THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Denying Revenue or Wasting Money?

Assessing the Impact of the Air Campaign Against 'Drugs Labs' in Afghanistan

LSE International Drug Policy Unit

David Mansfield

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Front cover photos. Top left: opium being collected using a traditional tool known as a *rambey* in eastern Afghanistan. Top right: a trader testing the quality of opium by drying it on a hot plate in southern Afghanistan. Bottom left: opium poppy capsules after lancing with gum exuding from the pod and drying in the sun, eastern Afghanistan. Bottom right: still image of a drugs lab in Gandam Raiz following its destruction by a smart bomb dropped from an F-16.

Back cover photos. Top: opium gum after being collected from the capsules, eastern Afghanistan. Middle left: a cake (*chakai*) of dried opium in eastern Afghanistan, weighing around 1.2 kilograms. Middle right: fresh black (*tor*) opium in southern Afghanistan, stored in polythene bags and weighing around 9 kilograms per bag. Bottom: the inside of an opium trader's store, complete with bags of fresh black (*tor*) opium, dried opium in metal pots, scales and lock boxes, in southern Afghanistan.

Photos: Alcis Ltd, David Mansfield. Additionally, some included images are stills from USFOR-A videos.

About the International Drug Policy Unit

The International Drug Policy Unit (IDPU) is a cross-regional and multidisciplinary research unit, designed to establish a global centre for excellence in the study of international drug policy. It is based at the LSE's United States Centre, at the London School of Economics and Political Science (LSE). By utilising LSE's academic expertise and networks, the IDPU fosters new research, analysis and debate around global drug policies. Working closely with governments and policymakers around the world, it helps design, implement and evaluate new policies at local, national, regional and international levels.

The IDPU hosts the *Journal of Illicit Economies and Development* (LSE Press), a peer-reviewed, open access, electronic journal publishing research and policy commentary on the complex relationship between illicit markets and development. The journal is cross-disciplinary and engages with academics, practitioners and decision makers in facilitating interventions and development planning that incorporates an in-depth understanding of the dynamics of illicit markets.

About the author

David Mansfield is a Senior Fellow at the London School of Economics. He has been conducting research on rural livelihoods and poppy cultivation in Afghanistan for 23 consecutive growing seasons. He has a PhD in development studies from the School of Oriental and African Studies, London, he is the author of *A State Built on Sand: How Opium Undermined Afghanistan*, and he is on the editorial board of the IDPU's *Journal of Illicit Economies and Development*. David has also worked for the Afghanistan Research and Evaluation Unit since 2005.

Acknowledgements

Thanks go to Alcis Ltd for their invaluable contributions of high-resolution imagery analysis, inventory of videos and for the infographics. My appreciation also goes to a number of Afghan colleagues and researchers for their continued work in the field. I also wish to thank ten peer reviewers, most of whom have policy or operational experience in Afghanistan. These include Richard Brittan, William Byrd, Mike Osman, Matthew Rubin and a number of other people who would prefer to remain anonymous. All their inputs have been invaluable. Any mistakes or errors in the final version of the paper are mine.

This report was produced with the help of London Publishing Partnership
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Summary

In November 2017, in the wake of the United Nations (UN) announcing an unprecedented year of opium cultivation in Afghanistan, United States Forces-Afghanistan (USFOR-A) launched a campaign of aerial strikes against drugs 'labs'. Over the following year as many as 200 of these drug-processing facilities – consisting of mud compounds containing basic equipment such as barrels, makeshift presses, buckets and bowls – were destroyed by high-tech ordnance and planes, many of which were flown in from the gulf specifically for the task. At the time critics argued that the aerial campaign represented a performative response to the announcement of such high levels of cultivation; a knee-jerk reaction on the part of the US government to show 'action' against a 63 per cent rise in poppy cultivation. In some parts of the counternarcotics community the aerial campaign was seen as both a credible attempt to address the burgeoning drugs problem in Afghanistan and a legitimate response following the failures of the past, including eradication, rural development and interdiction. According to those driving this new strategy – the US military – the bombing of labs would deprive the Taliban of the revenue they needed to fight the insurgency and replicate similar efforts that had been launched against Islamic State oil supplies in Syria – a campaign that had been celebrated for its success. This paper conducts a forensic assessment of the aerial campaign against drugs labs to determine whether it fulfilled its primary objective of denying revenue to the insurgency. The paper does this by combining video analysis, high-resolution imagery and in-depth interviews with the lab operators, owners and the rural population most affected by the campaign. It concludes that the campaign had a negligible effect on the Taliban's finances, exacted little toll on drug trafficking organisations, and served to alienate the rural population in and around the areas where airstrikes were deployed. It assesses that the assumptions that underpinned the campaign were unfounded, resulting in an intervention that failed to achieve its overriding objective and that cost on average ten times more than the losses incurred by drug trafficking organisations.

1 Introduction

On 19 November 2017 USFOR-A began an aerial campaign targeting drug-processing facilities. They justified the destruction of these facilities – referred to in common parlance as 'drugs labs', and locally in Afghanistan as 'factories' – on the grounds that it would deny the Taliban the revenue needed to mount their insurgency against the Afghan government.

The beginning of the campaign followed quickly on from the United Nations Office on Drugs and Crime (UNODC) announcement that an unprecedented 328,000 hectares of opium poppies had been cultivated in Afghanistan in 2017.[1] It also marked a shift in US military strategy underpinned by new legal authorities that provided legal cover for lethal military action and ultimately redefined civilians engaged in criminal enterprise as enemy combatants.[2]

During the initial months of the aerial campaign, USFOR-A made bold claims to the media. For example, in February 2018 a USFOR-A spokesperson spoke of the campaign 'cripple[ing] [the Taliban's] revenue generation enterprise', and reported that it had 'denied the Taliban over $30 million in direct revenue, as well as over $160 million in denied revenue from drug trafficking organizations'.[3] By August 2018, the amount of revenue denied to the Taliban had reportedly increased to $46 million and the combined efforts of USFOR-A and the Afghan Air Force had destroyed as many as 200 drugs labs.[4]

Despite estimates of the revenue denied to the insurgency and the impact the airstrikes had allegedly had on the profits of drug trafficking organisations, by August 2018 there were growing signs that the campaign against drugs labs was not having the desired effect. In contrast to the impact the US military campaign was thought to have had on Islamic State in Iraq and Syria (ISIS) by targeting oil revenues, the effects of the lab campaign were viewed as less significant. Lt General Jeffrey Harrigian, head of US Air Forces Central

1 United Nations Office on Drugs and Crime (UNODC)/Islamic Republic of Afghanistan Ministry of Counter Narcotics (2017). *Afghanistan Opium Survey 2017: Cultivation and Production*, Report, November. URL: https://www.unodc.org/documents/crop-monitoring/Afghanistan/Afghan_opium_survey_2017_cult_prod_web.pdf (accessed 17 January 2018).

