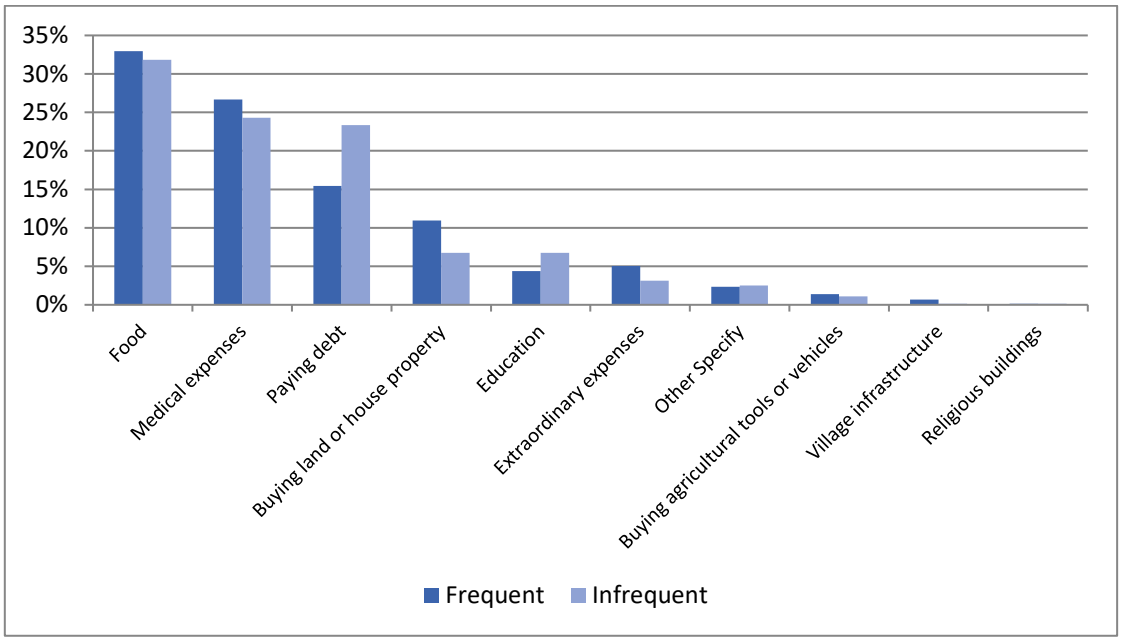
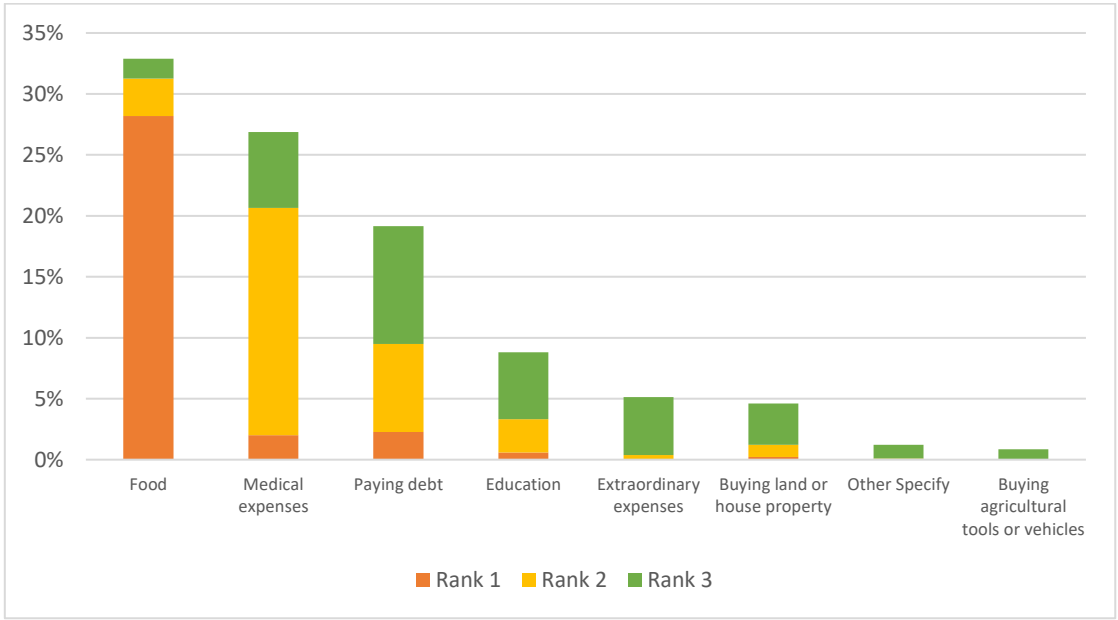


FIGURE 22 USE OF INCOME BY LANCERS, 2018



Discussion

The results of the MCN/UNODC village survey demonstrate that the Afghan opium economy in 2018 can be considered as an important pillar of Afghanistan's economy and rural society.

Opium poppy, being a lucrative cash crop with well-established markets and trade networks, has become a crucial component in securing the livelihoods of many Afghans who engaged in cultivation, worked on poppy fields or participated in the illicit drug trade. Opium poppy provided much needed income to many impoverished farming households in rural areas, as well as to many labourers, who worked as opium poppy harvesters on the fields.

The village survey confirmed that the wages in the opium economy are substantially higher than those obtained from licit farming and non-farming activities, thus increasing the potential appeal of opium poppy

related labour such as lancing. Lancers receive payments in cash but at times also in opium, with potentially exacerbates the already high levels of opiate consumption in the country.

Opium poppy farmers and lancers invest their income from opium in food, paying debt, and to cover medical expenses. Investment in property, education, or other activities that have potential in building alternatives to opium poppy cultivation, were reported by fewer farmers and lancers. The potential that opium poppy cultivation and lancing has for sustainably improving livelihoods of the rural population appears to be limited.

Peace, security and the rule of law

Rule-of-law related challenges, such as political instability, lack of government control and security, as well as corruption, have been found to be main drivers of illicit opium cultivation in Afghanistan. The 2018 MCN/UNODC opium survey confirmed the links between insecurity, the lack of government control and rule of law, and increased opium poppy cultivation. It explored the perception of risk of legal consequences for opium poppy cultivation in villages and assessed trends in funding of insurgency from opium cultivation, insecurity and government control.

Opium poppy cultivation is more prevalent in villages controlled by non-state authorities

Government control and government presence, and related concepts such as the strength of the rule-of-law and access to justice are difficult to measure. Afghanistan's power structure is scattered and complex, and the Afghan state has difficulties to enforce its will in many parts of the country. The MCN/UNODC village survey aimed at capturing government control and government presence by asking for the village headmen's perceptions and by asking for presence or absence of services usually provided by the state.

In 2018, 35 per cent of all headmen reported in the survey that the village was not under the control of the government. [36] Among those, 30 per cent reported that it was under the control of insurgency or anti-government elements and 5 per cent reported "others".[37] One per cent of headmen, predominantly in the Central region, reported that the village was under the control of both the government and anti-government forces in 2018. The remaining 64 per cent of village headmen reported that the government was in control of the village. There was no significant change in the control of villages compared to 2017.[38]

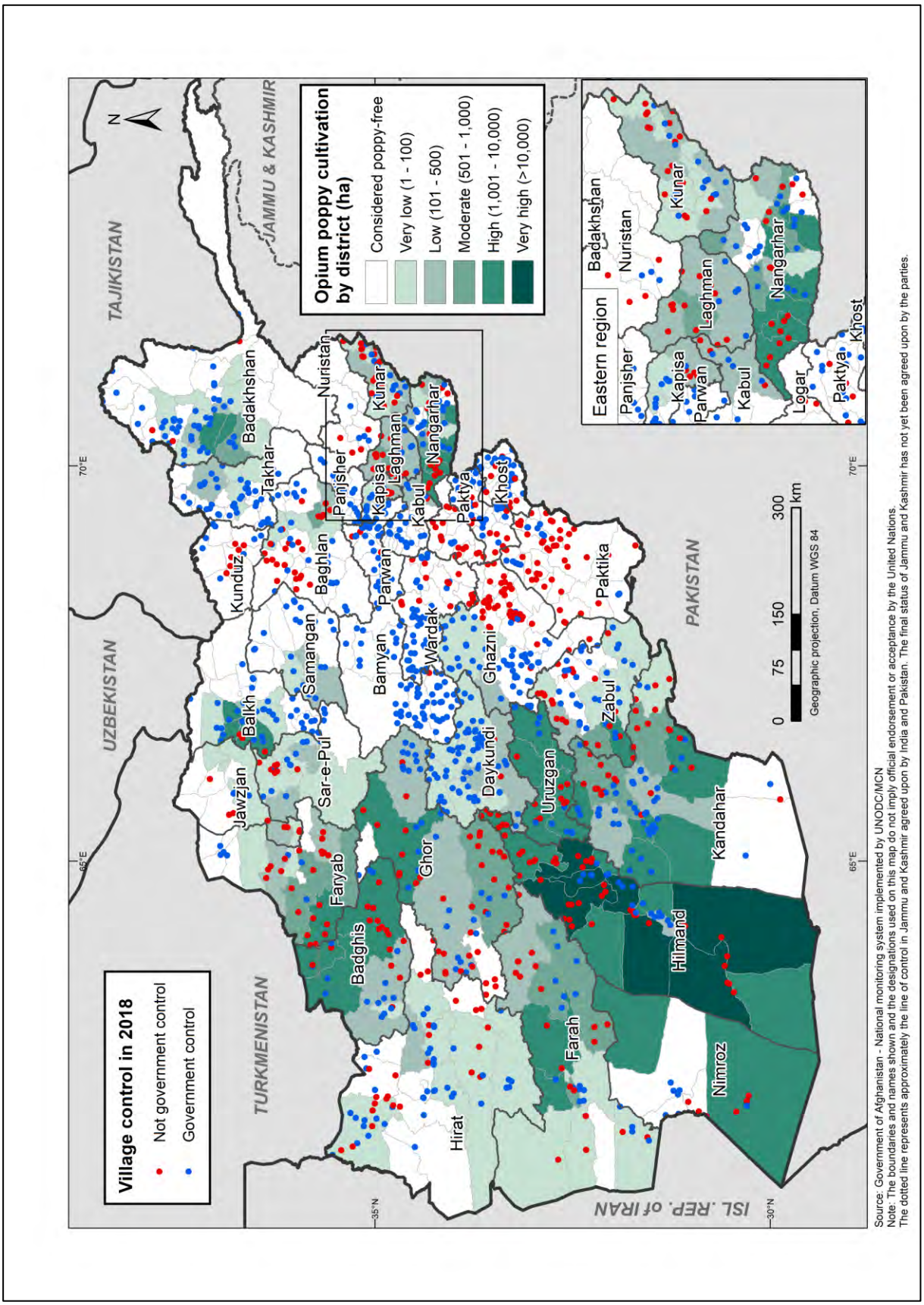
Where opium poppy cultivation took place, the share of villages outside of government control was much higher: 53 per cent of all headmen of poppy villages reported that the village was under control of insurgency and other non-state actors. Among villages without opium poppy cultivation, the share was 26 per cent.

[36] The notion of government control reflected the perception of the village headmen interviewed. What 'control' meant varied between different regions or even villages and being under control of the government or under non-state authorities did not necessarily mean that one or the other had no influence in the village. See as well *Mansfield, David, Understanding Control and Influence: What Opium Poppy and Tax Reveal about the Writ of the Afghan State (AREU, August 2017,* https://areu.org.af/wp-content/uploads/2017/08/1724E-Understanding-Control-and-Influence1.pdf*)* on varying degrees of control of state and non-state authorities in Afghanistan.

[37] No information was provided to what kind of groupings "others" refer.

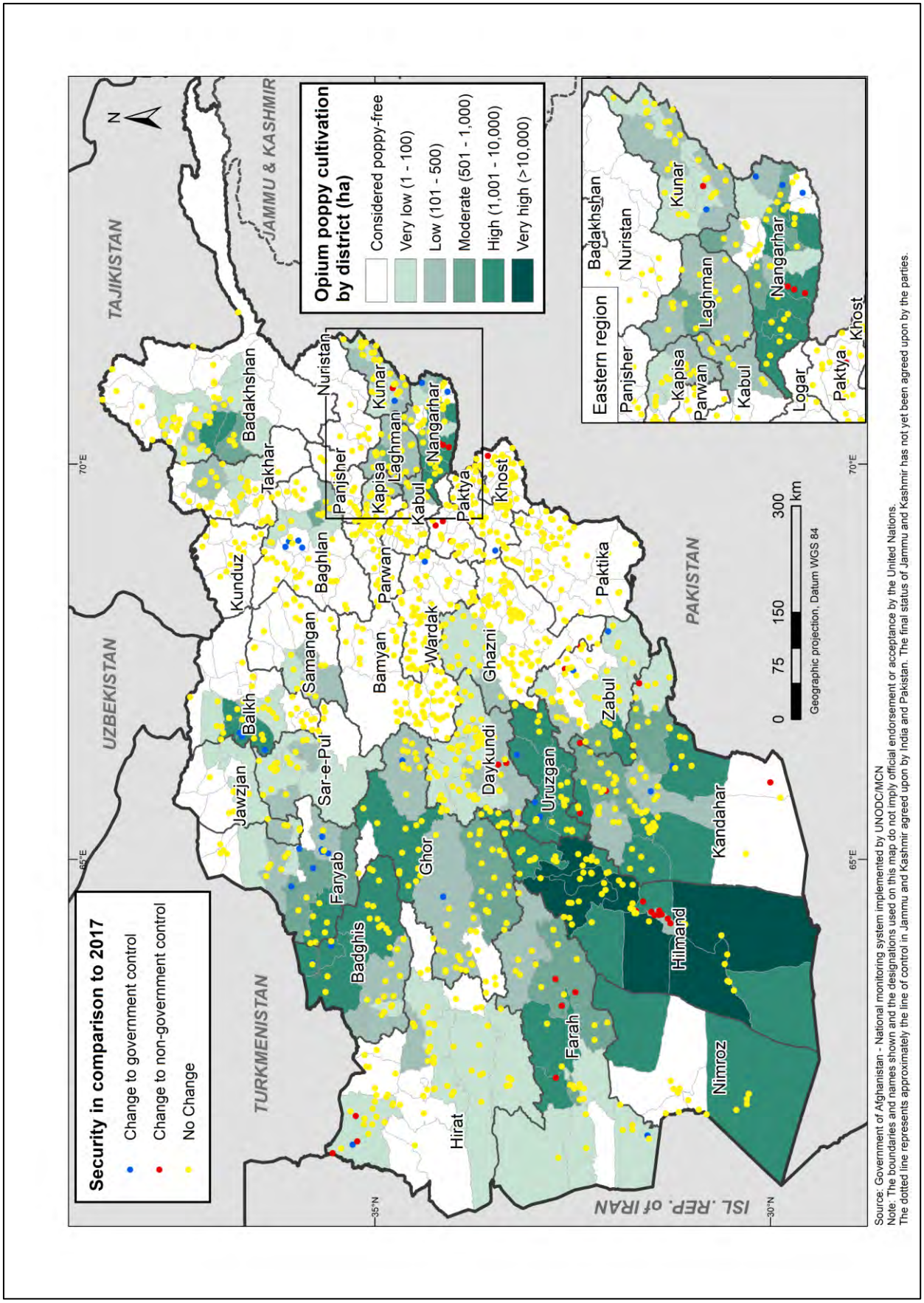
[38] Village headmen were asked about changes in government control: According to the interviews, the government lost control in about two per cent of all villages between 2017 and 2018, but re-gained control in around three per cent.

MAP 2 GOVERNMENT CONTROL IN SAMPLED VILLAGES AS REPORTED BY VILLAGE HEADMEN, 2018



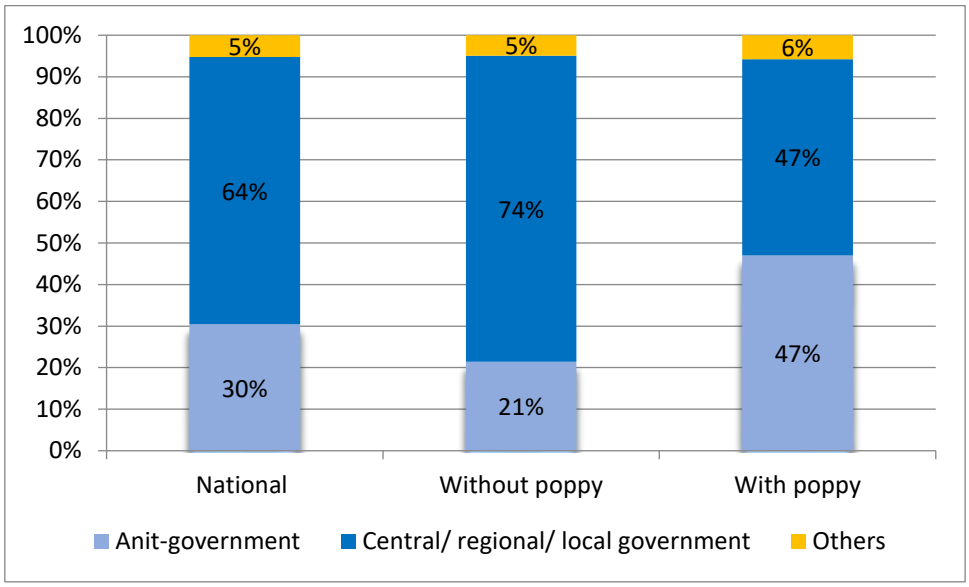
Source: Government of Afghanistan - National monitoring system implemented by UNODC/MCN
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The dotted line represents approximately the line of control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

MAP 3 CHANGE IN GOVERNMENT CONTROL IN SAMPLED VILLAGES AS REPORTED BY VILLAGE HEADMEN BETWEEN 2017 AND 2018



Source: Government of Afghanistan - National monitoring system implemented by UNODC/MCN
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The dotted line represents approximately the line of control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

FIGURE 23 GOVERNMENT CONTROL IN VILLAGES AS REPORTED BY VILLAGE HEADMEN, BY OPIUM CULTIVATION STATUS, 2018

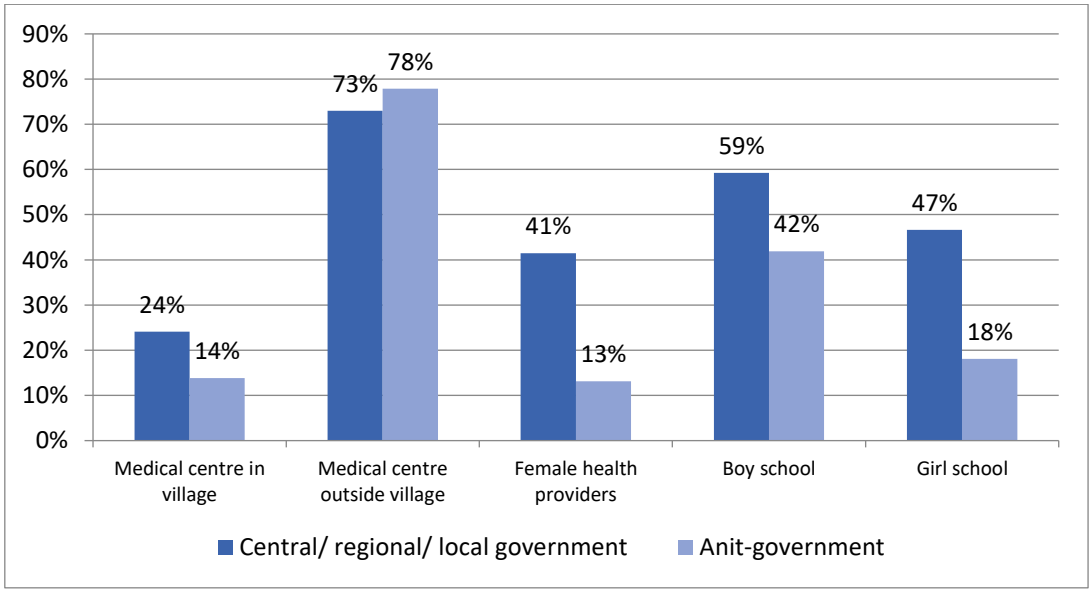


Note: Percentages reflect the perception of village headmen and could not be verified by the interviewers.