2 David Mansfield (2018a). *Bombing Heroin Labs in Afghanistan: The Latest Act in the Theatre of Counternarcotics*, Report, January, International Drug Policy Unit, London School of Economics. URL: http://www.lse.ac.uk/united-states/Assets/Documents/Heroin-Labs-in-Afghanistan-Mansfield.pdf.

3 US Department of Defense (2018). Department of Defense briefing by Major General Hecker via teleconference from Kabul, Afghanistan, 7 February. URL: https://dod.defense.gov/News/Transcripts/Transcript-View/Article/1435192/department-of-defense-press-briefing-by-major-general-hecker-via-teleconference/.

4 Dion Nissenbaum (2018). 'Months of U.S. strikes have failed to curtail Taliban opium trade: the effort to put pressure on the insurgency in Afghanistan hasn't crippled a major source of the group's revenue', *Wall Street Journal*, 8 August. URL: https://www.wsj.com/articles/taliban-drug-trade-persists-despite-u-s-strikes-1533726120.

Command in Doha, reported that the campaign was 'not working as well [in Afghanistan] as in Syria' and that he judged 'going after the distribution and warehouses [for drugs] that are more easily concealed and shifted than in Iraq and Syria … a more difficult problem'.[5]

This paper examines the impact of the aerial campaign against drugs labs. It argues that the destruction of these facilities had a negligible effect on the Taliban's finances, exacted little toll on drug trafficking organisations, and served to alienate the rural population in and around the areas where airstrikes were deployed. It concludes that the assumptions that underpinned the campaign were unfounded, resulting in an intervention that failed to achieve its overriding objective and that cost on average ten times more than the losses incurred by drug trafficking organisations.

The paper expands on previous research that examined the impact of the initial night of aerial strikes on nine buildings in Musa Qala in northern Helmand Province.[6] It draws on multiple sources of data – including video, high-resolution imagery and fieldwork – and combines them to assess whether the campaign achieved its primary objective.

The rest of the paper is divided into six further sections. The second section outlines the methodology used, documenting how high-resolution satellite imagery, video and several rounds of in-depth fieldwork were combined. The third section provides a detailed overview of the evolution of drugs processing in the three sites selected for detailed imagery analysis and fieldwork. It charts the reasons for the emergence of drug processing in these specific areas, the different market structures that can be found, and the degree of innovation, specialisation and changes in drug production and processing that have been seen over time. The fourth section analyses the lab strikes themselves. It offers a description of what a drug-processing facility looks like and then, using video and imagery analysis, as well as research in situ, it provides details on some of the targets of the air campaign and identifies the compounds struck and assesses whether they were drugs labs. It also documents whether the labs were active at the time they were destroyed and details the damage.

The fifth section focuses on the likely impact of the campaign, juxtaposing the financial losses to drug traffickers and the insurgency reported by USFOR-A with those reported from the ground. It also looks at how those who own the labs and the local communities in which they are located have responded to the aerial campaign. The sixth section provides a calculation of the cost of the aerial strikes documented in the USFOR-A videos and juxtaposes that total against an estimate of the damage incurred. Finally, a conclusion is offered.

5 Nissenbaum (2018).

6 Mansfield (2018a).

2 Methodology

The research for this report draws on four different but overlapping data sets: (i) 23 videos of lab strikes and one still image published by USFOR-A between November 2017 and April 2018; (ii) high-resolution imagery of 29 compounds shown in these videos and a further seven compounds identified – through either imagery analysis or fieldwork – as having been destroyed as part of the aerial campaign; (iii) in-depth interviews with those who owned the compounds, the lab owners and operators who worked in them, and neighbours and key informants; and, finally, (iv) a set of 450 interviews with farmers in central Helmand Province and in the district of Bakwa in Farah, areas where many of the compounds destroyed during the campaign were located.

The first phase of the research consisted of an analysis of 23 videos that USFOR-A posted online as part of a media campaign to promote the campaign to curtail Taliban finances through the destruction of drugs labs. These videos showed the destruction of as many as 43 buildings, mostly in Helmand Province but also some in neighbouring Farah. Each video was reviewed for content, including the number of compounds and buildings struck, the location, the scale of the damage and the munitions used, as well as a description of the target and its surroundings before and after being hit (see Annex).

A further part of the video analysis was aimed at identifying the location of the specific compounds destroyed. Close inspection of the USFOR-A videos by a team of skilled geo-spatial analysts – each with extensive experience in Afghanistan – allowed 29 separate compounds to be identified. The historical imagery for each of these compounds was then reviewed against the dates of the airstrikes documented in the USFOR-A videos to verify the location. Where available, additional historical imagery was obtained to develop a more detailed chronology of some of these compounds, in order to identify when they were built; if and when they were repaired after being attacked; whether they had been targeted by the air campaign more than once; and what the compounds were being used for prior to, during and after they were hit.

Using the specific locations of the labs, and a detailed history of some of the compounds struck during the air campaign, it was possible to conduct fieldwork in some of these areas. This part of the research was done iteratively as the campaign unfolded. Limited funds and insecurity also meant that it was important to focus the research on a small number of locations where multiple compounds had been destroyed under the aegis of the USFOR-A air campaign, allowing a number of compounds to be reached during each phase of fieldwork.

Over the course of one year, three locations were identified for closer inspection (see Figure 1).

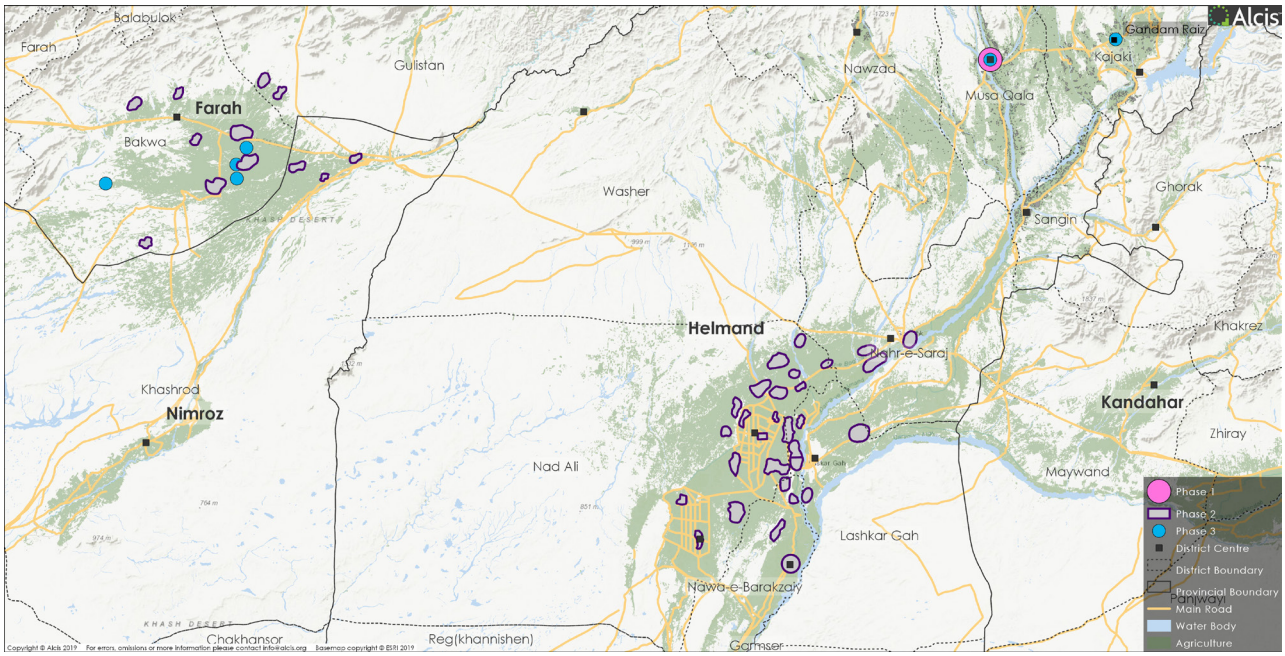

Figure 1. Map of research sites

The first location was the district centre of Musa Qala, in northern Helmand Province. This was an area targeted during the first night of the air campaign on 19 November 2017, and a total of nine compounds were destroyed there. The second location for fieldwork was Gandam Raiz, located to the north of Kajaki dam, in northern Helmand Province. This location was the target of a series of aerial bombardments over a period of seven months from November 2017 to June 2018. Imagery analysis indicated that 20 compounds were targeted – some more than once. Eighteen of these compounds were clustered to the north of the road running east to west through Gandam Raiz, and two more compounds were found on the southern outskirts of the main bazaar. The third and final area identified for fieldwork was the district of Bakwa in Farah. This is a former desert area that borders the provinces of Helmand and Nimroz, and to which the lab campaign expanded its remit in April 2018. Fieldwork revealed that five buildings had been destroyed by the air campaign in Bakwa.

Fieldwork was exploratory and was conducted over a year. The first round took place in November 2017 and solely focused on Musa Qala. The concentrated attack on this urban centre during the initial night of the air campaign and the accompanying videos aided a rapid identification of the buildings destroyed and the fieldwork to be tasked promptly. This work focused on developing a detailed history of the nine compounds destroyed, their inhabitants and an inventory of the damage. A second round of fieldwork was then conducted in central Helmand Province and in Bakwa in April/May 2018, including in

the former desert areas north of the Boghra, in the districts of Nad e Ali and Nahre Seraj. These were areas where drugs labs were commonplace.

The final round of fieldwork was conducted in September 2018. This work included a return to Musa Qala to follow up on what had happened to the compounds destroyed in November 2017 and to inquire about those who had worked there. It also involved more detailed research in Gandam Raiz and Bakwa, including interviews with those directly involved in the production of opiates and, as it turned out, methamphetamine.

The focus of inquiry for this last round of fieldwork was to obtain further information on the processing of opiates: the equipment and materials used; the costs of inputs, including labour and rents; conversion factors for the different stages of processing; and the different ways in which risks – financial, legal and technical – were managed. Details of the impact of the lab strikes were also explored with those who had rented out their compounds as drug-processing facilities, as well as those running and working them. As in Musa Qala, an inventory of damage – including any injuries, deaths, equipment and materials – was also collected, as well as data on how lab operators responded to the airstrikes. The results of this and other fieldwork were then used to inform further imagery and video analysis contained within the report.

Each round of fieldwork – which involved conducting research in insecure areas – was conducted by a team of Afghan researchers with deep experience of the specific locations under study. Interviews with lab owners, operators and workers always require caution due to the illegal nature of their activity and the threat of enforcement. Paradoxically, this research was made easier by the fact that respondents had already been targeted by the aerial campaign. Had they not been, and were the local researchers not well trusted, those interviewed might have been more reticent to talk about their work, fearful that they might be targeted next. The chemists, or cooks (*ustad*), were the most reluctant and reticent of respondents. Conscious that it was their knowledge and experience in the labs that led to them being paid a premium wage, they were typically reluctant to share the details of opiate and methamphetamine production.

To develop a better understanding of the factors that led both to the concentration of drugs labs in the specific research sites and to their personal involvement, as well as to put respondents at ease, interviews were semi-structured and followed a livelihoods approach. This approach positions illicit drugs within the wider socioeconomic, political and environmental context in which they are grown and produced; it does not fetishise drugs or moralise about their cultivation, production or use. Instead, it is an approach that examines how an individual, household and/or community derives their means of living. Illicit drugs are typically only one aspect of a respondent's livelihood; there are often other income streams, sources of capital and ways of managing risk that they draw upon. All of

these need to be examined to better understand the underlying factors that led to their involvement in drug production and their likely responses to interventions, such as the aerial campaign.[7]

Fieldwork with the farming population – the second round of fieldwork – in central Helmand Province and in Bakwa was less challenging. This particular round of fieldwork did not seek to identify specific destroyed buildings through interviews or imagery, nor to talk to those who owned or worked in drugs labs. Instead, it focused on collecting data on rural livelihoods. However, due to the timing, proximity and overall effects of the airstrikes against drugs labs, this particular research learned much about the local population's perception of the aerial campaign. It remains the case that the rural household is the most accessible unit of analysis when looking at the illicit drug economy in Afghanistan, and it offers a basis for cross-referencing findings both with other work on rural livelihoods in Afghanistan and with other research on the specific role of drug production in rural livelihood strategies in Afghanistan and elsewhere.

Here, discussions were focused on the direct experience of respondents and their households rather than on a wider geographic area, where answers become increasingly speculative.[8] Individual interviews with farming households were conducted in the field as farmers tended their crops, since holding interviews in the household compound can attract attention from others and become subject to repeated interruptions and biases. Group discussions with farmers were avoided, as they tend to be dominated by community elites; they are inappropriate for discussing sensitive issues; and, increasingly, they represent a security threat in rural Afghanistan, particularly in the south.

3 Understanding histories: the research sites and their changing role in illicit drug production

3.1 Musa Qala

The district of Musa Qala is located in the southern province of Helmand, some 91 kilometres north of the provincial centre of Lashkar Gah. During the reign of Zahir Shah and prior to the Russian invasion in 1979, Musa Qala is rumoured to have been the hub of the opium trade in the southern part of Afghanistan. This was a period when levels of opium

7 David Mansfield (2016). *A State Built on Sand: How Opium Undermined Afghanistan*, pp. 68–72. London: Hurst/Oxford University Press.

8 Swedish Committee for Afghanistan (1992). 'Farming systems of Nad Ali district, Helmand Province', in *Agricultural Survey of Afghanistan, Report 15*, Part VI. Peshawar: Swedish Committee for Afghanistan.

production were more limited and the crop was confined to the remote areas of northern Helmand in Baghrani, Nawzad and Kajaki as well as Musa Qala itself (see Figure 2).