TABLE 2 CONTROL OF THE VILLAGE, AS REPORTED BY THE VILLAGE HEADMEN, 2018

	Anti-government	Central/ regional/ local government	Others
Central	32%	64%	5%
Eastern	45%	54%	1%
North-eastern	8%	92%	0%
Northern	24%	73%	3%
Southern	38%	62%	0%
Western	28%	53%	19%
National	**30%**	**64%**	**5%**

FIGURE 24 SHARE OF VILLAGES WITH ACCESS TO MEDICAL AND EDUCATION FACILITIES, BY CONTROL OF VILLAGE, 2018



Government control is associated with better access to medical and educational facilities for the people living in the village, especially girls and women. In villages under government control, 47 per cent of headmen indicated girls had access to a school while in villages under the control of anti-government forces the share was only 18 per cent. Access to female health providers was available in 41 per cent villages under government control, but only in 13 per cent of villages outside the control of the government.

When comparing opium poppy cultivating villages with poppy-free villages, it became apparent that opium poppy cultivation is strongly linked to more limited access to essential infrastructure and services.

The results have been very consistent over the years and showed that opium poppy villages had – on average – significantly less access to infrastructure and services relevant for sustainable development. A detailed analysis of the differences can be found in the MCN/UNODC report "Sustainable development in an opium production environment - Afghanistan Opium Survey Report 2016" and in a recent issue of the UNODC Bulletin on Narcotics.[39]

Not only the presence or absence of the government was linked to opium poppy cultivation, but also the relationship of villagers to the government seemed to play a role. Findings from in-depth research of UNODC on alternative development programmes in Afghanistan showed that lack of trust in the government was a strong explanatory factor for the presence of opium poppy cultivation, too.[40] The research found that villagers who did not trust the government to protect its citizens or to guard them against corruption, were more likely to cultivate opium poppy.

Perception of risk of legal consequences of opium poppy cultivation

In 2018, some 406 hectares of opium poppy were eradicated, which is about 0.15 per cent of the total area under cultivation. In 2018/2019, the Counter Narcotics Justices Center recorded 810 cases with 1,153 suspects of drug trafficking. Out of these, some 20 per cent were detained in attempting to traffic drugs from Kabul airport via plane to outside of Afghanistan. In the same period of time, 1,000 suspects in connection to 682 cases were convicted with sentences from one year and six months to 21 years and more in prison. To date, no reliable data exists on the number of persons involved in the cultivation and production of opium and in heroin manufacture, but it can be expected that law enforcement success remains limited in comparison to the size of the opiate economy in Afghanistan.

Possible legal consequences can be one among many factors in farmer's decision making on opium poppy cultivation. Despite comparatively small areas eradicated, farmers have consistently named "fear of eradication" as one of the main reasons for stopping opium poppy cultivation in previous years' MCN/UNODC village surveys. Risk perception and actual risk may thus be diverting.

In 2018, MCN/UNODC asked village headmen about an assessment of the likelihood of legal consequences for opium poppy cultivation. The risk assessment is the opinion of headmen based on their experience. MCN/UNODC could not verify the reports. It cannot be excluded that the responses were subject to a so-called social-desirability-bias, where respondents to a survey answer questions in a way that will be viewed positively by others.[41]

Overall, 38 per cent of village headmen assessed that legal consequences are 'likely' or 'very likely'. Among opium poppy cultivating villages, this share was 28 per cent and among non-poppy villages 45 per cent. The share of 'unlikely' and 'very unlikely' responses was similar across villages, the category 'somewhat

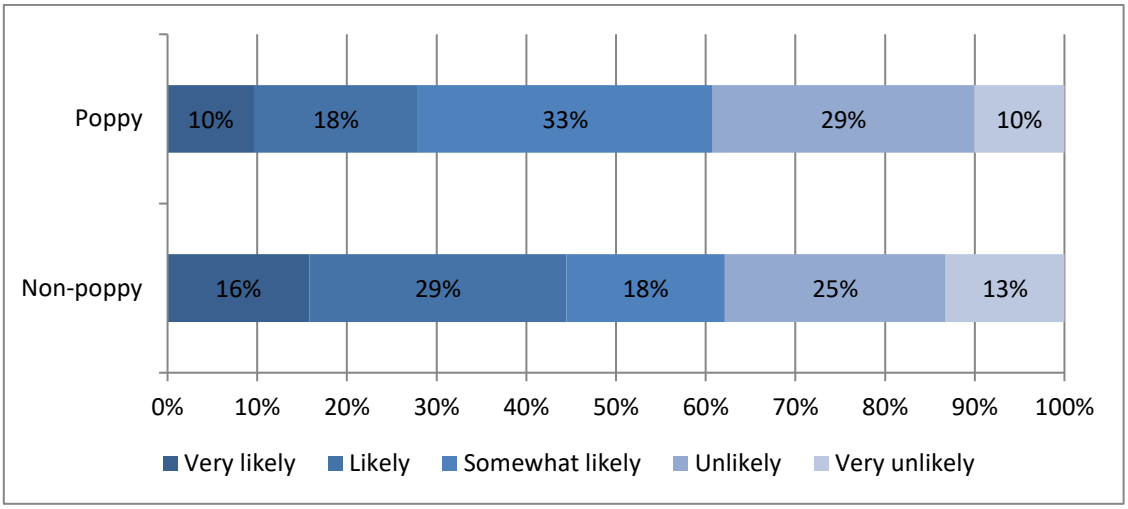
[39] https://www.unodc.org/unodc/en/crop-monitoring/index.html; García-Yi, J. "Building resilience to opium poppy cultivation by strengthening the design of alternative development interventions: evidence from Afghanistan" in UNODC Bulletin on narcotics, Volume LXI, 2017, "Alternative development: practices and reflections".

[40] UNODC, "Baseline report and impact assessment of alternative development projects in Afghanistan", forthcoming.

[41] See e.g., Krumpal, Ivar. "Determinants of social desirability bias in sensitive surveys: a literature review." *Quality & Quantity* 47.4 (2013): 2025-2047.

likely' made the difference: in poppy villages, this was the response of 33 per cent of headmen, in non-poppy villages of 18 per cent.

FIGURE 25 RISK OF FACING LEGAL CONSEQUENCES FOR OPIUM POPPY CULTIVATION, BY OPIUM POPPY CULTIVATION STATUS, 2018



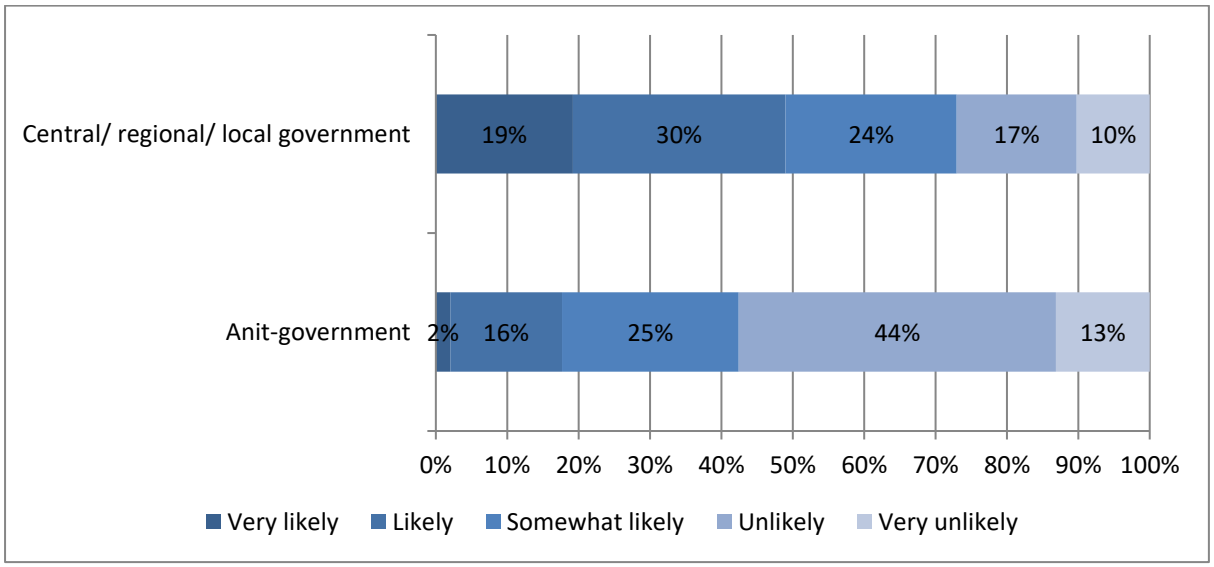
Looking at the risk assessment of headmen by government control made showed strong differences in risk perception, too. In villages under the control of the government 49 per cent of village headmen found legal consequences to be likely or very likely, whereas only 18 per cent of headmen in non-government-controlled villages said the same. The difference in unlikely and very unlikely responses was more pronounced: 27 per cent of village headmen responded that way in government-controlled villages, while 57 per cent of headmen responded that way in non-government-controlled villages.

Previous UNODC/MCN village surveys also showed that government control was linked to access (or lack thereof) to dispute resolution mechanisms.[42] Villages under insurgency control use anti-governmental organizations much more often for dispute resolution than villages under government control. In villages under "other" control, traditional justice mechanisms and respected members of the community were the most frequently named dispute resolution mechanisms.

When asked about efficacy of dispute resolution, anti-government organizations were perceived to be most ineffective: 8 per cent of village headmen found anti-government organizations to be very ineffective and 41 per cent ineffective. In comparison, less than 1 per cent of village headmen considered traditional justice systems to by very inefficient, and 18 per cent considered them inefficient. The majority of village headmen who reported a government official as the main dispute resolution method found it to be effective (49 per cent) or very effective (30 per cent).

[42] UNODC

FIGURE 26 LIKELIHOOD OF FACING LEGAL CONSEQUENCES FOR OPIUM POPPY CULTIVATION, 2018

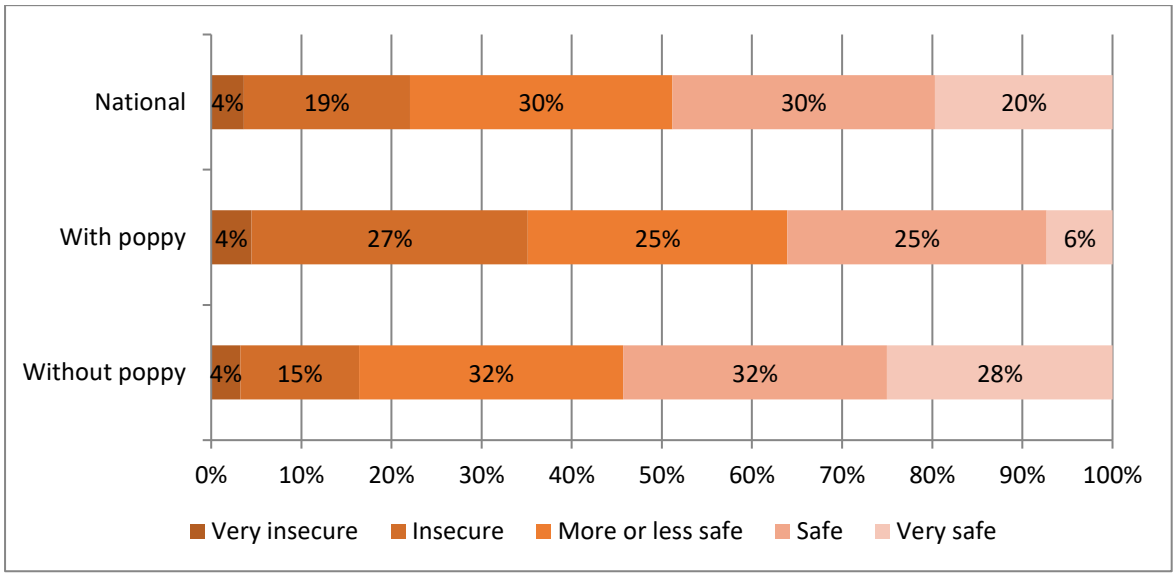


Insecurity and opium poppy cultivation

As in previous years, village headmen were asked to assess whether the village was very safe, safe, more or less safe, insecure or very insecure. The findings confirmed patterns of previous years, where opium poppy cultivation tends to take place in less secure areas and in areas where the security situation was perceived as deteriorating.

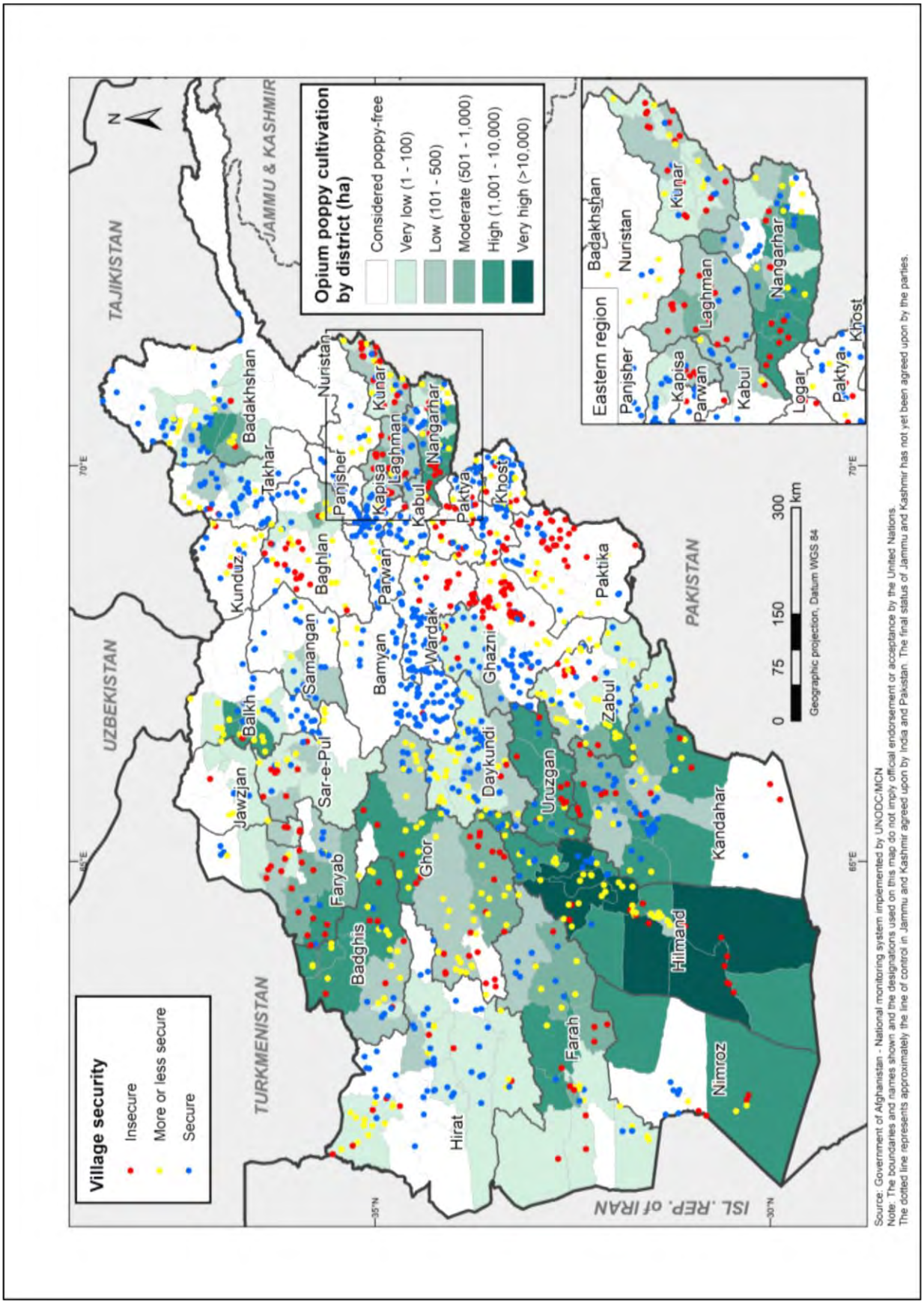
In 2018, at the national level, about a quarter of village headmen (23 per cent) assessed that their village was insecure or very insecure. Among villages with opium poppy cultivation 31 per cent of headmen considered their village as insecure or very insecure, whereas only 19 per cent of villages without opium poppy cultivation reported the same.[43]