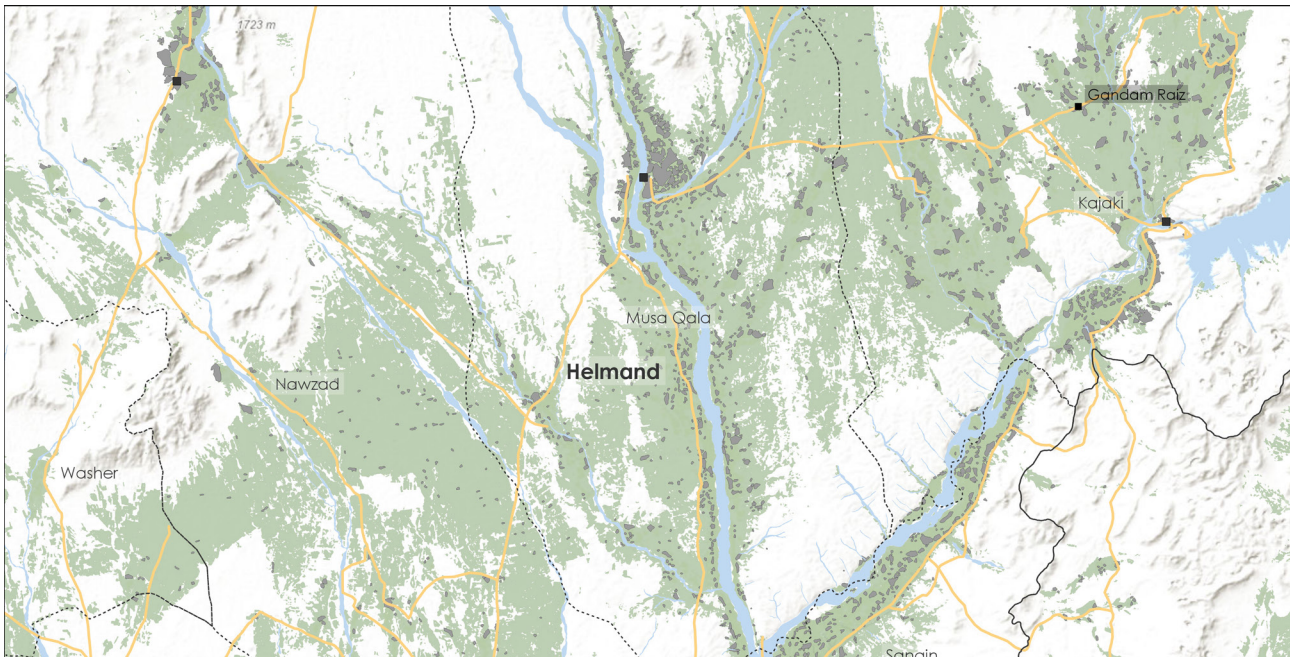

Figure 2. Map of northern Helmand

As the civil war in Afghanistan unfolded in the 1980s, the economy deteriorated and the Afghan government's reach into rural areas diminished. In response, opium poppy cultivation moved further down the valleys onto more accessible terrain, and with it came the opium trade. However, the trade in opium was more restricted by the conflict. Factionalism between the warring parties within the mujaheddin, as well as by those armed groups allied with the communist government, resulted in trade and markets that were shaped by local power brokers. For example, in the late 1990s opium traders argued that the neighbouring district of Sangin gained a competitive edge over the bazaar in Musa Qala due to predation by the Akhundzada family, a powerful Alizai family from Narcha in northern Musa Qala, who went on to become governors of the province under both the mujaheddin and Karzai governments. Traders blamed excessive tax, extortion and the theft of opium by Nasim Akhundzada and his fighters for Sangin's ascendancy as the dominant opium bazaar in the 1980s.[9]

Under the Taliban regime, Musa Qala once again became a major trading centre for opium and had around 100 shops trading in the main bazaar.[10] The numerous checkpoints manned by the factional forces that had hampered trade across southern Afghanistan – not just of opium but of all goods and services – were removed by the Taliban, allowing people to go

9 David Mansfield (1998). Fieldnotes, May.

10 Mansfield (1998).

about their business freely. The opium business became just another part of the economy. So much so that in the late 1990s opium was traded openly and dried in full public view on polythene sheets in the streets of Musa Qala, as it was in many district bazaars in Helmand.[11] Furthermore, Iranian and Pakistani buyers could go directly to a number of bazaars in Helmand, not just Musa Qala and Sangin, to make bulk purchases of opium, and traders from neighbouring district bazaars would often cooperate with each other if they had insufficient inventory to meet an order.[12]

Following the collapse of the Taliban, the trade in opium was inhibited by fighting and by the presence of first government and then international military forces. During the initial years of the Karzai regime, government forces had a presence in the district bazaar of Musa Qala and trade was no longer conducted openly. Later, in 2006 and 2007, Musa Qala became a focal point for the insurgency, and the district centre changed hands a number of times as UK and then US military forces looked to gain control from a resurgent Taliban.[13] After a short-lived peace deal between UK forces and the Taliban in late 2006, the insurgents regained control over the district centre in February 2007.[14] This was followed by intense fighting, including an aerial bombardment that damaged much of the central bazaar. In late 2007 the Musa Qala centre was subdued once again, under a deal brokered by the UK, the Afghan government, local elders and a former 'Taliban' commander, Mullah Salaam.[15]

From late 2008 until late 2012, the presence of UK and then US military forces resulted in the opium trade once again retreating behind closed doors. This all changed with NATO's withdrawal from the area, and by February 2013 Afghan military forces had retreated from the town, leaving Musa Qala bazaar to the advancing Taliban. With foreign and then Afghan military forces gone, opium was again traded openly. In contrast to the 1990s, when there were many shops selling opium across the district centre, a more centralised opium bazaar was established. This was located to the western edge of the town and consisted of around 50 shops. It was flanked by the vehicle bazaar to the north, the river to the west, and what had been residences to the east.

It was these residences to the east of the opium bazaar that were the focus of the opening salvo of the USFOR-A air attack on drugs labs in November 2017 (see Figure 3). Most of these buildings had been empty compounds owned by local traders in Musa Qala but were

11 Mansfield (1998).

12 Mansfield (1998).

13 David Reynolds (2016). *Afghanistan – Britain's War in Helmand: An Historical Account*, pp. 39–42. Plymouth: DRA Publishing.

14 Theo Farrell (2017). *Unwinnable: Britain's War in Afghanistan, 2001–2014*, pp. 187–191. London: Penguin.

15 Farrell (2017, pp. 224–225).

now being rented out to traders and smugglers on a temporary basis so that opium bought in the bazaar could be converted into cooked opium (*chaynaki*) or into opiates such as morphine base (*beest*) and, less commonly, heroin base or heroin hydrochloride (*crystal*), as outlined in Box 1. Most of these compounds contained simple mud buildings with a number of basic rooms.