FIGURE 27 SECURITY ASSESSMENT BY VILLAGE HEADMEN, BY OPIUM POPPY CULTIVATION, 2018

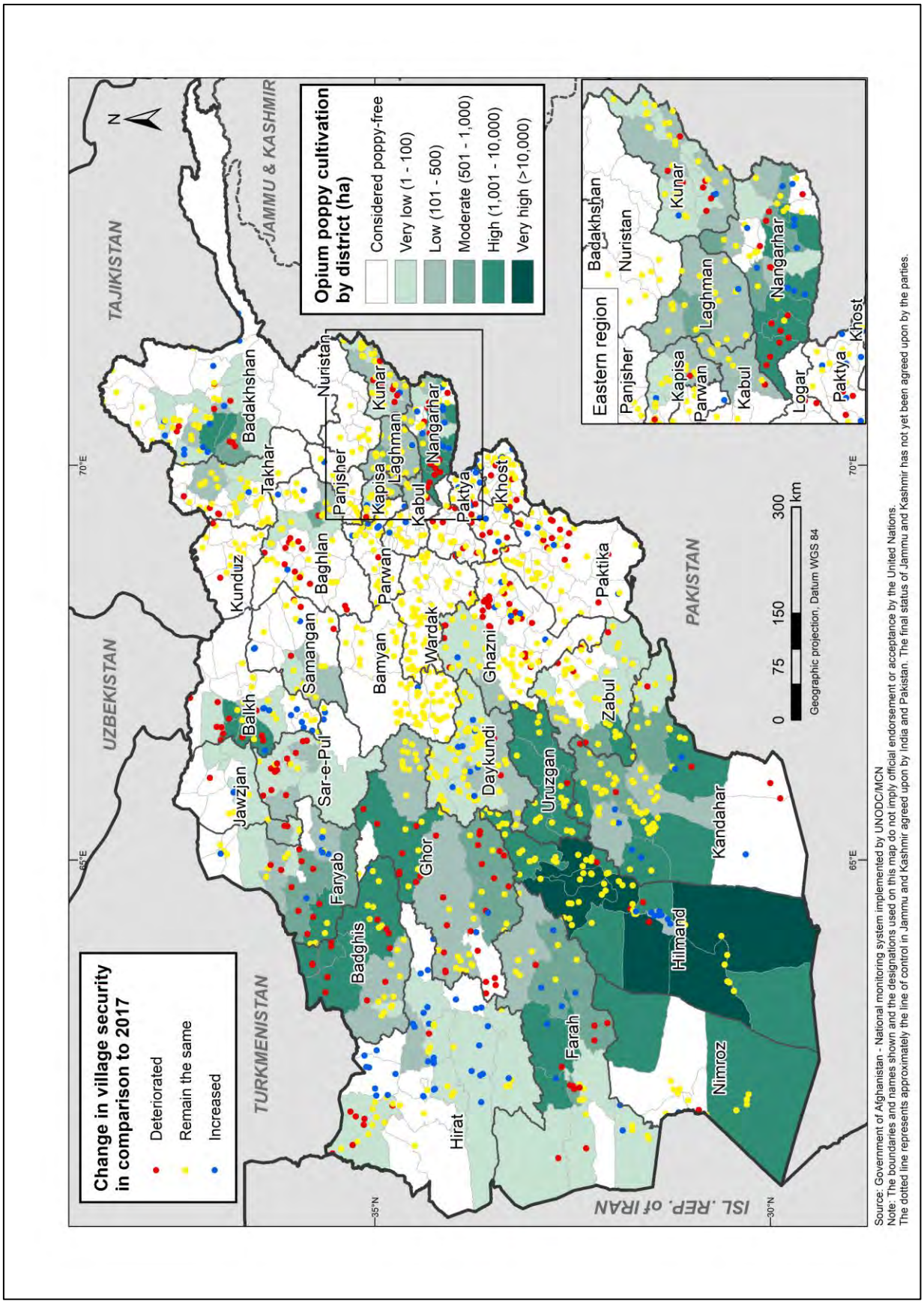


[43] Please note, that the reported security situation reflects the assessment of the village headmen. MCN/UNODC could not verify the reports.

MAP 4 SECURITY LEVELS IN SAMPLED VILLAGES ACCORDING TO VILLAGE HEADMEN, 2018



MAP 5 CHANGE IN SECURITY LEVELS IN SAMPLED VILLAGES BETWEEN 2017 AND 2018 ACCORDING TO VILLAGE HEADMEN



Source: Government of Afghanistan - National monitoring system implemented by UNODC/MCN
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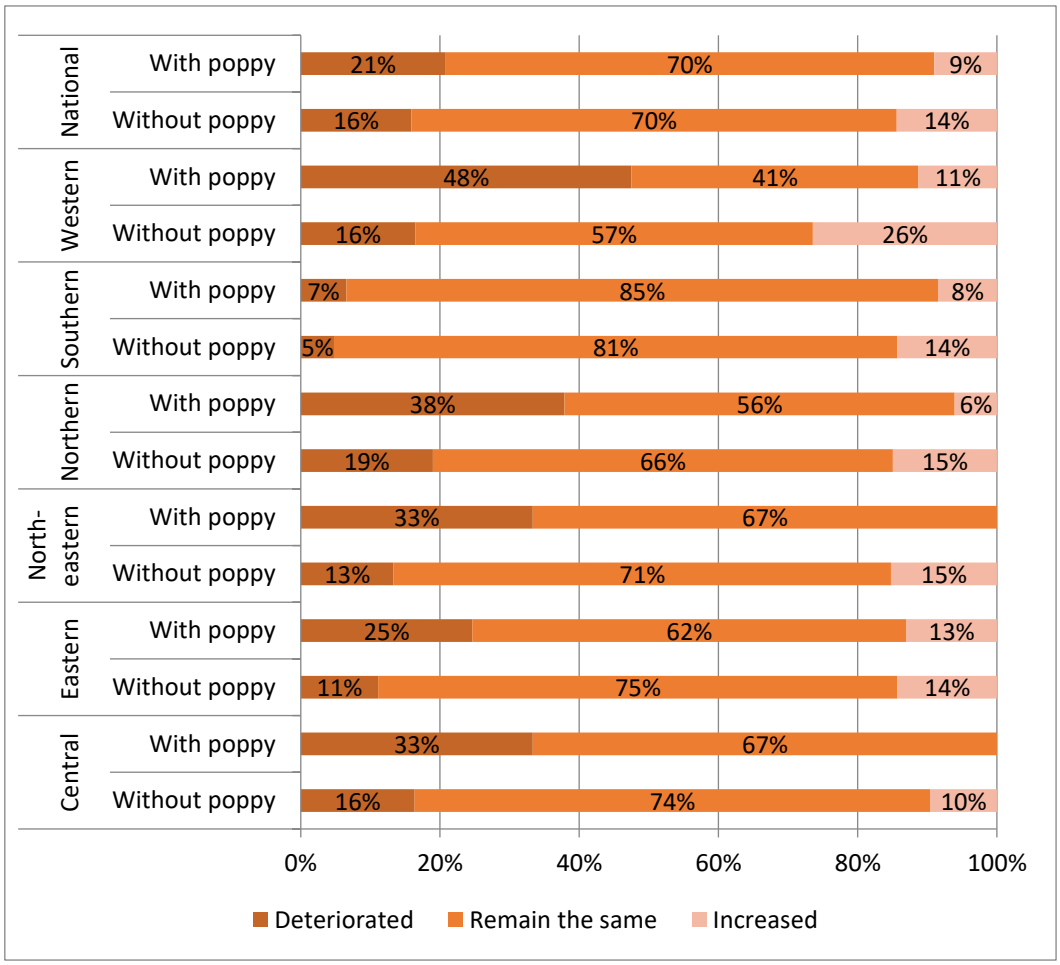
Overall, 18 per cent of village headmen assessed that the security situation had deteriorated when compared to 2017 while 70 per cent stated it remained the same. According to headmen, security deteriorated in particular in the following provinces: Sar-e-pol, Badghis, and Ghor.

Village headmen of villages with opium poppy cultivation reported more frequently that the situation deteriorated. Among opium-poppy villages, 21 per cent of headmen reported a deteriorating security situation while only 9 per cent reported that the security had improved when compared to the last year. The remaining 70 per cent reported that the situation remained the same. In villages without opium poppy cultivation, 16 per cent reported a deterioration, 14 per cent an improvement and 70 per cent reported that the situation remained the same between 2017 and 2018.

TABLE 3 CHANGE IN THE SECURITY SITUATION IN THE VILLAGE ACCORDING TO VILLAGE HEADMEN, 2017-2018

	Deteriorated	Remained the same	Increased
Central	17%	74%	9%
Eastern	18%	68%	14%
North-eastern	14%	71%	15%
Northern	24%	63%	13%
Southern	6%	85%	9%
Western	28%	51%	21%
National	**18%**	**70%**	**13%**

FIGURE 28 CHANGE OF THE SECURITY SITUATION IN THE VILLAGE ACCORDING TO VILLAGE HEADMEN, BY POPPY-CULTIVATION STATUS, REGION AND NATIONAL, 2017 TO 2018



Opium poppy tax and funding of insurgency

In Afghanistan, opium poppy and other agricultural products can be subjected to taxes collected by state and non-state authorities. Information on who collects taxes in the village can yield insights on who is in control of the village and on the profits made by insurgency groups from illicit crop cultivation in Afghanistan. Given the unstable political situation, an understanding of how insurgency is funded is critical for designing policies that strengthen the national government and the rule of law.

In the past three years, since MCN/UNDOC started to estimate taxes collected from opium production, insurgency and other groups accrued around 5 per cent of the estimated farm-gate value of opium sales.

Overall, based on the data collected in 2018, poppy farmers needed to pay taxes on their opium sales in an estimated 36 per cent of villages where opium poppy cultivation took place. Considering the different levels of opium production at the provincial level, it can be further estimated that 35 per cent,[44] or some 2,240 out of 6,400 tons opium harvest were subject to some form of tax in 2018.

[44] The number of samples in each province does not allow for a direct extrapolation at the province level. However, in the case of taxation, a regional average would mask large differences in the provinces. For this calculation, the average share of tax-paying poppy-villages per province was calculated and applied to the provincial production estimates of 2018. The results should not be representative for each province, but only at the regional/national level. It is assumed that the share of villages reporting to pay tax is equivalent to the share of the opium production of that province being taxed.

The collection of taxes on opium poppy sales was very heterogeneous across the country, based on the answers of the headmen. In the Southern region alone, taxes were collected in 60 per cent of villages in Hilmand, 45 per cent in Kandahar but only 7 per cent in Day Kundi and 9 per cent in Zabul.

TABLE 4 PERCENTAGE OF VILLAGE HEADMEN OF OPIUM POPPY VILLAGES REPORTING THAT OPIUM FARMERS PAID A TAX ON OPIUM SALES AND NUMBER OF RESPONSES, BY REGION, 2018

	Tax paid	Number of responding village headmen
Central	50%	8
Eastern	18%	65
North-eastern	50%	2
Northern	50%	66
Southern	33%	258
Western	46%	78
National	36%	477
Percentage of opium harvest taxed	35%	

Note: National average represents the estimated share of poppy villages where farmers have to pay for their opium harvest. For the purpose of the estimate of the percentage of the national opium production being taxed, the average share of tax-paying poppy-villages per province was calculated and weighted by provincial production estimates of 2018. It is assumed that the share of villages reporting to pay tax is equivalent to the share of the opium production of that province being taxed.

The reported average tax on opium sales varied between 1 and 20 per cent of the sales value of opium, with half of the values lying between 3 and 10 per cent. The geographic differences were not as pronounced as in the share of villages where the harvest was taxed, but still present. While most provinces averaged at about a 7 per cent tax, farmers reported an average tax as high as 20 per cent in Badakhshan and as low as 2 per cent in Ghazni.

TABLE 5 RESPONSES OF VILLAGE HEADMEN TO "WHAT PERCENTAGE OF OPIUM EARNINGS IS PAID IN FORM OF TAXES?" AND NUMBER OF RESPONSES, 2018

	Average tax rate (%)	Number of responses
Central	7	4
Eastern	6	12
North-eastern	20	1
Northern	13	33
Southern	4	85
Western	8	36
National	**6**	**171**

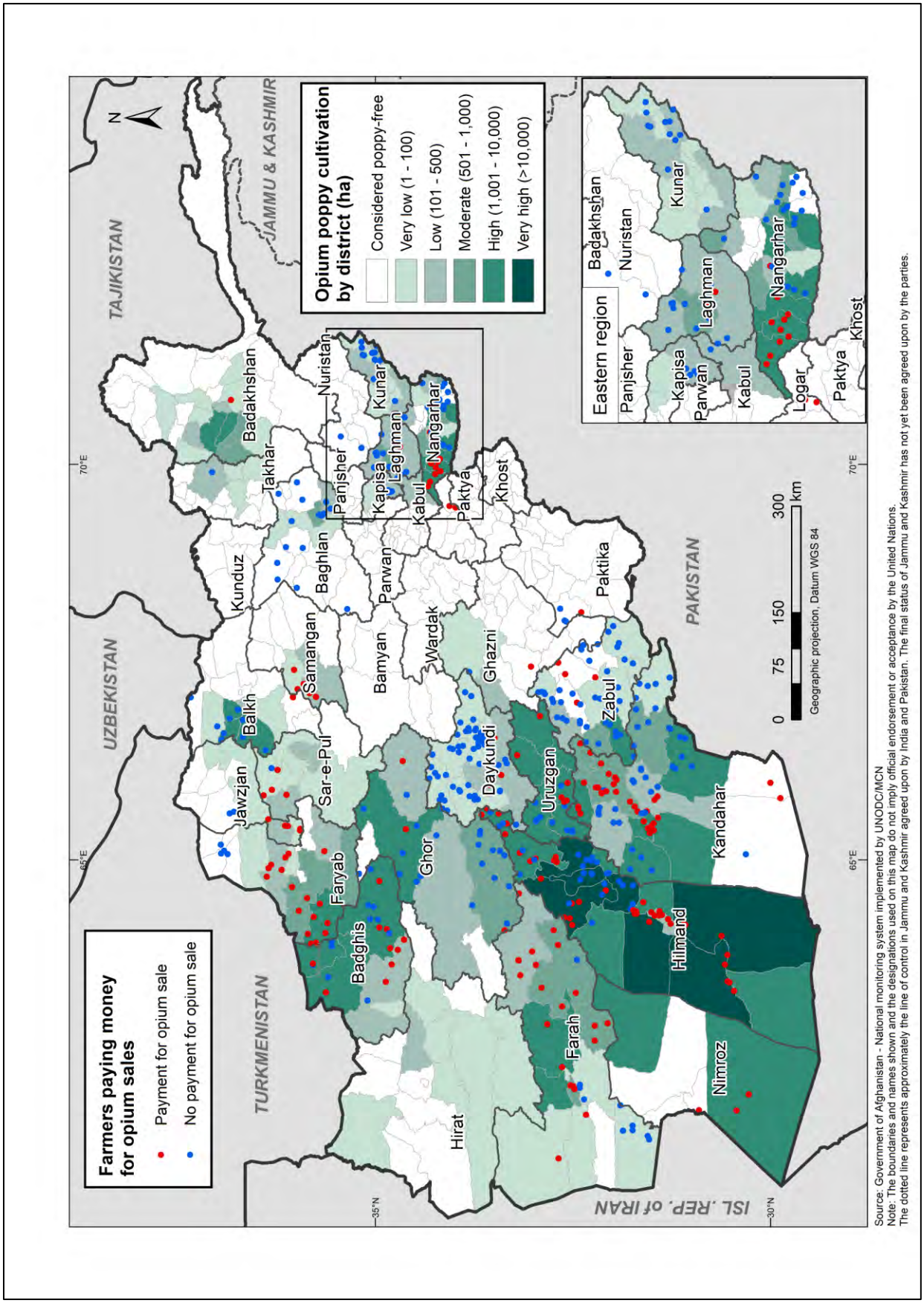
Note: National average represents averages weighted by regional production levels.

Combining the estimates on the share of the harvest taxed and the average tax rates yielded a total tax revenue of 4.5 per cent of the opium sales in 2018 (farm-gate value). This corresponded to US$ 29 million (24 – 31 million) being incurred in the form of opium taxes from the farm-gate value of opium in 2018.

Village headmen were asked about the recipients of the opium poppy taxes. Responses were open-ended, meaning that the headmen could report freely to whom they thought that villagers paid their taxes. It has to be noted that taxes in rural Afghanistan can complex and are often paid to more than one player,[45] but

[45] Mansfield, David, Understanding Control and Influence: What Opium Poppy and Tax Reveal about the Writ of the Afghan State (AREU, August 2017, https://areu.org.af/wp-content/uploads/2017/08/1724E-Understanding-Control-and-Influence1.pdf).