Figure 3. Imagery showing Musa Qala district centre and the buildings targeted

Box 1. The making of *chaynaki*, *beest*, *gul* and *crystal*[16]

Chaynaki is opium that is dried for storage or to transport across the border. *Chaynaki* has a greater value to weight ratio than fresh opium and it has negligible moisture content and little smell, making it less perishable and easier to store and transport. It is made by placing fresh opium in a metal pot and heating it using coal. The opium is stirred continuously. When it is completely dry the opium is placed on a wooden table and kneaded by hand and pressed with a piece of wood until any remaining moisture is removed. The *chaynaki* is then sealed into a cloth bag and marked with an identifying stamp.

Beest is morphine base, the first stage in the production of heroin hydrochloride but also a final product for many of the labs in southwestern Afghanistan. To make morphine base, 5–7 man (22.5–31.5 kilograms) of dry opium dry is placed in a 200-litre barrel. The barrel should be clean and undamaged. One-third of the barrel is then filled with water and the mixture is heated and stirred and lime is added. When the solution reaches the appropriate temperature

16 Derived from interviews with lab workers, owners and cooks for this research as well as from U. Zerell, B. Ahrens and P. Gerz (2005). Documentation of heroin manufacturing process in Afghanistan.

('the cook knows'), more water is added until the barrel is two-thirds full. The process is repeated until the solution once again reaches the temperature required. Finally, the barrel is filled to the top with water and the solution is heated and stirred and lime is added. Once this final stage is complete the barrel is removed from the heat, covered with a cloth and left to cool for 6–8 hours. When the solution has cooled, the alkaloids will have separated from the opium, forming an oily residue. This is drained from the barrel into a plastic pot using a plastic pipe. This solution is then added in equal amounts into two separate barrels. The residue, or 'mud', from the bottom of the original barrel is also placed in a press, where any residual solution is extracted and added to the two barrels in equal amounts. The waste (*kachara*) from the press is removed and either discarded or sold as fertiliser for between US$4 and US$8 for a 50-kilogram bag. Ammonium chloride (n*owshouda*) is then added to each of the two barrels, along with water. These barrels are then heated, and once the required temperature is reached the solution is cooled rapidly using cold water, which is applied to the outside of the barrels. This solution is then filtered through a cloth and the residue is dried in the open under a lean-to (*sapara*) for up to 24 hours. Conversion rates differ by lab and by area, even within the south, but the general understanding among those working and managing the labs is that 9 kilograms of opium will produce 1 kilogram of *beest*. The cook will be paid for each kilogram of morphine base produced, with rates varying from US$16 to US$20 per kilogram.

Gul is brown heroin or heroin base (sometimes also referred to as *bataan*) and, according to the lab workers and owners interviewed, it is not in as much demand as morphine base. *Gul* is produced by mixing the morphine base with acetic anhydride at a rate of 1 kilogram for each kilogram of heroin produced (again rates differ based on the skills and knowledge of the cook). The solution is heated, this time for a specific amount of time, placed in a solution of hot water and then filtered through a cloth. The solution is then mixed with sodium carbonate and filtered again. The mixture is then stirred in hot water and filtered. Once filtered the remaining residue is heroin base, which can be left to dry or converted into heroin hydrochloride. If heroin base is being produced, the cook will be paid a further US$16–20 per kilogram in addition to the payment already received for converting opium into morphine base. While rates differ by the quality of opium and according to the experience of the cook, 2 kilograms of morphine base are typically required to produce 1 kilogram of heroin base in Gandam Raiz.

Crystal (referred to as *sheesha* in Gandam Raiz) is heroin hydrochloride. This is a product that is not commonly produced in the labs covered by this research and it was difficult to get details of the process. However, Zerell *et al.* (2005) report that to make heroin hydrochloride, heroin base first needs to be purified. This is done by diluting it in hydrochloric acid, adding activated carbon and then leaving the mixture to stand. The solution is filtered to remove the activated carbon and then ammonia solution is added. The solution is subsequently filtered through cloth to produce white heroin base. The final stage in the production of heroin hydrochloride is to dissolve the white heroin base in a mixture of hydrochloric acid and acetone.

This solution is then filtered through a paper filter into a metal bowl and evaporated. The white heroin hydrochloride is then precipitated. As with the production of morphine base and heroin base, the cook is paid based on the output and will receive between US$16 and US$20 per kilogram of heroin hydrochloride.

In Musa Qala, the rent on these compounds was determined by the amount of opium processed. Each building had a guard (*chawkidar*) and, during those periods when it was rented out to a trader for processing, it would also be allocated a clerk (*munshi*). The clerk was responsible for assessing the amount of opium processed and for collecting the rent accordingly. Rent for cooked or dried opium in Musa Qala in November 2017 was 200 Pakistani rupees (PR) per kilogram: the equivalent of US$1.80. The clerk would also be responsible for paying the tax to the local Taliban commander, at a rate of 500 PR on each 5-kilogram cloth bag of dried opium (the equivalent of US$0.91 per kilogram) and 1,850 PR (the equivalent of US$16.36) per kilogram of heroin.[17] Locally, these labs were viewed as little more than household compounds rented out for basic processing: largely the production of cooked opium.

3.2 Gandam Raiz

Like Musa Qala, Gandam Raiz was a focal point for the air campaign launched against drugs labs in November 2017. Once the centre of the historic region of Zamindawar, Gandam Raiz was relegated to an outpost after 1964 when northern Helmand was split into the districts of Baghran, Kajaki and Musa Qala, each with its own administrative centre.[18] The fate of Gandam Raiz was sealed with the redrawing of the administrative boundaries of Zamindawar, and the classification of the districts in northern Helmand as less important than those in the centre and south of the province. Eligible for fewer resources and lying north of the large-scale irrigation works overseen by the Helmand and Arghandab Valley Authority (HAVA), Gandam Raiz was completely marginalised.

By the 1990s Gandam Raiz was an entrepot for onward travel to Musa Qala and Lashkar Gah: merely a bus station – 'Gandam Raiz Adah' – surrounded by a few local shops. The prolonged drought that hit the country in the late 1990s exacted a further toll on Gandam Raiz, drying the underground water system, known as a *karez*, which compelled those in the north of the village to look for more fertile land elsewhere. By the time the Taliban regime collapsed in 2001, Gandam Raiz appeared much like any other village in northern Kajaki.

17 At the time of the first round of fieldwork in November 2017 the exchange rate was US$1 = 105 PR.

18 Mike Martin (2014). *An Intimate War: An Oral History of the Helmand Conflict*, p. 32. London: Hurst.

However, the fortunes of the population of Gandam Raiz were to change under the Karzai government. Whereas under the Taliban regime opium had been sold openly in the district centres of Kajaki, Musa Qala and Sangin, the new administration wanted to prevent their new counternarcotics laws from being flouted in such a public way, particularly in full view of US and UK military patrols. Local reports suggest that by 2006 the combination of the government presence in Sangin and fighting in both Kajaki and Musa Qala led to the opium trade being displaced from the district centres of northern Helmand, and from the town of Kajaki in particular (see Figures 4–6).

It was Gandam Raiz that filled the vacuum – a function of history, location and the presence of a resurgent Taliban. Initially, a number of shops were built on land rented along the roadside where the bus station once stood. Over time more opium traders arrived and set up business there. They were accompanied by other shopkeepers and traders looking to take advantage of the economic opportunities and the multiplier effect the opium trade offered.

By 2018 it was estimated that there were more than 2,000 permanent shops in Gandam Raiz, of which around 200 were thought to trade in opium. The range of goods available in the bazaar was such that a saying developed: 'things that you can't buy in Lashkar Gah, can be bought in Gandam Raiz'. As such, Gandam Raiz became the centre of the opium trade for those in northern Helmand and the neighbouring provinces of Oruzgan and Daikundi. It is also said to have replaced Kajaki as the commercial hub of the district and northern Helmand.

Figure 4. Imagery showing the changes to Musa Qala district centre: 2007, 2012 and 2018

Figure 5. Imagery showing the changes to Gandam Raiz: 2007, 2012 and 2018

Figure 6. Imagery showing the changes to Kajaki district centre: 2007, 2012 and 2018

Gandam Raiz's position as a hub of the opium trade in northern Helmand was further consolidated by the location of opium-processing facilities. In contrast to the Musa Qala district centre, these labs were not concentrated around a central opium bazaar (Figure 7) but instead surrounded the centre of Gandam Raiz itself: a nodal point for transport in and out of the area, the location for the trading of livestock (*mandayee*), and the place where temporary shops are set up during the weekly markets (the *mela*), on Wednesdays

and Fridays. As in Musa Qala, there are reports of a central opium bazaar in Gandam Raiz but it is located further to the west. There are also many other stores that are selling opium that are not located in this particular bazaar.

Figure 7. Imagery of Gandam Raiz showing the buildings hit

Locally, the explanation for the concentration of drugs labs or 'factories' to the north of the road is water supply. In part, the density of labs in this area is said to be a function of the number of abandoned compounds following the drought in the late 1990s and the drying of the underground water system (*karez*). However, it is said that the primary reason that lab owners have been attracted to this particular part of Gandam Raiz, to the north of the road, is the quality of the ground water. The suggestion being that the water in this area is 'sweet', rather than salty, and the belief that opiates produced from this water are of higher quality.

The discovery of the water quality is attributed to two brothers who returned to the area in 2014. They are said to have dug deep wells, one for each of their two compounds. On learning of the water quality, lab operators rented these houses from the brothers for US$1,220 per month. The brothers are reported to have then built three further houses on their agricultural land, renting these out to lab operators as well. Other landowners in the immediate vicinity began to do the same, returning from other parts of Helmand where they had fled following the drought to take advantage of the inflated rents they could charge to lab operators.

In the context of this research the drugs labs in Gandam Raiz were relatively large and might be considered more professional businesses, not the 'mom and pop'-type establishments that were found elsewhere. Most of the labs were located in compounds that were rented by individuals from outside the area, including Sangin, Dehrawud and Bakwa. The compounds were made of mud and consisted of a number of basic rooms – up to six – and an exterior wall (see Figures 8 and 9). These labs typically worked for between 10 and 20 days per month, cooking or drying opium after the harvest, from May to August, and processing opiates between September and April.

Figure 8. Imagery of drugs lab in Gandam Raiz

Figure 9. Imagery of drugs lab in Gandam Raiz

The amount of equipment reported in these compounds supports the proposition that these were labs operating at a larger scale of production and might be considered more 'specialised' or 'professional' operations than were found in Musa Qala or Bakwa. One lab owner reported working with as many as 200 steel barrels of around 200–220 litres capacity. Other lab owners claimed to have 180 barrels, 150 barrels and 120 barrels, respectively. The smallest number of barrels reported in Gandam Raiz was 40, which was still a larger scale of production than was reported in the other two research sites. Each lab owner used both a 'large' and a 'small' press in the production of opiates, further highlighting the scale of production in these particular compounds. Although made locally, a large press[19] might cost as much as US$2,110 and a small one US$1,220.[20] Some of these labs employed as many as 30 people, including a cook (*ustad*), 20–25 labourers, a clerk, guards, someone to work the press and someone to manage the large amounts of water needed for production.

Lab owners in Gandam Raiz also reported that while they primarily produced morphine base (*biste*) and heroin base (*gul*) – as these were the products for which there was regular demand – they also produced small amounts of what they locally referred to as '*sheesha*' or 'crystal', which from their description of the process was heroin hydrochloride.

The degree of specialisation among the lab operators in Gandam Raiz is also evident from the measures adopted to manage risk. Labs there were alleged to time their processing activities so as to minimise the amount of processed opiates they had on the premises overnight. For example, the conversion of morphine base to heroin base was started at the beginning of the second day of production to allow for the more valuable product to be removed from the premises at the end of the working day and not be left overnight.

3.3 Bakwa

Bakwa is located in the most easterly district in the western province of Farah. To the east of Bakwa lies Khashrod district in Nimroz and Gulistan in Farah, and to the west and north lie the districts of Bala Bulok and Farah (see Figure 10). The district has changed dramatically over the last two decades.[21] Historically, the area consisted of 13 villages irrigated by up to 300 *karez*. In the late 1990s the irrigation from these *karez* was increasingly

19 These are made by local blacksmiths. They are typically made from iron girders and consist of a car jack on the lower side and a wheel on the upper side. They are used to squeeze out the remaining fluids from any residue at different stages in the process.

20 At the time of fieldwork in late September 2018, the Pakistani rupee (PR) had lost value against the dollar and the exchange rate was US$1 = 123 PR.

21 David Mansfield (2018b). 'Turning deserts into flowers: settlement and poppy cultivation in southwest Afghanistan', *Third World Quarterly* 39(2), 331–349: see pp. 341–344. URL: https://www.tandfonline.com/doi/full/10.1080/01436597.2017.1396535.

unreliable due to consecutive years of drought that continued into the early years of the Afghan Interim Administration. In response to the drought, farmers dug shallow wells in ever greater numbers, further lowering the water table – so much so that by the early twenty-first century both the *karez* and the shallow wells were dry.