MAP 6 SAMPLED OPIUM POPPY VILLAGES AND TAXES ON OPIUM SALES AS REPORTED BY VILLAGE HEADMEN, 2018



Source: Government of Afghanistan - National monitoring system implemented by UNODC/MCN
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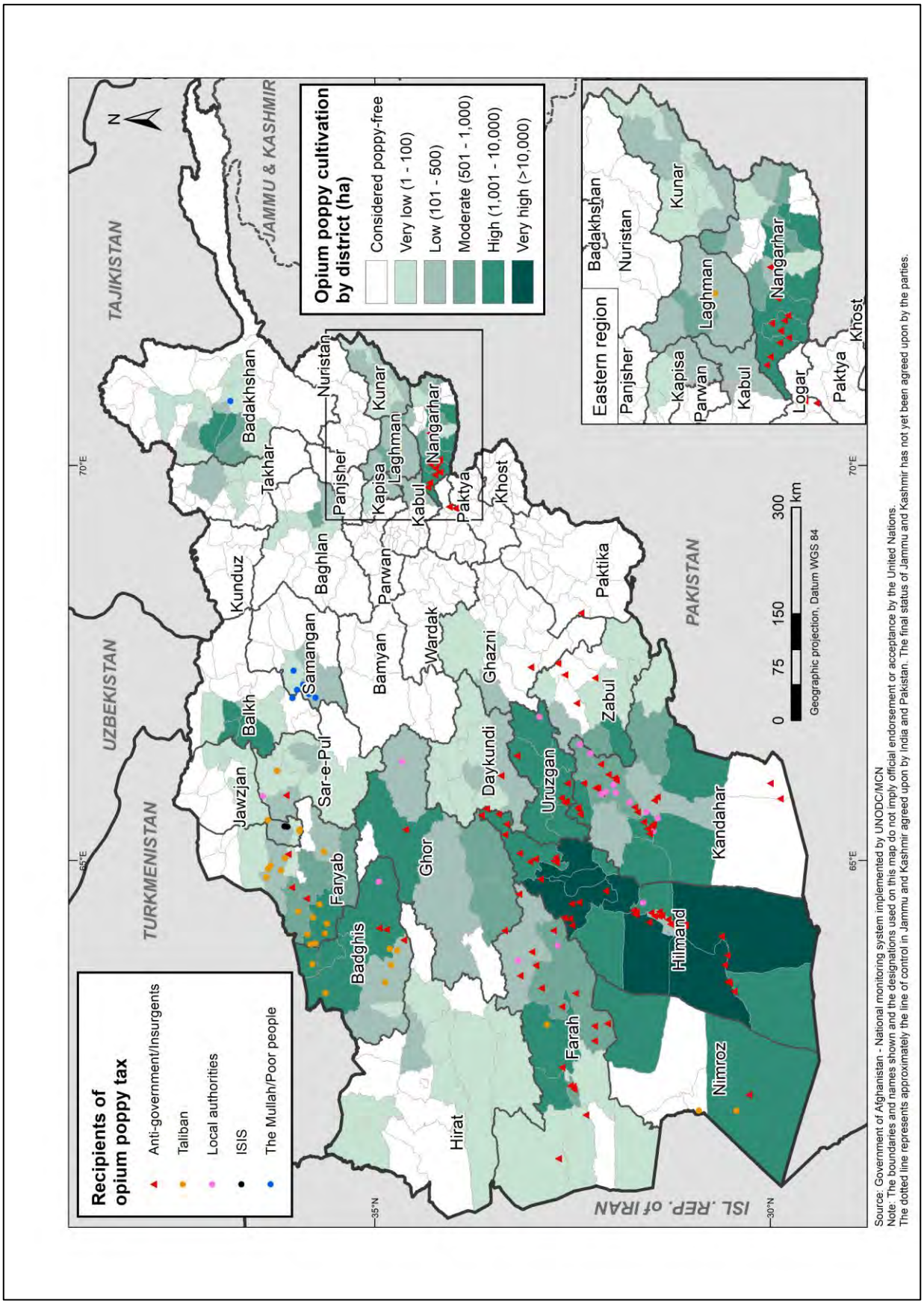
MAP 7 RECIPIENTS OF OPIUM POPPY TAX IN SAMPLED VILLAGES (VILLAGES WITHOUT OPIUM TAX ARE NOT SHOWN) ACCORDING TO VILLAGE HEADMEN, 2018



Source: Government of Afghanistan - National monitoring system implemented by UNODC/MCN
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this complexity cannot be fully captured by the village survey, which intends to provide a national overview of the situation.

A total of 55 per cent of headmen reported that the taxes were paid to anti-government groups, and 17 per cent reported payments to the Taliban. A share of 11 per cent of headmen reported to pay taxes to 'local powerbrokers'.[46] This answer was provided mostly by village headmen of Hilmand and Kandahar provinces, and – according to the interviewers – included local insurgency groups, the Taliban, local government and non-government officials including local police forces.

The information on the groupings receiving taxes is provided as reported by the village headmen and no further information on the nature of these groupings was available. It therefore cannot be excluded that some mentionings of anti-government groups referred to the Taliban. The relationship and affiliation of the 'local powerbrokers' to the Taliban and/or anti-government groups was not investigated in the village survey.

The amount of taxes collected by each group depended on the proportion of the opium harvested in villages controlled by the group[47] and the average tax rate applied. The following table shows the percentage of the total opium production taxed by group of recipients, the percentage of the sales value incurred, and the amount of taxes collected from the farm-gate value of opium. The last column shows the amount of taxes collected if the same groups applied a similar tax to the earnings from manufacturing and trafficking of opiates after the farm-gate.

The values presented correspond to 4.5 per cent of the value of the opiate economy in 2018, which was estimated at US$ 1.2 – 2.2 billion (the farm-gate values of the opium production is part of that range).

To provide an example, the Taliban secured at least US$ 3 million in taxes from the farm-gate value of opium alone and up to around US$ 6 million if they collected a similar share of taxes on the earnings from onwards manufacturing and trafficking of opiates in Afghanistan.

TABLE 6 PERCENTAGE OF OPIUM HARVEST TAXED, PERCENTAGE OF FARM-GATE VALUE ACCRUED, AND INCOME INCURRED FROM TAXING OPIUM POPPY SALES, BY GROUP OF RECIPIENTS, 2018

	Percentage of total opium production taxed	Percentage of farm-gate value accrued from taxing opium	Million USD from the farm-gate value	Million USD of the value of opiates*
Anti-government	29.60%	2.81%	18	34 - 62
Local powerbrokers	11.37%	0.86%	6	10 – 19
Taliban	5.42%	0.43%	3	5 – 10
Local Police	1.37%	0.15%	1	2 – 3
Poor people	4.09%	0.11%	1	1 – 2
Government officials	1.33%	0.10%	1	1 – 2
District Governor	0.13%	0.04%	0	1
Local commanders	0.24%	0.03%	0	0 – 1

[46] The 'local powerbrokers' were referred to as 'the powerful' in the Afghanistan opium survey 2017 due to a change in the translation.

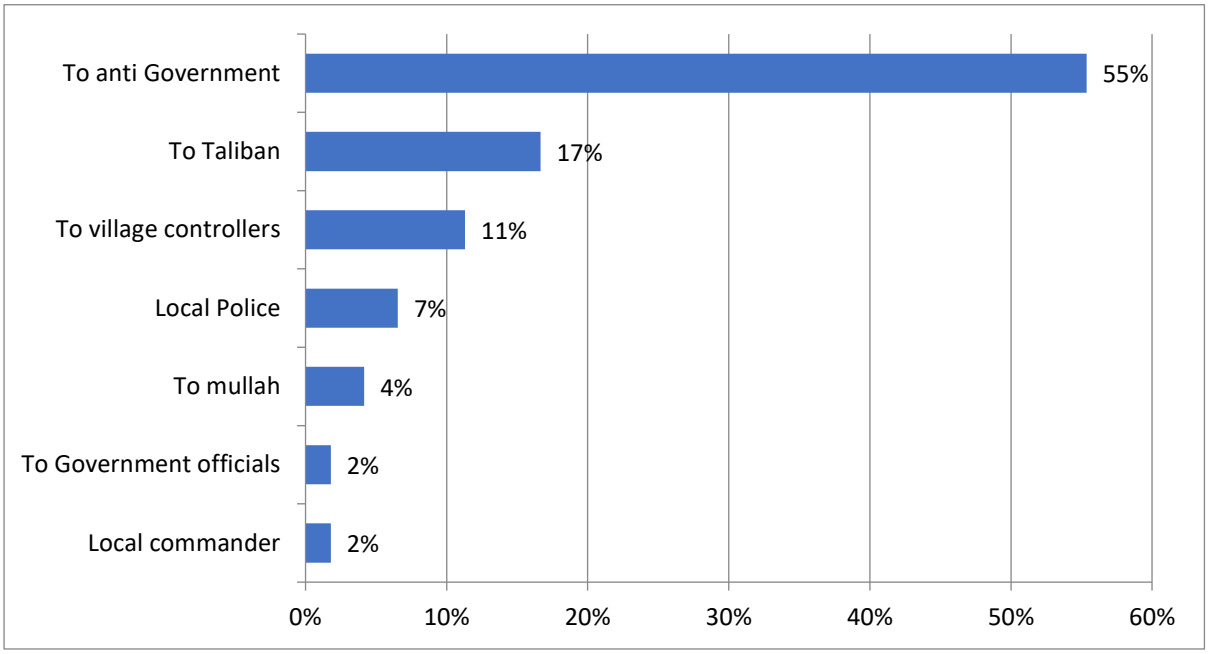
[47] Given the large heterogeneity within regions, the national estimate was calculated on basis of provincial estimates weighted by production. Some provincial estimates are based on a limited number of samples. In contrast to area and production estimates, these results are based on less robust data have to be interpreted with caution. Estimates are considered as indication of the order of magnitude instead of a robust statistical estimate.

National	54%	4.54%	29 (24 - 31)	54 – 100

Notes: Values presented are a combined estimate of the number of villages reported to pay taxes on opium sales per province, an average, regional tax rate, and the distribution of the recipients per province. It is assumed that the share of villages reported to pay taxes in a province is equivalent to the share of the opium harvest taxed in that province. Estimates need to be seen as indications of the order of magnitude rather than robust statistical estimates.

*The groups of recipients are reported here as they were provided. Since no further information on the nature of these groupings was available, it cannot be excluded that some of the answers might refer to the Taliban even if they are not explicitly named. *Farm-gate value and onwards manufacturing and trafficking.*

FIGURE 29 PERCENTAGE OF VILLAGE HEADMEN NAMING A CERTAIN RECIPIENT OF OPIUM TAXES, 2018



Note: Based on 168 responses from village headmen in opium poppy cultivating villages where taxes were collected. The recipients are provided as reported. Since no further information on the nature of the anti-government groupings was available, it cannot be excluded that some of the answers might refer to the Taliban even if they are not explicitly named.

Opium poppy is not the only source of funding for insurgency groups. The MCN/UNODC village survey collected evidence that non-state authorities, including the Taliban, use the traditional ushr to fund their activities. Ushr denotes the traditional Islamic tithe on agricultural production, usually about 10 per cent, which is payable on the harvest a farmer makes. The term ushr combines many forms of taxes, including Zakat, the Muslim tradition of alms-giving.

Paying ushr was a wide-spread phenomenon. Overall, 84 per cent of all headmen reported that farmers pay ushr. The highest percentage was found in the Northern region with 93 per cent, the lowest in the Central and Western regions with 75 per cent. The most commonly named recipients of the ushr were 'poor people' (40 per cent of all villages) and the 'Mullah' (29 per cent of all villages).

Based on the data collected, it could be estimated that the Taliban collected ushr in 10 per cent of all villages, and anti-government elements in another 2 per cent. The Taliban were named most often in the Central (13 per cent), Northern (12 per cent) and Southern (12 per cent) regions. 'Poor people' are the main recipients of ushr in the Eastern (70 per cent) and North-eastern (50 per cent) regions while the 'Mullah' is the main recipient in the Western region (53 per cent).

The 2018 village survey results show a slight increase in percentage of villages paying ushr to the Taliban (10 compared to 7 per cent in 2017). Future surveys will show if the difference is a statistical fluctuation or a sign of the increased influence of the Taliban in rural Afghanistan.

FIGURE 30 SHARE OF VILLAGE HEADMEN NAMING A CERTAIN RECIPIENT OF USHR, THE TRADITIONAL ISLAMIC TITHE ON AGRICULTURAL PRODUCTION, 2018

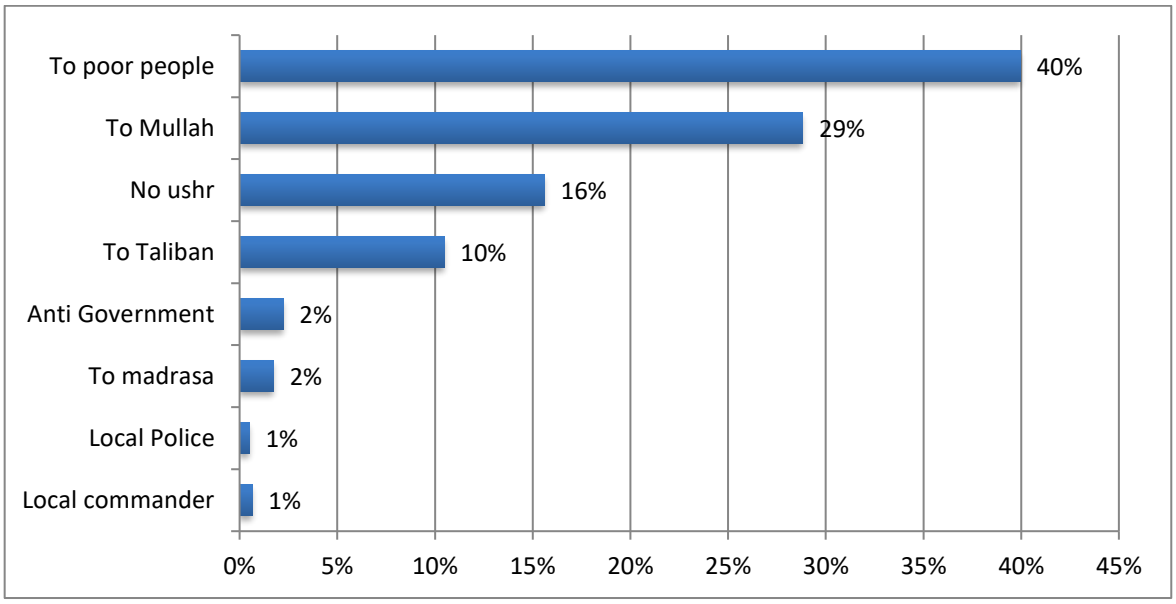


TABLE 7 RECIPIENTS OF 'USHR', INCLUDING VILLAGES WITHOUT USHR, BY REGION, 2018

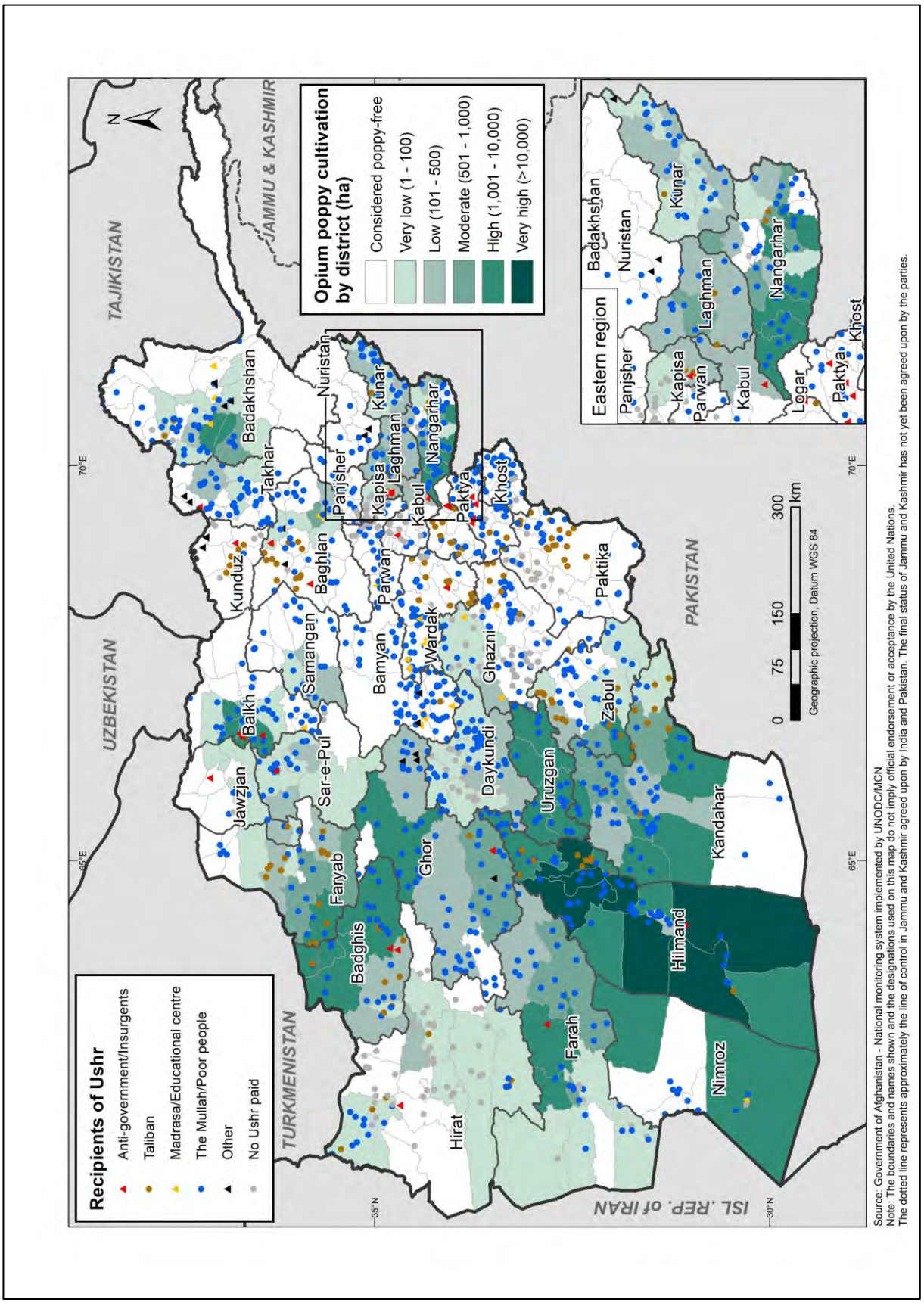
	Central	Eastern	North-eastern	Northern	Southern	Western	National
Poor people	40%	70%	50%	42%	43%	12%	40%
Mullah	17%	3%	20%	34%	37%	53%	29%
Taliban	13%	6%	9%	12%	12%	6%	10%
Anti-Government	3%	3%	2%	3%	1%	2%	2%
Madrasa (school)	3%	0%	4%	3%	0%	0%	2%
Local commander	0%	0%	1%	2%	0%	2%	1%
Local Police	0%	0%	6%	0%	0%	0%	1%
No ushr	25%	18%	8%	4%	7%	25%	16%

Note: Based on 1,384 responsive villages. Information as provided by the village headmen.

When comparing opium poppy cultivating villages with villages without opium poppy cultivation, the village survey found that ushr was more often collected in villages with opium-poppy cultivation (94 per cent) than in villages without opium poppy (79 per cent).