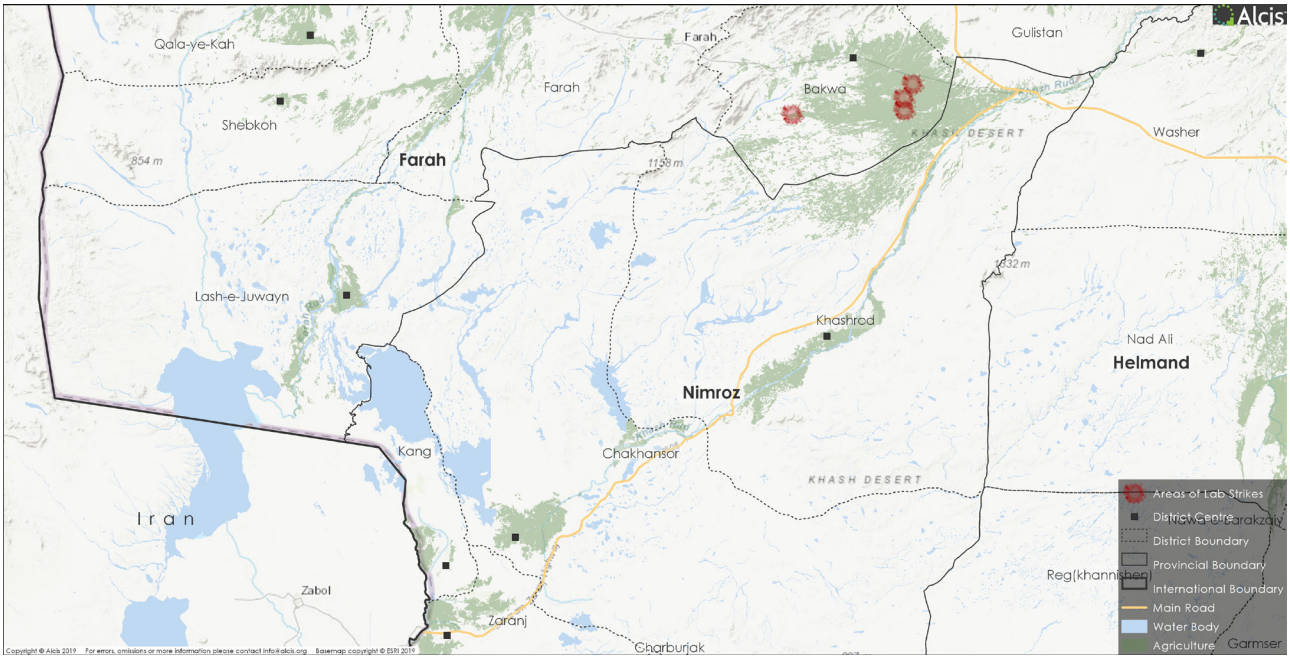

Figure 10. Map of the district of Bakwa and the Afghan/Iranian border

In the early part of the twenty-first century deep well technology was introduced to south-west Afghanistan. Supported by diesel generators and pumps from Pakistan, China and Iran, it soon became possible to drill wells of up to 120 metres and fully exploit the groundwater. Bakwa was transformed, and by using this technology large areas of former desert land were brought under agricultural production (see Figure 11).

At first, tracts of dry desert land were seized by the landowning residents of the original 13 villages. The land was then divided among these households, with some receiving as much as 100 *jeribs*[22] each. With the expansion into the desert land, opium poppy became the favoured crop. For one, the premium price associated with illegal opium poppy cultivation – particularly in the immediate years following the Taliban ban, when prices reached as high as US$500 per kilogram – allowed farmers to generate the revenues required to meet the high sunk and recurrent costs of agricultural production in this former desert area.

22 A *jerib* is a measure of land area. One hectare is the equivalent of 5 *jeribs*.

Deep wells are costly to sink and the equipment is expensive; a full diesel-powered system could cost as much as US$4,000 to install.[23]

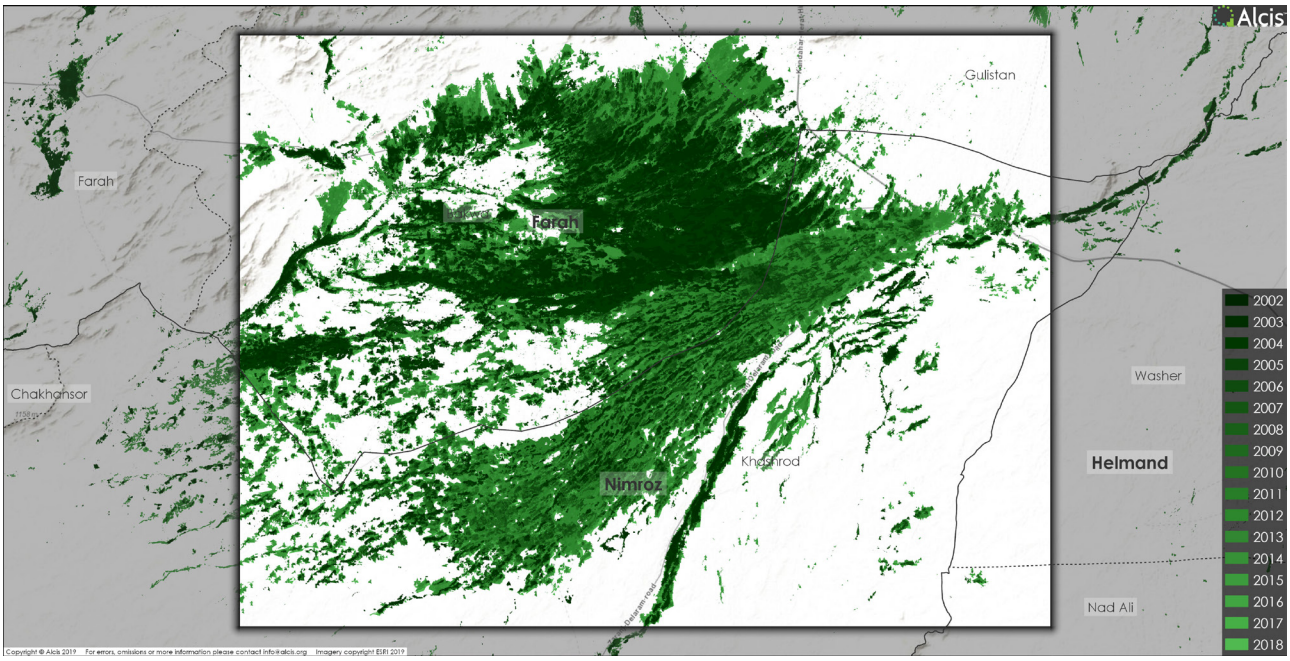

Figure 11. Imagery showing the expansion of agricultural land in the district of Bakwa, Farah, 2003–18

The amount of diesel required, along with frequent repairs and the replacement of the generators and pumps (largely due to the adulterated diesel), also led to high recurrent costs of around US$1,000 per year.[24] The move to solar-powered technology – which eliminated the need for diesel and repairs – increased sunk costs to around US$5,000 but eliminated recurrent costs and the risks of inflation (see Figure 12).[25] In Bakwa – a location some way from any sizeable urban market – there is no other crop that could cover these costs.

The second reason opium poppy became favoured in Bakwa was the ready demand for the crop. Because of the growing number of traders operating in the area and in Nimroz and neighbouring Iran, as well as their willingness to travel to purchase the crop at the farmgate, opium was well suited to the remote district and the desert terrain. Thirdly, even at the height of the government's reach in Farah province, its presence, and its capacity to enforce the law, were severely curtailed in Bakwa by the insurgency.