If and how the presence of opium poppy tax and ushr are related was difficult to assess. It cannot be excluded that in areas where opium poppy was taxed, ushr was paid in its more traditional form as tithe for the support of the poor and religious communities.

MAP 8 PAYMENTS OF USHR AND ITS RECIPIENTS IN SAMPLED VILLAGES ACCORDING TO VILLAGE HEADMEN, 2018



Source: Government of Afghanistan - National monitoring system implemented by UNODC/MCN
Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations.
The dotted line represents approximately the line of control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Advance payments for opium poppy cultivation

One element which makes opium poppy cultivation attractive is the practice of advance payments for the opium poppy harvest. A farmer would receive credit in form of cash for agricultural inputs, such as seeds and fertilizers, or for exceptional expenses such as a wedding. The credit needs to be re-paid in form of raw opium after the harvest.

About 16 per cent of headmen from opium-poppy villages reported that farmers in their villages received advanced payments for opium-poppy cultivation in 2018. The percentage varied year-by-year, in 2017 about 24 per cent of headmen reported that farmers in their villages received advanced payments for opium-poppy cultivation, whereas in 2016, 37 per cent of headmen reported the same. More research on that topic is needed to understand these annual fluctuations.

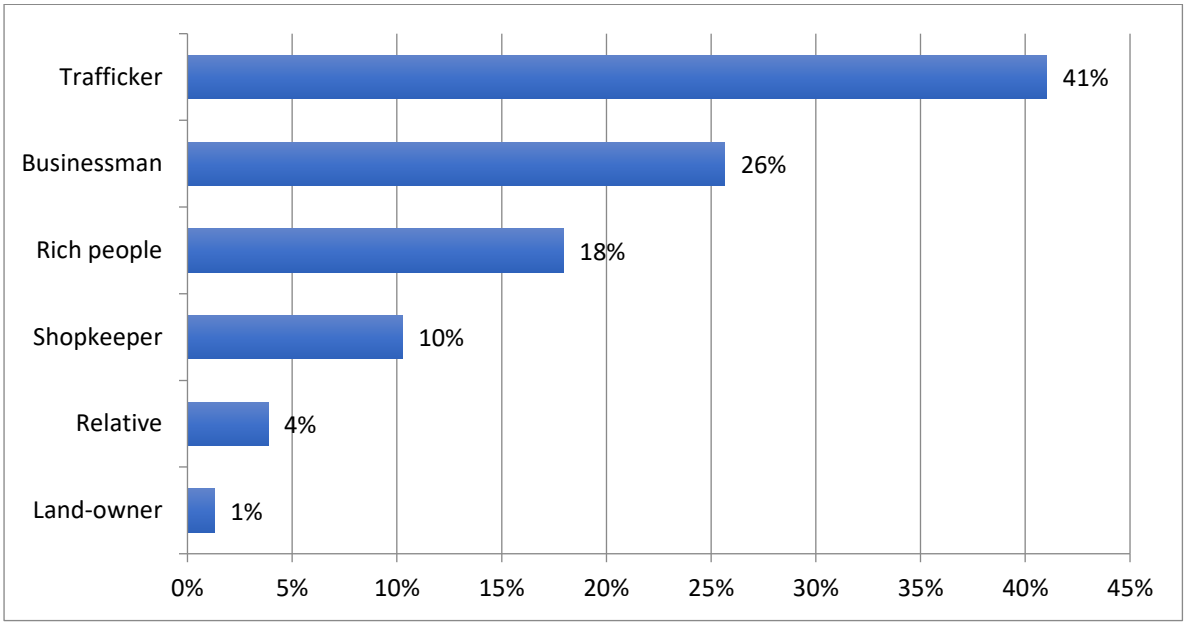
The nature and function of advance payments appeared to be different and independent from the system of taxing opium poppy sales. While non-government authorities such as the Taliban appeared to be heavily involved in collecting taxes on opium sales, advance payments were collected by private persons such as traffickers or businessmen. More in-depth information around this practice and its relation to opium poppy cultivation would be needed to assess if and how insurgency groups were benefitting from this practice.

TABLE 8 PERCENTAGE OF VILLAGE HEADMEN IN OPIUM POPPY VILLAGES REPORTING THAT FARMERS HAD ACCESS TO ADVANCE PAYMENTS FOR OPIUM POPPY CULTIVATION, BY REGION, 2018

Region	Advance money available
Eastern	30%
Northern	27%
Southern	10%
Western	10%
National	**16%**

Note: Because of a very small number of samples, the Central and North-eastern regions have been excluded from the regional analysis but are considered in the national average.

FIGURE 31 PROVIDERS OF ADVANCE PAYMENTS FOR OPIUM POPPY CULTIVATION, ACCORDING TO VILLAGE HEADMEN, 2018



Discussion

The MCN/UNODC village survey 2018 confirmed the strong links between government control, insecurity and opium poppy cultivation in Afghanistan. It showed as well that a noteworthy proportion of the opium harvest is taxed by non-state authorities and insurgency groups such as the Taliban.

There is little disagreement regarding the high level of correlation between poor governance and illicit crop cultivation in Afghanistan.[48] Government control can take many forms and what is understood as 'being under the control' of the government (or any non-state authority), can vary between different provinces and even villages. The notion of control in this report reflects the perception of the village headmen interviewed during the survey. There appear to be varying degrees of government influence and influence of local power-holders that are far from being a dichotomy.[49]

The MCN/UNODC village survey found that opium poppy is more prevalent in villages outside the control of the government and that the likelihood of legal consequences for opium cultivation is perceived much lower in these villages than in villages under the control of the government. Moreover, insecurity and a deteriorating security situation have been linked to increased poppy cultivation.

The causal links behind absence of government and opium poppy cultivation can be manifold and may be closely linked to how government presence manifests itself, including through the availability and effectiveness of mechanisms to enforce the law. For instance, support via the organized community (e.g. the shura) is more readily available to villagers in non-opium-poppy villages than to those in opium poppy villages, based on the assessments of headmen in previous MCN/UNODC village surveys.[50] One element of perceived government control is the enforcement of the law: lack of government control may increase the perception that opium poppy can be cultivated with no or only little risk of legal repercussions (including eradication), which – in particular in absence of viable legal alternatives – can make farmers more vulnerable to partake in opium poppy cultivation. Research has shown that farmers diversify their sources of income in areas not under government control, probably as risk mitigation strategy in an unsecure situation.[51] It has to be noted, though, that the actual risk of being subjected to consequences such as crop eradication have been very low in recent years, because eradication efforts have been limited.

Lack of good governance and security can also reduce the sustainability of livelihoods by legal means. The absence of good governance, which manifests itself in the form of lack of schools, health care or security, hinders the development of licit markets, the accumulation of assets and the growth of sustainable economic activities in the legal sector of the economy.[52] This creates an environment that is conducive to the illegal economy and to increased influence of insurgency groups.

Another possible link between increased opium poppy cultivation and absence of government is active encouragement of opium poppy cultivation by insurgency, with the motive to increase funding for their activities through collecting taxes on the opium sales. The village survey did not collect any data on whether non-state authorities actively encouraged opium poppy cultivation. However, since 36 percent of village headmen of poppy villages reported some forms of taxes for opium poppy cultivation, it cannot be excluded that opium poppy cultivation is welcomed or even promoted by non-state authorities.

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[48] García-Yi, J. "Building resilience to opium poppy cultivation by strengthening the design of alternative development interventions: evidence from Afghanistan" in UNODC Bulletin on narcotics, Volume LXI, 2017, "Alternative development: practices and reflections".
[49] In Afghanistan, the relationship between the population, the government, and various non-state authorities – which include but are not limited to armed insurgent groups – has found to be complex and often fluid in nature, especially in rural areas. See as well Mansfield, David, Understanding Control and Influence: What Opium Poppy and Tax Reveal about the Writ of the Afghan State (AREU, August 2017, https://areu.org.af/wp-content/uploads/2017/08/1724E-Understanding-Control-and-Influence1.pdf).
[50] UNODC, Afghanistan opium survey 2016
[51] UNODC, "Baseline report and impact assessment of alternative development projects in Afghanistan", forthcoming.
[52] García-Yi, J. "Building resilience to opium poppy cultivation by strengthening the design of alternative development interventions: evidence from Afghanistan" in UNODC Bulletin on narcotics, Volume LXI, 2017, "Alternative development: practices and reflections".

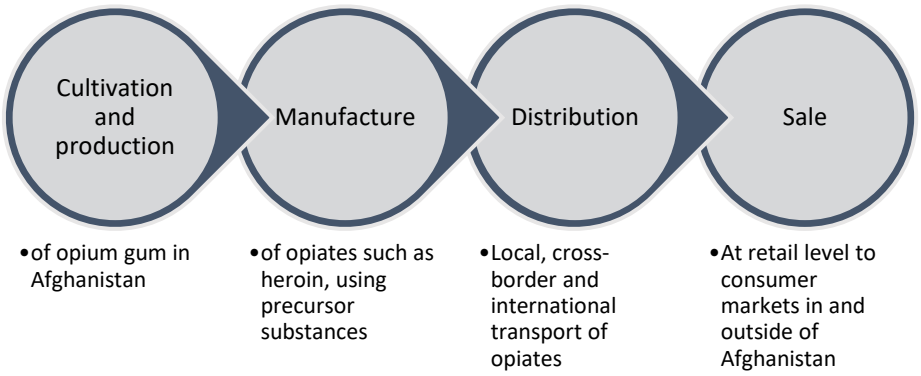
The lack of government control and opium poppy cultivation creates a vicious cycle. The absence of the government is a strong contributing factor for increased opium poppy cultivation, and opium poppy cultivation undermines the rule of law by funding insurgency and organised crime groups. The evidence provided by the MCN/UNODC village surveys suggests that improvements in the presence of the government, e.g. through public service provisions and governability may assist to break that vicious cycle.

Trade with Afghan opiates: profits and time lags

Each year thousands of tons of opium are produced in Afghanistan and then converted into heroin to reach end-consumer markets around the globe. Opiate manufacturing and trade can be divided into four stages: production of opium gum, manufacturing of opiates (heroin and its precursor morphine), distribution and retail.

At each stage, income is generated that benefits different players. While cultivation of opium poppy and production of opium gum occur primarily in Afghanistan, distribution and final retail most often take place in major destination markets such as Europe and Asia.

FIGURE 32 VALUE CHAIN OF AFGHAN OPIATES



Value of opium production and heroin manufacture

Farm-gate value

The farm-gate value of opium represents the potential gross amount earned from opium by farmers in a given year. It is the value of the first link of the value chain, of cultivation and production of opium gum. The farm-gate value is an important measure of the added value generated in rural communities by the cultivation and harvesting of opium. In contrast to the proceeds of onward processing and trafficking, which is assumed to mainly benefit external individuals, the proceeds of opium poppy cultivation most likely remain within rural communities. The estimated farm-gate value is based on the premise that the entire opium poppy production is sold by farmers during a given year.

The estimated farm-gate value of opium production in 2018 amounted to US$ 604 million (US$ 530 - 680 million), which is a decrease of 56 per cent from its 2017 level. The decrease in farm-gate value was due to the decrease in opium production, average opium yield per hectare and average farm-gate price of opium in that year.

Heroin manufacture and exports

All the opium produced in Afghanistan is either consumed as raw opium in and outside of Afghanistan or further processed into heroin, which is then traded to end-consumer markets across the world.

It can be estimated that the 2018 harvest of 6,400 tons provides 1,100 - 1,400 tons of opium to meet the demand for opium consumption. The remaining 5,000 – 5,300 tons are potentially available for heroin production and can yield some 360 – 610 tons of heroin of export quality (purity between 50 and 70 per cent) or 250 – 300 tons of pure heroin base.

FIGURE 33 ESTIMATED SHARES OF OPIUM PRODUCTION AVAILABLE FOR HEROIN PRODUCTION

Opium production 2018	Demand for unprocessed opium in the region	Potential production of heroin of export quality	Potential production of pure heroin base
6,400 tons (5,600 – 7,200)	1,100 – 1,400 tons	360 – 610 tons	250 – 300 tons

A ratio of 18.5:1 (17.5:1 – 19.6:1) is used for converting opium to pure heroin base. For converting opium to 50% pure heroin, 9.2 kilograms (8.7 to 9.8 kilograms) of opium are assumed to be needed; for converting opium to 70% pure heroin, 12.9 kilograms (12.2 to 13.7 kilograms) of opium are assumed to be needed. For a detailed discussion of the heroin conversion ratios see "Afghanistan opium survey report 2014 – cultivation and production." Ranges reflect different purities and the upper and lower bounds of the 95% confidence interval around opium production estimates 2018.

These values represent a potential heroin production: A noteworthy share of the opium and heroin production is seized or lost along the supply chain from source to destination countries, and a proportion of the product does not enter the market in the year of interest. The amount of heroin that reaches end-consumer markets may thus be lower than this estimate.

There is great uncertainty around these estimates. While confidence in the opium production estimates is high, uncertainties around the conversion ratio from opium to heroin stem mainly from the wide range of possible purities of the product and from scarce data on the efficiency of the conversion from opium to heroin (i.e., how much opium is needed to produce one kilogramme of heroin). Uncertainties around the demand estimate are mainly associated with the assumptions around annual opium consumption per user.

The estimation process and its underlying assumptions are presented in detail in the annex together with the discussion on the quantity of the heroin potentially produced inside and outside Afghanistan.

Within Afghanistan, the by far the largest share of income is generated by opiate transformation and exports to neighbouring countries. Based on seizure data of opium and heroin in Afghanistan and neighbouring countries, it can be estimated that around two thirds of the 2018 opium harvest were converted into heroin or morphine within Afghanistan and that the remainder was exported unprocessed.

The proceeds of Afghan traffickers from the processing of opium into morphine/heroin and from the export of processed and unprocessed opiates was estimated to range between US$ 0.5-1.3 billion. It is the net value of all exported opiates after the opium left the farm and represents the income from opiate manufacturing and trafficking from source to the borders of Afghanistan. [53]

Onwards trafficking and sale of opium in retail markets

Onwards trafficking and sale in retail markets represent the largest piece of the total income generated by Afghan opiates. A 2015 UNODC study[54] on Afghan opiates trafficked to Western Europe through the Balkans estimated the total value of illicitly trafficked heroin and opium at some US$ 28 billion per year, which was worth more than the entire GDP of Afghanistan in 2018 – and this estimate pertains only to opiates trafficked along the Balkan route and leaves out other important routes such as the Northern route to Central Asia and Russia and the Southern route.

[53] Net value excludes the costs for imported precursor substances.
[54] UNODC (2015), Drug Money: the illicit proceeds of opiates trafficked on the Balkan route.

FIGURE 34 VALUE OF THE AFGHAN OPIATE ECONOMY 2018 BY COMPONENT, AND ESTIMATED PROCEEDS FROM ONWARDS TRAFFICKING (AVERAGE 2010-2015)

Proceeds from onwards trafficking to markets through the Balkan route are an average of five years between 2010 and 2014; Sources: UNODC, "Drug money: the illicit proceeds of opiates trafficked on the Balkan route". Data on the value of the opiate economy 2016 are MCN/UNODC estimates. The value of onwards trafficking to consumer markets in Europe is a gross value. Seized opiates are not considered in these calculations.

The proceeds generated in the international trade hardly feed into Afghanistan's licit economy. Trafficking from Afghanistan's borders to end-consumer markets appear to be organized by nationals of countries other than Afghanistan with the result that these proceeds are – in some sense – lost to Afghanistan's economy.

Time until the opium harvest reaches the market

Opium farmers and lancers collect opium between April and July, depending on the region (earlier in the warm South, later in the more elevated and colder regions in the North-east).

In 2018, farmers were asked about the share of opium poppy being sold to traders in the same year. Farmers sold on average 80 per cent of the previous year's opium harvest to traders and kept on average some 20 per cent (on average of 5 kg per farmer). When applied to the total 2017 production, the share of opium poppy not being sold to traders was around 1,800 tons. This would mean that overall about 7,200 tons out of the almost 9,000 tons harvested in 2017 were sold in the same year.

The bulk of the opium poppy remaining from the 2017 harvest was in the Southern region: farmers reported that 21 per cent of the previous year's opium poppy harvest remained unsold, which amounted to about 7 kg per farmer and 1,100 tons for the entire Southern region. Farmers in the Northern and North-Eastern regions on the other hand, reported having sold their entire harvest the previous year.

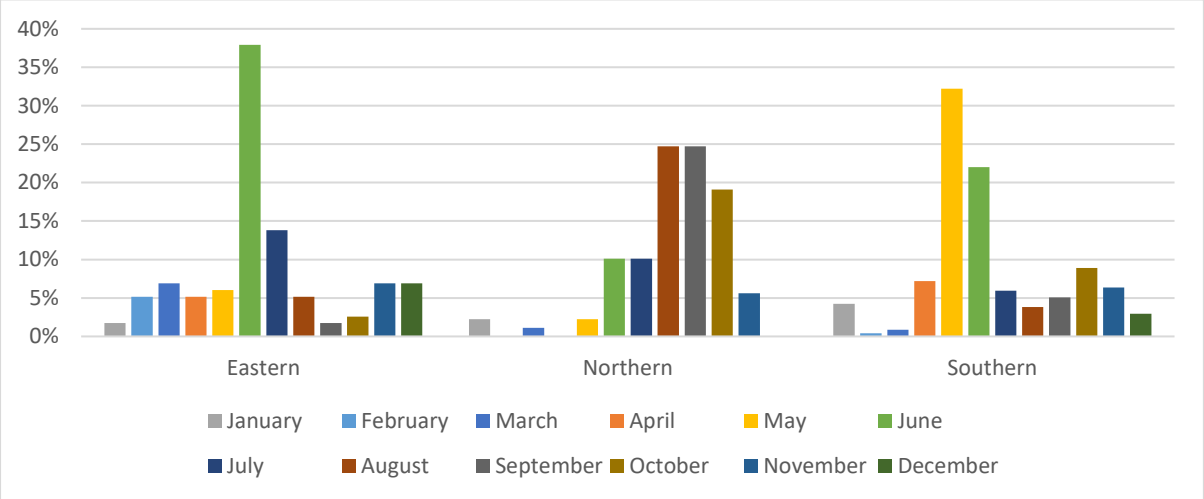
In addition to opium being kept by farmers, a certain proportion of opium is used to pay lancers and other poppy field workers. Self-consumption may have reached significant levels and is not reflected in absence of a recent drug use survey.[55]

[55] Data used to estimate domestic consumption dates back to 2009. The most recent drug use survey, The Colombo Plan (2015), *"Afghanistan National Drug Use Survey 2015"*; http://www.colombo-plan.org/?wpfb_dl=305; showed very high levels of exposure to opiates in the rural population, but the result cannot be used to calculate updated opium consumption estimates for Afghanistan. It is likely that opiate consumption has strongly increased in Afghanistan since 2009.

Farmers were also asked to indicate the month in which they sold the opium poppy harvested. The majority of farmers sold their opium poppy during the month of the harvest or in the months following it. In the Southern region, where the harvest occurs in April, about two thirds of farmers (61 per cent) sold their harvest during the months of April, May or June. A smaller share of farmers sold their harvest during the subsequent months, with 9 per cent of farmers in the Southern region indicating they sold their harvest in October. In other regions, a similar pattern was found.

It should be noted that the 2017 harvest was at a record high level, which led to a substantive decrease in opium prices in Afghanistan. Further research is required to assess what share of the harvest remains unsold during a more regular year and what the underlying factors and dynamics are for keeping a certain portion unsold.

FIGURE 35 SHARE OF FARMERS SELLING THEIR OPIUM POPPY HARVEST, PER MONTH, SELECTED REGIONS, 2017 (DATA COLLECTED IN 2018)



Note: Month of harvest in the South is April, in the East April/May and in the North until June.

Farmers sell opium at the farm-gate, and at local and district markets

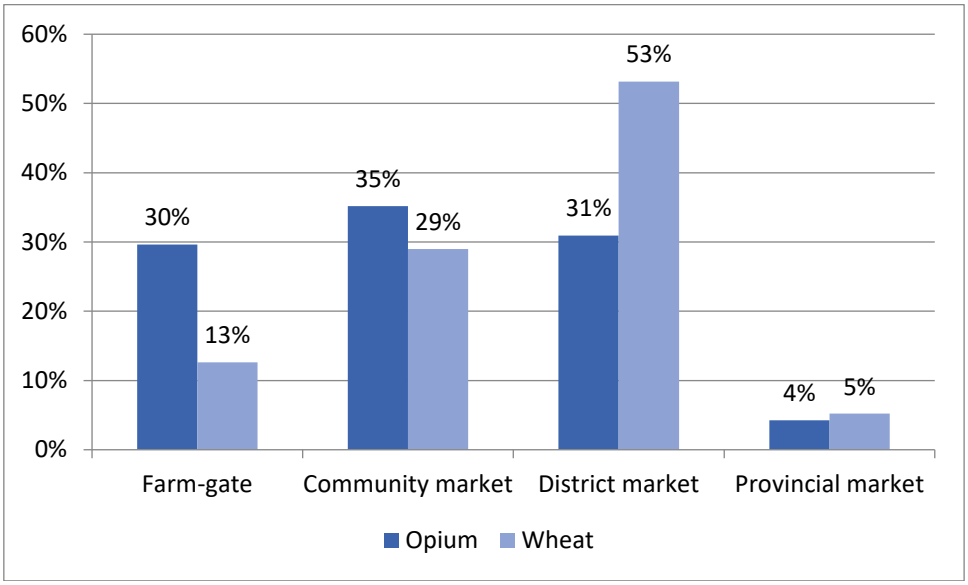
A common idea is that opium is purchased by traders directly from the farmers at the farm-gate.[56] In comparison to licit crops, farmers would not need to bring opium to the local markets, which supposedly adds to the attractiveness of opium as a cash crop. In 2018, MCN/UNODC collected data from farmers to provide up-to-date data on the selling points of farmers for their opium and wheat harvest.

The most common points of sale for opium were community and district markets with about two-third of opium farmers reporting to sell their harvest there. The farm-gate, meaning that opium is collected at the farm by traders, was named by about 30 per cent of all opium farmers. As comparison, for wheat, 13 per cent of farmers named the farm-gate and more than 80 per cent community and district markets. These patterns translate by and large to the regional level, too (see statistical annex for a regional breakdown).

The farm-gate is thus more frequently used for opium sales than for wheat sales. District and community markets appear to play a more important role in the opium trade than the farm-gate.

[56] See e.g., MCN/UNODC Afghanistan opium survey 2011

FIGURE 36 SHARE OF FARMERS SELLING THEIR PRODUCTS AT A CERTAIN MARKET TYPE, 2017 (DATA COLLECTED IN 2018)



Only little information is available on the time opium takes to be manufactured to heroin and to being distributed to end-consumer markets

Once opium is sold to first-level traders, it is collected and either sold on as opium to other traders or manufactured to heroin. Only little is known about the time between the opium harvest and it being manufactured to heroin within and outside of Afghanistan.

Price data collected by MCN/UNODC between 2009 and 2013, indicated that it took about 2-4 months that changes in opium prices in Afghanistan reached heroin prices in Pakistan. This gives an indication for how long it takes to convert large portions of the opium harvest to heroin, however with the caveat that average opium production between 2009 and 2013 was much smaller than in 2017 and 2018, which potentially made it easier to convert opium more quickly.

Analysis of seizure data revealed that the correlation between global opiate seizures and opium production was highest with a one-year time lag, indicating that it takes between one and two years until changes in the opium production are visible in seizure rates.

To fully understand the time component of heroin manufacture and trafficking, more qualitative research on heroin manufacture in and outside of Afghanistan and quantitative research using international seizure data would be required.

Part II: Statistical annex

Labour for poppy harvesting and daily wages

AVERAGE NUMBER OF DAYS SPENT ON POPPY LANCING AND POPPY WEEDING BASED ON FARMERS' ANSWERS, BY REGION, 2018

	For poppy lancing	For poppy weeding
Central	6	4
Eastern	12	16
North-eastern	5	19
Northern	9	10
Southern	15	14
Western	5	3
National	13	13

Note: National average is the average of the regional daily wages, weighted by area under cultivation.

AVERAGE NUMBER OF FARMERS FOR WHOM LANCERS WORKED AND AVERAGE NUMBER OF DAYS WORKED HARVESTING OPIUM DURING THE PAST SEASON BASED ON LANCERS' ANSWERS, BY REGION, 2018

	Farmers	Days
Central	2	17
Eastern	2	17
North-eastern	4	20
Northern	4	14
Southern	2	15
Western	3	12
National	2	15

Note: National average is the average of the regional daily wages, weighted by area under cultivation.

DAILY WAGE RATES FOR OPIUM GUM COLLECTION AND OPIUM POPPY WEEDING BASED ON FARMERS' ANSWERS, BY REGION, 2018

	Opium poppy weeding US$	Lancing/ gum collection US$
Central	16.1	14.7
Eastern	3.9	5.1
North-Eastern	6.0	9.3
Northern	5.8	9.3
Southern	4.5	7.1
Western	6.4	11.1
National	4.9	7.7

Note: National average is the average of the regional daily wages, weighted by area under cultivation.

DAILY WAGE RATES FOR NON-POPPY RELATED LABOUR BASED ON FARMERS' ANSWERS, 2018

	Farm labour (non-poppy)	Non-farm labour (construction of roads, houses, etc)
Central	4.1	4.8
Eastern	3.8	4.4
North-eastern	4.9	4.5

Northern	4.3	4.7
Southern	4.0	5.1
Western	3.5	3.8
National	4.0	4.8

Note: National average is the average of the regional daily wages, weighted by area under cultivation.

DAILY WAGE RATES FOR LANCING ACCORDING TO LANCERS' ANSWERS, BY REGION, 2018

	Lancing US$
Central	7
Eastern	6
North-eastern	9
Northern	11
Southern	13
Western	8
Total	12

SHARE OF LANCERS WHO WERE PAID IN OPIUM, BY REGION, 2018

	Paid in opium
Central	17%
Eastern	1%
Northern	22%
Southern	22%
Western	11%
National	20%

Note: National average is the average of the regional daily wages, weighted by area under cultivation.

AVERAGE AMOUNT OF OPIUM PAID DAILY TO LANCERS, BY REGION, 2018

	Opium (in gram)
Central	98
Eastern	5
Northern	281
Southern	572
Western	107
National	444

Note: National average is the average of the regional daily wages, weighted by area under cultivation.

PERCENTAGE OF LANCERS WHO WERE PROVIDED DAILY FOOD, BY REGION, 2018

	Provided daily food
Central	85%
Eastern	94%
Northern	93%
Southern	99%
Western	97%
National	98%

Note: National average is the average of the regional daily wages, weighted by area under cultivation.

SHARE OF FARMERS ALSO LANCING FOR OTHER FARMERS, BY REGION, 2018

Region	Lancing for others
Eastern	28%
Northern	4%
Southern	17%
Western	14%
National	16%

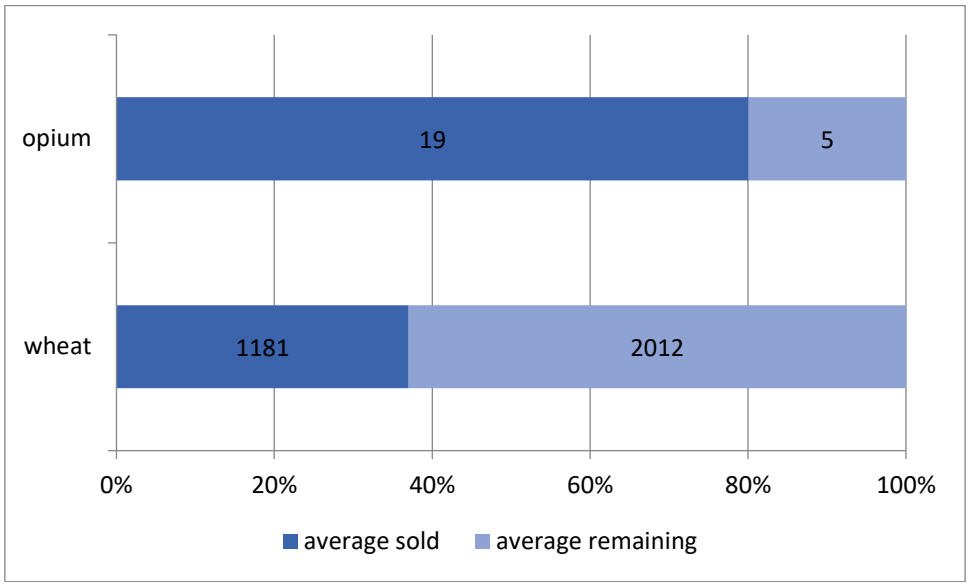
Note: National average is the average of the regional daily wages, weighted by area under cultivation.

SHARE OF FARMERS INDICATING THEY HAD DIFFICULTIES FINDING LABOURERS, BY REGION, 2018

Region	Percentage
Southern	80%
Eastern	59%
Western	41%
Northern	34%
National	76%

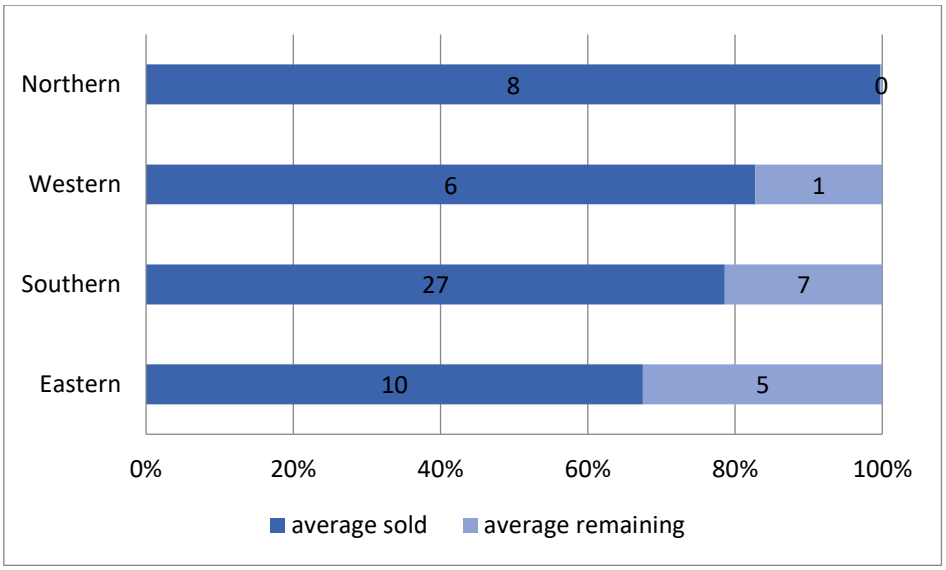
Harvest and markets

SHARE AND QUANTITY (IN KG) OF OPIUM AND WHEAT SOLD AND REMAINING FROM THE HARVEST, 2018



Note: Farmers keep a share of the wheat they cultivate for personal consumption.

SHARE AND QUANTITY (IN KG) OF OPIUM SOLD AND REMAINING FORM HARVEST, BY REGION, 2018



SHARE OF OPIUM SOLD EACH MONTH BY FARMERS, BY REGIONS, 2018

	Eastern	Northern	Southern	Western
January	0%	4%	3%	2%
February	1%	0%	0%	0%
March	1%	0%	0%	9%
April	6%	0%	8%	2%
May	10%	4%	37%	6%
June	49%	17%	25%	8%
July	21%	17%	5%	31%
August	7%	41%	3%	2%
September	1%	9%	4%	11%
October	1%	7%	10%	6%
November	1%	2%	2%	20%
December	0%	0%	2%	3%

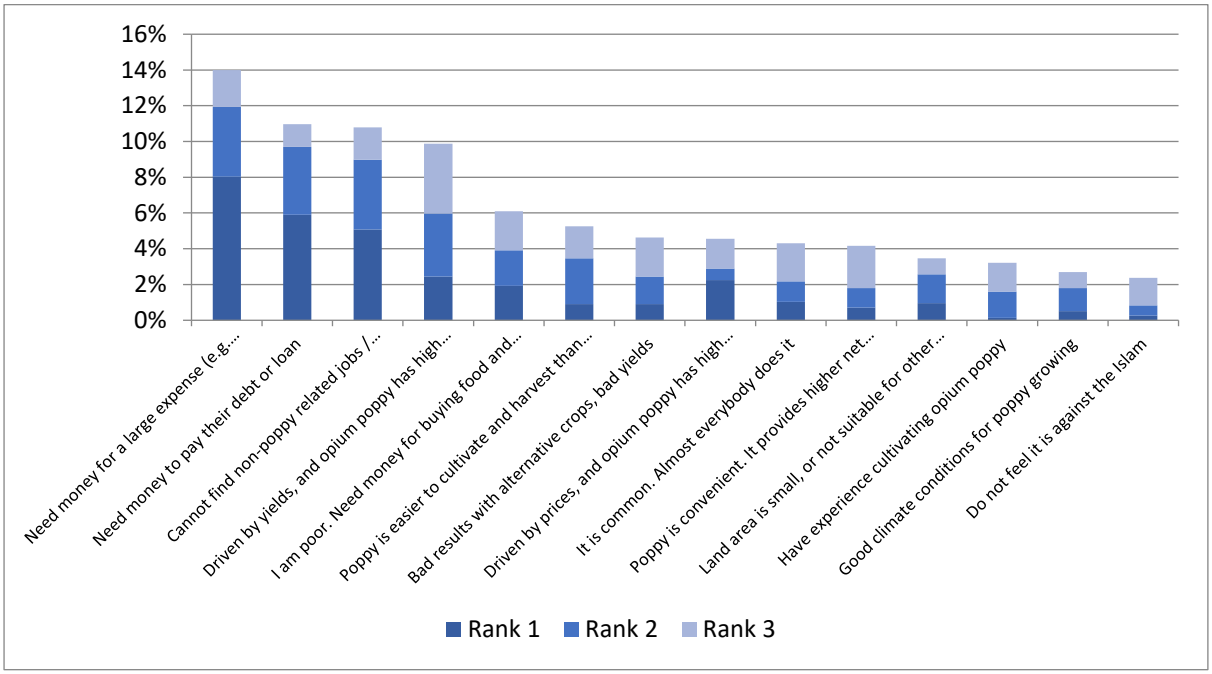
Note: Harvest in the Eastern, Southern and Western region occurs around the month of April while in the Northern region is occurs slightly later around the month of June

Self-reported reasons for cultivating opium poppy

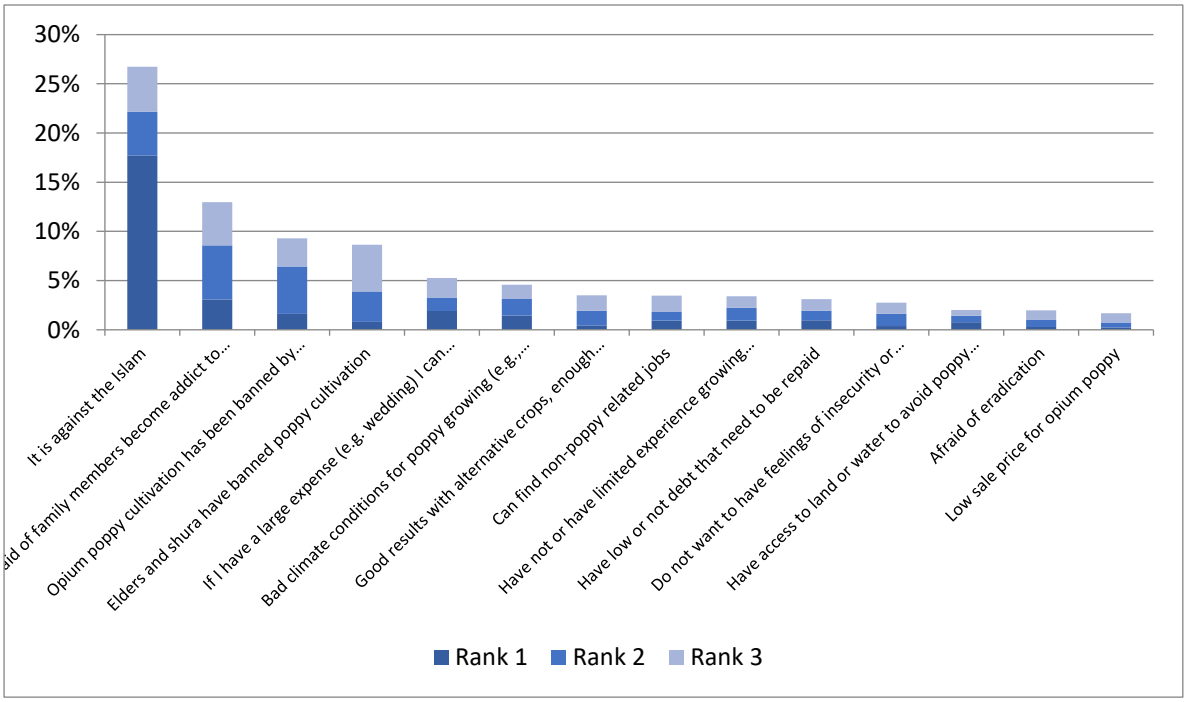
Given a number of reasons to choose from, Afghanistan's opium poppy farmers named a singular large expense, such as a wedding, most often as one of three reasons for cultivating opium poppy in 2017. This was followed by lack of alternative employment, and high poppy yields.

The far most common reason named for never cultivating opium poppy cultivation was that opium poppy cultivation is against Islam, followed by fear of addiction.

REASONS FOR CULTIVATING OPIUM POPPY AMONG FARMERS IN AFGHANISTAN (PERCENTAGE), 2018



REASONS FOR NEVER CULTIVATING OPIUM POPPY, 2018



Security and government control

GOVERNMENT CONTROL OF VILLAGES, BY REGION, 2018

	Anti-government	Central/ regional/ local government	Others
Central	32%	64%	5%
Eastern	45%	54%	1%
North-eastern	8%	92%	0%
Northern	24%	73%	3%

Southern	38%	62%	0%
Western	28%	53%	19%
National	30%	64%	5%

Note: The notion of government control reflected the perception of the village headmen interviewed.

SECURITY ASSESSMENT BY VILLAGE HEADMEN, BY REGION, 2018

	Very insecure	Insecure	More or less safe	Safe/secure	Very safe
Central	6%	20%	15%	27%	32%
Eastern	11%	27%	19%	28%	15%
North-eastern	1%	6%	25%	50%	17%
Northern	4%	16%	24%	24%	31%
Southern	0%	16%	41%	34%	8%
Western	0%	24%	43%	26%	7%
National	4%	19%	28%	30%	20%

CHANGE IN SECURITY SITUATION AS ASSESSED BY VILLAGE HEADMEN, BY REGION, 2018

	Deteriorated	Remained the same	Increased
Central	17%	74%	9%
Eastern	18%	68%	14%
North-eastern	14%	71%	15%
Northern	24%	63%	13%
Southern	6%	85%	9%
Western	28%	51%	21%
National	18%	70%	13%

Taxing of opium poppy and ushr, by province and region

PERCENTAGE OF VILLAGE HEADMEN OF POPPY VILLAGES REPORTING TO PAY OPIUM POPPY TAX, 2018

Province	Percentage of poppy villages paying taxes on opium poppy
Badakhshan	100.0%
Badghis	47.6%
Baghlan	0.0%
Balkh	0.0%
Daykundi	6.9%
Farah	66.7%
Faryab	81.0%
Ghazni	100.0%
Ghor	12.5%
Helmand	59.7%
Jawzjan	62.5%
Kabul	0.0%
Kandahar	45.1%
Kapisa	0.0%
Kunarha	0.0%
Laghman	14.3%
Logar	100.0%

Nangarhar	33.3%
Nimroz	100.0%
Nooristan	0.0%
Paktika	25.0%
Samangan	100.0%
Sar-e-pul	80.0%
Takhar	0.0%
Urozgan	31.3%
Zabul	8.7%

Note: Provincial estimates are often based on few samples and have to be considered as indicative, since the sample size does not allow for extrapolation.

RECIPIENTS OF POPPY TAX ACCORDING TO VILLAGE HEADMEN, BY PROVINCE, 2018

	Anti-government	The Taliban	To ISIS	Local powerbrokers	Others
BADAKHSHAN	0%	0%	0%	0%	100%
BADGHIS	30%	60%	0%	0%	10%
DAYKUNDI	100%	0%	0%	0%	0%
FARAH	80%	5%	0%	0%	15%
FARYAB	18%	82%	0%	0%	0%
GHAZNI	100%	0%	0%	0%	0%
GHOR	67%	0%	0%	0%	33%
HELMAND	63%	0%	0%	35%	3%
JAWZJAN	0%	60%	40%	0%	0%
KANDAHAR	53%	0%	0%	16%	31%
LAGHMAN	0%	100%	0%	0%	0%
LOGAR	100%	0%	0%	0%	0%
NANGARHAR	100%	0%	0%	0%	0%
NIMROZ	33%	67%	0%	0%	0%
PAKTIKA	100%	0%	0%	0%	0%
SAMANGAN	0%	0%	0%	0%	100%
SAR-E-PUL	33%	33%	0%	0%	33%
UROZGAN	80%	0%	0%	0%	20%
ZABUL	100%	0%	0%	0%	0%

Note: Provincial estimates are often based on few samples and have to be considered as indicative, since the sample size does not allow for extrapolation. 'Others' include 'district governor', 'government officials', 'local commander', 'local police', 'Mullah', 'To poor people'.

AVERAGE TAX RATE ON OPIUM POPPY SALES AS REPORTED BY VILLAGE HEADMEN, BY REGION, 2018

Region	Average tax rate
Central	7%
Eastern	6%
Northern	13%
Southern	4%
Western	8%
National	6%

Note: National estimate is an average of regional estimates weighted by estimated regional production of opium gum.

RECIPIENTS OF USHR ACCORDING TO VILLAGE HEADMEN, BY REGION, 2018

	Central	Eastern	North-eastern	Northern	Southern	Western	National
No ushr	25%	18%	8%	4%	7%	25%	16%
Anti Government	3%	3%	2%	3%	1%	2%	2%
Local commander	0%	0%	1%	2%	0%	2%	1%
Local Police	0%	0%	6%	0%	0%	0%	1%
To madrasa	3%	0%	4%	3%	0%	0%	2%
To Mullah	17%	3%	20%	34%	37%	53%	29%
To poor people	40%	70%	50%	42%	43%	12%	40%
To Taliban	13%	6%	9%	12%	12%	6%	10%

TAXES INCURRED FROM OPIUM SALES (FARM-GATE VALUE) BY RECIPIENT AND REGION, (US$), 2018

	Eastern	North-eastern	Northern	Southern	Western	National
Local commander	0	0	18	0	175	193
Local Police	0	0	0	363	535	897
To anti Government	1107	0	119	10379	5193	16968
To district Governor	0	0	0	0	267	267
To Government official	0	0	0	574	0	574
To ISIS	0	0	7	0	0	7
To mullah	0	0	20	0	0	20
To poor people	0	678	0	0	0	678
To Taliban	100	0	500	0	2019	2619
To local powerbrokers	0	0	0	5196	0	5196

Presence of more than one opium poppy harvest

PERCENTAGE OF VILLAGE HEADMEN REPORTING THAT VILLAGERS HARVEST OPIUM POPPY MORE THAN ONCE A YEAR, BY REGION, 2018

Region	More than one poppy harvest
Central	0%
Eastern	0%
North-eastern	0%
Northern	0%
Southern	20%
Western	1%
National	11%

PERCENTAGE OF VILLAGE HEADMEN OF THE SOUTHERN REGION REPORTING THAT VILLAGERS HARVEST OPIUM POPPY MORE THAN ONCE A YEAR, BY PROVINCE, 2018

Region	More than one poppy harvest

Day Kundi	3%
Helmand	33%
Kandahar	32%
Urozgan	19%
Zabul	7%
Southern total	20%

Awareness campaigns against opium poppy

PRESENCE OF AN AWARENESS CAMPAIGN AGAINST POPPY, BY REGION, 2018

Region	Awareness campaign
Central	54%
Eastern	69%
North-eastern	59%
Northern	63%
Southern	64%
Western	52%
National	59%

MOST COMMON SOURCES OF AWARENESS CAMPAIGNS AGAINST OPIUM POPPY CULTIVATION, 2018

source	percentage
Billboard	3%
Governor	11%
Mosque/Mullah	34%
Radio	19%
Shura	22%
TV	10%

Part III: Technical notes and methodology

Village survey methodology

Village survey activities (such as training, deployment and data collection) were carried out from the end of March to the end of April 2017 by 136 local field surveyors across all provinces. These activities were supervised jointly by MCN and UNODC. The surveyors were selected based on their experience in opium poppy surveys, knowledge of local customs and their acceptance by local communities. Security was generally problematic for the surveyors, but the selection of local surveyors helped to reduce security risks.

New sampling frame 2017

For the 2017 MCN/UNODC village survey, a new list of settlements was made available by the Afghan Geodesy and Cartography Head Office (AGCHO). The new list of settlements replaced the old village frame, which has not been updated since 2010 and was based on information from the Central Statistical Office and UN databases. The new village frame is more up-to-date and has a better geographical coverage.

Overall, the 2017 village frame has 5 per cent more villages than the old one. At the regional level, the differences can be greater. In contrast to previous years, the Central region, and thus a region with very limited opium poppy cultivation, is comparatively stronger represented than the Southern region. This means that in 2017, opium poppy villages had a smaller weight on national estimates than non-poppy villages. This may limit the year-on-year comparability of national estimates.

TABLE 9 NUMBER OF VILLAGES IN THE VILLAGE SAMPLING FRAME, 2010-2016 AND 2017, BY REGION

Region	Village frame 2010-2016	Village frame 2017	Difference (%)
Central	10,602	12,857	21%
Eastern	3,571	4,467	25%
North-Eastern	3,668	4,181	14%
Northern	7,162	7,846	10%
Southern	11,749	8,663	-26%
Western	6,782	7,495	11%
National	43,534	45,509	5%

Sample selection and obtained samples

The sample of villages visited was a nationally representative sample. It was drawn by means of a simple random sampling approach. The sample size was allocated to the regions proportionally to their size measured by the number of villages. This resulted in a self-weighting sample of villages. The estimates are considered to be representative at the regional level. Provincial level estimates are based on a small number of samples that does not allow for extrapolation. These estimates are indicative and not considerd to be statistical estimates.

In 2017, a total of 1,503 villages were selected into the sample. Out of these, 1,377 villages were successfully visited. Surveyors sought to interview three farmers in each village: one opium-growing farmer; one who had discontinued opium poppy cultivation; and one who had never grown opium. Interview partners were recruited by opportunity sampling. This resulted in 4,083 interviews with farmers and 1,378 interviews with village headmen. The selection of farmers in the village was based on opportunity and not on a random sampling procedure. NSIA and UNODC are working on improving the selection of interview partners in future surveys to be in line with standard survey methodology.

The interviews were conducted by following a questionnaire developed jointly by MCN and UNODC.

TABLE 10 NUMBER OF VILLAGES IN THE SAMPLING FRAME, NUMBERS OF SAMPLED AND RESPONSIVE VILLAGES, BY PROVINCE, 2017

Province	Villages in frame	Sampled villages	Responsive villages
BADAKHSHAN	1,869	62	56
BADGHIS	1,017	33	30
BAGHLAN	1,535	51	48
BALKH	1,235	41	40
BAMYAN	1,891	62	62
DAYKUNDI	2,134	70	56
FARAH	1,267	42	39
FARYAB	1,052	35	31
GHAZNI	3,262	107	98
GHOR	2,330	78	67
HELMAND	2,059	68	66
HERAT	2,363	78	72
JAWZJAN	455	15	11
KABUL	844	28	24
KANDAHAR	2,224	73	73
KAPISA	684	23	22
KHOST	1,081	36	29
KUNARHA	1,166	38	35
KUNDUZ	963	32	22
LAGHMAN	718	24	24
LOGAR	767	25	24
NANGARHAR	1,506	50	43
NIMROZ	518	17	16
NOORISTAN	393	13	10
PAKTIKA	1,696	56	56
PAKTYA	1,374	45	43
PANJSHER	534	18	18
PARWAN	1,299	43	39
SAMANGAN	843	28	24
SAR-E-PUL	835	28	28
TAKHAR	1,349	44	38
UROZGAN	618	20	16
WARDAK	2,000	66	65
ZABUL	1,628	54	52
National	45,509	1,503	1,377

TABLE 11 NUMBER OF VISITED VILLAGES, NUMBER OF VILLAGES WITH AND WITHOUT OPIUM POPPY CULTIVATION AND THE SHARE OF VILLAGES WITH OPIUM POPPY CULTIVATION AMONG TOTAL NUMBER OF VILLAGES, BY REGION

Region	Number of sampled villages	Number of villages without poppy cultivation	Number of villages with poppy cultivation	Percentage of villages with poppy cultivation
Central	396	387	9	2.27%
Eastern	134	64	70	52.24%
North-Eastern	116	100	16	13.79%
Northern	244	157	87	35.66%
Southern	263	40	223	84.79%
Western	224	138	86	38.39%
National	1,377	886	491	35.66%

TABLE 12 NUMBERS OF INTERVIEWS CONDUCTED IN 2017

Region	Headmen	Farmers who never grew opium poppy	Opium poppy farmers	Farmers who stopped growing
Central	396	1,141	16	22
Eastern	134	161	117	93
North-Eastern	116	277	26	45
Northern	244	534	89	106
Southern	263	252	292	241
Western	224	412	108	151
National	1,377	2,777	648	658

Surveyor training

In order to prepare for the village survey, and as part of a capacity-building exercise for national staff, regional survey coordinators and their assistants were trained in Kabul over a two-day period. They, in turn, trained surveyors in their respective regions. The extension of survey training sessions to the regional level is one of the milestones reached in building national capacity to conduct opium poppy surveys.

During the training period, a total of 136 surveyors were trained in the use of the survey form and techniques by MCN survey coordinators and supervised by UNODC survey coordinators. Surveyor training began in March 2017. The training included practical (use of GPS, etc.) and theoretical aspects (interviewing and dialogue with village headmen and farmers).

Data collection

Opium poppy cultivation is illegal in Afghanistan and is considered to be forbidden by Islam. Given the sensitive nature of the issue, data collection is difficult and can be dangerous. Surveyors are thus selected from different regions of Afghanistan by means of a very careful process. MCN and UNODC regional offices and coordinators recruit surveyors according to survey specifications and the surveyors' skills. Most of those selected already have experience of conducting UNODC surveys.

Surveyors were trained in techniques for approaching local community members and conducting interviews. Following intensive theoretical and practical training, they were deployed to the field where they interviewed village headmen and conducted other survey-related activities. MCN and UNODC coordinators closely monitored data quality and the progress of the survey.

Fortunately, the surveyors did not encounter any security problems. However, interviewers often faced difficult security situations in the field might have impacted the quality of the data collected. NSIA and UNODC work together on further improving the monitoring and support of interviewers in the field to ensure high data quality in future surveys.

Debriefing

After the survey, surveyors were debriefed by survey coordinators. This helps understand the difficulties surveyors may have encountered (for example, due to the difficult security situation) and whether questions were properly understood by respondents.

Heroin production estimates

Estimating the amount of heroin that one year's opium production can yield, requires knowledge on a set of critical components:

- The share of raw opium that is consumed in the form of opium (demand for opium) and the remainder that is available for conversion to heroin within and outside of Afghanistan,
- the amount of heroin/morphine that can be produced from one kilogramme of raw opium (conversion ratio),
- and the purity of the heroin considered.

There is a clear understanding of the amount of opium produced, which is a compound estimate of area under cultivation and annual opium yield per hectare. The factors that define annual heroin production estimates are much less clear as only secondary data can be used as a proxy. For example, the purity of the heroin is often unclear and only little is known about the conversion of opium to morphine and heroin.

Demand for raw opium in the region

Data reported to UNODC by member states, as well as academic sources, indicate substantial consumption of raw opium in Afghanistan, the Islamic Republic of Iran and Pakistan. By using information from drug use surveys,[57] MCN/UNODC estimated that some 950 to 1,200 tons of opium are consumed annually in Iran and Pakistan, and some additional 160-200 tons are consumed in Afghanistan, totalling in approximately 1,100 – 1,400 tons of opium used for consumption. More details on the estimates are presented in the methodology section.

ESTIMATED OPIUM CONSUMPTION IN AFGHANISTAN, PAKISTAN AND IRAN

	Iran and Pakistan	Afghanistan
Number of opium users	1,432,000 (1,257,000 – 1,607,000)	230,000 (210,000 – 260,000)
Average annual consumption	0.77 kilograms	0.77 kilograms
Estimated consumption in tons (range)	1,100 (970 – 1,230)	175 (160 – 200)

Sources: Afghanistan Ministry of Counter Narcotics/Ministry of Health/UNODC: Drug Use in Afghanistan 2009 Survey (average daily consumption and drug users in Afghanistan); UNODC/Pakistan Ministry of Interior and Narcotics Control: "Drug use in Pakistan 2013"; Ali Nikfarjam et al. (2016), "National population size estimation of illicit drug users through the network scale-up method in 2013 in Iran", International Journal of Drug Policy, Volume 31, 2016 (opium users in Iran).

[57] Sources: Afghanistan Ministry of Counternarcotics/Ministry of Health/UNODC: Drug Use in Afghanistan 2009 Survey (average daily consumption and drug users in Afghanistan); UNODC/Pakistan Ministry of Interior and Narcotics Control: "Drug use in Pakistan 2013"; Ali Nikfarjam et al. (2016), "National population size estimation of illicit drug users through the network scale-up method in 2013 in Iran", International Journal of Drug Policy, Volume 31, 2016 (opium users in Iran).

Conversion ratio of opium to pure heroin base

The amount of raw opium needed for producing pure heroin base depends on two main factors:[58]

- the average morphine content of opium, which is the base for heroin,
- the efficiency of the heroin laboratory in extracting morphine from opium and in converting the yielded morphine to pure heroin base (laboratory efficiency).

Morphine content of opium is very well researched. Annual investigations undertaken from 2010 to 2015[59] resulted in an average morphine content of 12.35 per cent (95 per cent confidence interval ±0.71 per cent). However, only little is known about the laboratory efficiency of heroin laboratories in Afghanistan.

The laboratory efficiency depends on how well (or efficient) raw opium is converted into heroin base.[60] There are two main steps: In the first step, the extraction step, morphine (and other alkaloids) are extracted from raw opium by adding hot water and readily available chemicals such as calcium oxide and ammonium chloride. In the second step, morphine base is converted to heroin base by adding costly, internationally controlled precursor substances such as acetic anhydride.

In a theoretical scenario, 100 kilograms of opium with a 12.35 per cent morphine content could yield 15.9 kilograms of pure heroin base (corresponding to 6.3 kilograms of opium per kilogram heroin). However, in reality traffickers are not well-trained chemists and do not work under optimal conditions. Thus it is unlikely that all morphine is extracted from the opium and a that no morphine is lost at the conversion step to heroin.

The combined losses in both steps are reflected in "laboratory efficiency",[61] which is a measure of the ability of traffickers and clandestine chemists to extract morphine from opium and to convert it into heroin. Laboratory efficiency can vary substantially, depending on factors such as the skills and efforts of the chemists producing the heroin, the availability and quality of precursor substances, and the equipment used.

To date, only one study[62] is available that has investigated laboratory efficiency in Afghanistan under local conditions. In this experiment, a laboratory efficiency[63] of 34 per cent was achieved in the conversion of raw opium of low quality (8.5 per cent morphine content) to pure heroin base. The study has some limitations, including a limited number of experiments performed by only two "heroin cooks". The main uncertainty surrounding the conversion ratio of opium to pure heroin base is thus due to a lack of information on the average efficiency of heroin laboratories in Afghanistan.

Using a 12.35 per cent morphine content together with 34 per cent of laboratory efficiency results in a conversion ratio of 18.5:1 for opium to pure heroin base, meaning that 18.5 kilogrammes of opium are needed to produce one kilogramme of pure heroin base.

TABLE 13 OPIUM CONVERSION TO PURE HEROIN BASE, ASSUMPTIONS AND RATIO

	Value
Average morphine content of opium	12.35 per cent (±0.71 per cent)

[58] For more details on the heroin production process in Afghanistan, please see *Bulletin on Narcotics, vol. LVII, Nos. 1 and 2, 2005, pp. 11-31.*

[59] In 2013 and 2014, UNODC/MCN also collected samples. These samples have been dried and stored and their analysis is in progress.

[60] Chemically it is Diacetylmorphine.

[61] Laboratory efficiency is expressed as the percentage of actual amount of pure heroin base produced over the theoretically possible, maximum output (potential amount).

[62] Bulletin on Narcotics, vol. LVII, Nos. 1 and 2, 2005, pp. 11-31.

[63] In the study, 70 kilograms of raw opium with 8.5% morphine content were converted to 2.9 kilograms of pure heroin hydrochloride, which is equivalent to 2.64 kilograms of pure heroin base – assuming no further losses.

Laboratory efficiency	34 per cent
Chemical constant	1.29
Conversion ratio to pure heroin base	18.5:1 (17.5:1 – 19.6:1)

Note: range of the conversion ratio reflects the 95% confidence interval of the average morphine content. The chemical constant reflects the weight morphine gains when being converted to heroin base.

Purity of heroin in the market

Heroin base is hardly ever pure. At all stages of the conversion process impurities remain in the product and increase its volume. Heroin of higher purity is easier to traffic, which is one of the reasons why traffickers undertake the effort to purify the product. High quality heroin is predominantly found close to the source and at wholesale trade level. At later stages of the supply chain, at retail level, heroin is adulterated to increase its volume and thus its sales value.

Purity of heroin of export quality can vary greatly. Reported purities of heroin seized at the whole sale level of 2015 ranged between 20 per cent (15-25 per cent) in Kazakhstan, 25 to 60 per cent in Tajikistan (no point estimate provided), 70 per cent (60-80 per cent) in Italy and 70 per cent (65-85 per cent) in Lebanon. Turkey, an important transit country at the route between Afghanistan and Europe, reported 52 (24-84 per cent) in 2015.[64]

The data closest to the source are from the United States Drug Enforcement Agency, which conducted purity analyses of major seizures in Afghanistan.[65] The DEA reported an average purity of bulk seizures (reflecting export quality) of the highly-refined Afghan heroin of 76 per cent (based on 25 samples collected over four years). The average purity of the crude heroin base seized in Afghanistan was about 60 per cent (based on 21 samples over four years). DEA also received over 230 other samples of heroin from Afghanistan that were deemed to be "sham" or "junk" samples. These samples were not included in the averages presented.

Based on the available data, MCN/UNODC used a range of 50 -70 per cent purity for estimating the amount of heroin produced from the opium harvest and a laboratory efficiency of 34 per cent.

OPIUM CONVERSION TO HEROIN OF EXPORT QUALITY, ASSUMPTIONS AND RATIO[66]

	100 per cent pure heroin	70 per cent purity	50 per cent purity
Conversion ratio to heroin of a certain quality	18.5:1 (17.5:1 – 19.6:1)	12.9:1 (12.2:1-13.7:1)	9.2:1 (8.7:1-9.8:1)

The above is calculated by using the values in Table 13: 12.35% (±0.71%) morphine content; 34% laboratory efficiency.

Opium consumption in the region and Afghanistan opiate consumption

In 2009, the Ministries of Health and Counter Narcotics, in collaboration with UNODC, implemented an extensive national drug use survey in Afghanistan,[67] in which the number of opium and heroin users in the country was estimated to be 230,000 (210,000-260,000) and 120,000 (110,000-140,000), respectively. These numbers account for poly-drug use, i.e. one person is counted in both groups if using both opium and heroin.

The report provides information on the average numbers of days that both groups consume the drugs (256 days per year for opium users and 285 days per year for heroin users). This information, together with the

[64] Source of all purities UNODC statistics - https://data.unodc.org/.
[65] US Drug Enforcement Administration Special Testing and Research Laboratory analysis – October 2017
[66] Estimates have been updated with the latest available data and thus differ from the figures published in *"Afghanistan opium survey-cultivation and production report 2017"*.
[67] Ministry of Counter Narcotics/Ministry of Health/UNODC: Drug Use in Afghanistan 2009 Survey.

average amount spent on each drug per day, can be used to calculate the total amount spent on opium and heroin in Afghanistan in a given year. This total amount divided by the average end-consumer price gives the total quantity consumed. As there were no end-consumer prices available for 2009, the earliest (and lowest) data available, which was the price average of October 2010, was used. The price of 1 kilogram of heroin was reported to be US$ 6,300 and of 1 kilogram of opium to be US$ 530. Combining the price data with the other estimates yields the results shown in the following table.

TABLE 14 AFGHAN OPIATE MARKET, 2009

Substance	Days consumed, 2009*	Total expenditure (US$), 2009	Total consumption (tons)	Average daily consumption (grams)	Average annual consumption (grams)
Opium	58,045,000	92,872,000	175	3	770
Heroin/ Morphine	34,142,000	75,113,000	12	0.4	100

Source: Ministry of Counter Narcotics/Ministry of Health/UNODC: Drug Use in Afghanistan: 2009 Survey.

The resulting average daily consumption is a sensible magnitude for Afghanistan and is confirmed by regular non-representative use surveys undertaken by MCN/UNODC among heavy users in Afghanistan. It should be noted that there are indications that the quality of heroin/morphine at street level is very poor. When multiplying these quantities consumed by current end-consumer level prices, the value of the domestic opiate market can be calculated.

In absence of national data available, the consumption estimate retrieved from the Afghanistan drug use survey is applied to estimates on the number of drug users in Pakistan and Iran, which results in the estimates presented in the following table.

TABLE 15 ESTIMATED OPIUM CONSUMPTION IN AFGHANISTAN, PAKISTAN AND IRAN

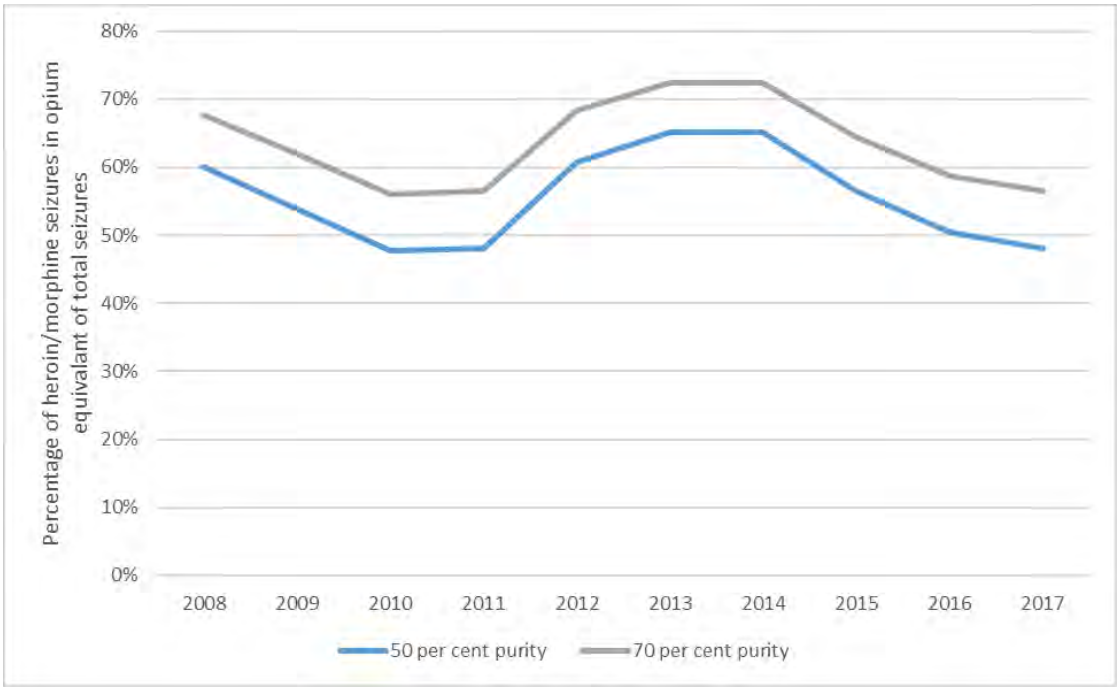
	Iran and Pakistan	Afghanistan
Number of opium users	1,432,000 (1,257,000 – 1,607,000)	230,000 (210,000 – 260,000)
Average annual consumption	0.77 kilograms	0.77 kilograms
Estimated consumption in tons (range)	1,100 (970 – 1,230)	175 (160 – 200)

Sources: Afghanistan Ministry of Counter Narcotics/Ministry of Health/UNODC: Drug Use in Afghanistan 2009 Survey (average daily consumption and drug users in Afghanistan); UNODC/Pakistan Ministry of Interior and Narcotics Control: "Drug use in Pakistan 2013"; Ali Nikfarjam et al. (2016), "National population size estimation of illicit drug users through the network scale-up method in 2013 in Iran", International Journal of Drug Policy, Volume 31, 2016 (opium users in Iran).

Ratio of opium and heroin/morphine seizures in Afghanistan and neighbouring countries

Data presented is 3-year moving average of the percentage of heroin/morphine seizures (converted to opium equivalent) of total opiate seizures in Afghanistan and neighbouring countries with two different purity assumptions for the conversion of heroin/morphine to opium equivalents.

FIGURE 37 PERCENTAGE OF HEROIN/MORPHINE SEIZURES (IN OPIUM EQUIVALENTS) OF TOTAL OPIATE SEIZURES, 2008 - 2017



Value of the opiate economy

Key components and underlying assumptions

Opium available for conversion to heroin. All the opium produced in Afghanistan each year is either exported as raw opium or in the form of heroin/morphine, consumed domestically in various forms, seized, stored for later use or lost (for example, due to mould or disposal to avoid seizures). Seized opiates do not contribute to the value of the opiate economy and are therefore subtracted from the opium harvest. To approximate seizures in the current year, the latest available data of seizures of opiates in Afghanistan is used. Heroin and morphine seizures are converted into opium equivalents by using the latest available conversion ratio from opium to heroin and morphine.

Percentage of opium converted to heroin within Afghanistan. Once approximate amounts of seized opiates are subtracted from the opium production estimates, the amounts of opium converted to heroin within Afghanistan has to be estimated. All seizure data from Afghanistan and neighbouring countries is used for the estimation, which assumes that the shares converted in and exported from Afghanistan are proportional to all seizures made in those countries. Since seizures are often driven by chance and can vary strongly from year to year, a three-year moving average of seized amounts is used for establishing the shares. Heroin and morphine seizures are converted into heroin equivalents by using the latest available conversion ratio estimate and purity assumptions.

Precursor substances. For the production of 1 kilogram of heroin, 1 litres of the costly precursor substance acetic anhydride is needed (updated in 2017 from 1.5 litres).[68]

Purity. The calculation of the value of the opium economy is limited by the fact that the drug products leaving laboratories in Afghanistan may undergo further processing, such as adulterations, before reaching assumed points of sale in neighbouring countries. To account for these uncertainties, MCN/UNODC uses a wide range of purities.

Domestic market. The calculation of opiates consumed within Afghanistan uses the drug use estimates from the 2009 Drug Use Survey implemented by the Government of Afghanistan and UNODC, as well as more recent price data. The underlying assumption is that the quantity used has not changed since 2009, which is a simplification due to the lack of more recent data. The value of the domestic market was calculated by multiplying the estimated volumes of opium and heroin consumed in Afghanistan with the latest available retail price data retrieved from the MCN price monitoring system.

Gross and net export value. For the calculation of gross export value, the potential volumes of opium and heroin exported to neighbouring countries were multiplied by the corresponding average cross-border prices. The total gross export value is the combined gross export value of opium and morphine/heroin exports. Morphine exports are not considered separately, and all processed opium exports are assumed to be in the form of heroin. By using cross-border prices, any profits made with Afghan opiates from onwards trafficking to end-consumer markets are not considered in the value of the opiate economy. To estimate the net value, the value of imports is subtracted from the gross value of all final goods, since this is income lost to the exporting country (Afghanistan). There are many imports necessary for opiate production but only imports of the main precursor substance for heroin production are considered in the calculation.

Components of the estimation

The opium economy estimation process includes the following steps:

- Estimation of the gross value of the domestic market for heroin/morphine and opium;

[68] US Drug Enforcement Administration Special Testing and Research Laboratory analysis – October 2017

- Estimation of the gross export value of the remaining opium in the form of opium or heroin/morphine, after deducting seizures and domestic consumption. The respective value is calculated by multiplying quantities by prices in respective neighbouring countries;
- Estimation of the net value of the economy by subtracting the costs of imported precursors used for the production of domestically consumed opiates and the gross export value of remaining opiates;
- Therefore, up-to-date cross-border (for the export value) and end-consumer market (for the domestic market value) prices are needed, as well as the prices of the main precursor substances;
- Furthermore, in order to estimate the amount of opium needed for each of those markets a conversion factor for opium into morphine and heroin is needed.

The gross value of Afghan opium production at end-consumer level and at the country's borders is calculated by the amounts consumed and traded multiplied by their respective prices. The net value of opiate production is the gross value minus all expenditure for imports from abroad needed for processing opium into morphine and heroin and results in a net gain for the Afghanistan economy. Net value is considered to be more suitable for comparison with GDP than gross value.

Seizures are not represented in these calculations, as the income that would be generated by seized products is lost. The value of the domestic market at end-consumer level is calculated by multiplying the amounts consumed by the street-level price for heroin/morphine and opium, respectively. The cross-border price was used to calculate the value of the potential exports of opium and opiate products.

The calculation of a possible range in the potential value of the Afghan opiate economy is based on different assumptions on purity that affect the conversion ratio from opium to heroin, on different price ranges and on the confidence intervals around the estimated opium production of the current year. The resulting ranges are not meant to provide a confidence interval or any other statistical measure, but rather they constitute a what-if analysis that offers results on the basis of different assumptions about the further processing of opium in Afghanistan.

Prices

Until 2015, for Pakistan, the cross-border price of opium was the simple average of the average monthly wholesale price in Peshawar, Pakistan and the average monthly wholesale price in Quetta, Pakistan, collected via MCN Afghanistan opium price monitoring system. However, in 2016 the collection in Pakistan was discontinued. The source for prices of heroin and opium in neighbouring countries are the Annual report questionnaires submitted by Member States to UNODC. The simple average of these prices was used for estimating the value of exported opiates. In 2018, the methodology was updated by using prices from Iran, Pakistan and Tajikistan. The change in methodology was prompted by the findings of the UNODC report "Afghan opiate trafficking along the Northern route".[69]

It should be noted that price information has strong limitations and needs to be improved to enhance the reliability of the estimate.

Average farm-gate price and farm-gate value of opium production

Since 2009, farm-gate prices at harvest time have been derived from the opium price monitoring system and refer to the month when opium harvesting took place in the different regions of the country, which is thought to reflect opium prices at harvest time better. To calculate the national average price, regional price averages were weighted by regional opium production. The opium price in the Central region is approximated by the national average, as there is no monthly opium price monitoring in that region.

[69] UNODC June 2018, available at https://www.unodc.org/documents/publications/NR_Report_21.06.18_low.pdf.

The farm-gate value of opium production is the product of potential opium production at the national level multiplied by the weighted average farm-gate price of dry opium at harvest time. The upper and lower limits of the range of the farm-gate value were determined by using the upper and lower opium production estimate.

Cumulative precipitation charts

The dataset used to generate the cumulative precipitation charts is the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS), which was developed by the United States Geological Survey with Climate Hazard Group scientists to monitor rainfall globally. The precipitation estimates are generated using five different data sources: infrared cold cloud duration[70] (CCD) observations taken from satellite imagery, satellite means, elevation and location data, weather station normals, and a bias correction from rain gauge observations. First, the CCD critical temperature threshold is fixed at 235 °K and translated into millimeters of precipitation using a coarser dataset that combines satellite data with station data. Second, the data is blended using an inverse weighted distance algorithm to define the distances where the correlation between the precipitation values is 0. This is then used together with rain gauge measurements at weather stations to calculate and adjust for biases at any given pixel. The dataset's highest temporal resolution is a daily mean, while its spatial resolution is 0.05 °. More information on this can be found in the dataset's development paper by Funk et al. (2015).

[70] Cold Cloud Duration is a technique that estimates the actual amount of rainfall by applying a regression to measurements of the length of time a cloud is at its critical threshold temperature for precipitation (Milford and Dugdale, 1990).