23 David Mansfield (2014). *From Bad They Made It Worse: The Concentration of Opium Poppy in Areas of Conflict in the Provinces of Helmand and Nangarhar*, a case study for the Afghanistan Research and Evaluation Unit, pp. 67–69. Kabul: AREU.

24 Mansfield (2014).

25 David Mansfield (2017a). *Truly Unprecedented: How the Helmand Food Zone Supported an Increase in the Province's Capacity to Produce Opium*, issues paper for the Afghanistan Research and Evaluation Unit, p. 24. Kabul: AREU.

Figure 12. Imagery showing solar-powered tubewell in Bakwa district, Farah

Ultimately, the district of Bakwa is dominated by the Noorzai, largely from the Bahardarzai and Chalakzai tribes. The kind of tribal unity in Bakwa is such that politico-military actors survive only with the support of the population and not vice versa. The Government of the Islamic Republic of Afghanistan (GIRoA) was at best simply tolerated in Bakwa; its presence was limited and there were few services delivered beyond the district centre. In fact, the official district centre – Sultani Bakwa, situated on the Delarem-to-Farah city road – is said to have fallen to the Taliban not long after the departure of international military forces in 2014.[26] The new district centre – which consists of three containers from which both identity and registration cards are issued – is located on the main highway from Delarem to Herat: an area where the government can at least maintain a presence during the day (see Figure 13).

It is in the context of its location on the route to Iran, a recent history of extensive and high-input opium production, and the absence of any meaningful law enforcement that drug processing took root in Bakwa. In contrast to Gandam Raiz, the drugs labs in Bakwa appear to be largely owner-operated, 'mom and pop'-style businesses located in an old compound or in a building abandoned by a tenant farmer or sharecropper. Most of these labs were owned and run by former opium traders who had diversified into drugs processing. None of those interviewed had been operating a drugs lab for more than six years. These labs had fewer labourers (with a maximum of 8), and lab operators reported they worked

26 Mirwais Adeel (2015). 'Taliban video shows former US base captured in Farah province', *The Khaama Press*, 27 March. URL: https://www.khaama.com/taliban-video-shows-former-us-base-captured-in-farah-province-9958/.

with a much lower number of barrels (up to 30) and only one small press, compared with both a large press and a small one and up to 200 barrels in Gandam Raiz.

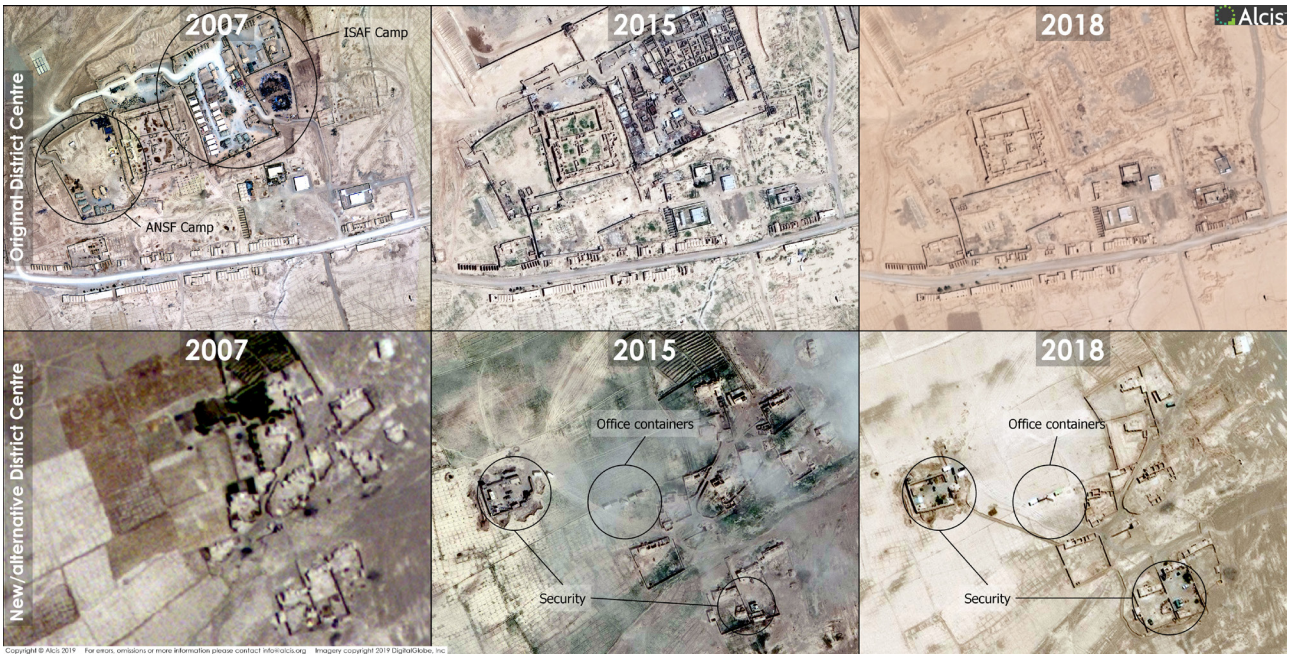

Figure 13. Imagery showing the changes to the district centre of Bakwa, Farah: 2007, 2015 and 2018

The cost and scale of production were also considerably lower in Bakwa than in Musa Qala and Gandam Raiz. Rent was much more reasonable, with monthly rates for a compound of around US$150 rather than the US$900 per month typically paid in Gandam Raiz. The costs of equipment such as barrels[27] and presses[28] and of chemical inputs such as acetic anhydride[29] were also considerably cheaper than in Helmand Province. There was also an absence of the kind of risk-management strategies that were implemented in Gandam Raiz. Whereas respondents in Gandam Raiz reported timing their work so as to finish each day at a particular stage of processing and remove whatever they had produced from the building in order to minimise losses were the lab to be raided or attacked, there were no such procedures in Bakwa.

Despite the smaller scale of operations in Bakwa, these labs showed greater levels of innovation than the more specialist labs found in Gandam Raiz. Of particular note was the fact that five of the six lab operators interviewed produced methamphetamine, known locally as '*sheesha*' (a term also used in Gandam Raiz for heroin hydrochloride), as well as cooked

27 In Bakwa barrels were 2,000–2,200 PR each, compared with 3,000–3,500 PR in Gandam Raiz.

28 A small press in Bakwa cost around 65,000–90,000 PR, compared with 110,000–150,00 PR in Gandam Raiz.

29 Acetic anhydride was only 22,000–25,000 PR per kilogram, compared with 55,000–65,000 PR per kilogram in Gandam Raiz.

opium and morphine base (see Box 2). They claimed to have produced methamphetamine for around three years, largely for the Iranian market. During the first two years of production they had used decongestant (less than US$1 per bottle) from Pakistan ('Actifed P') as the source of pseudoephedrine, the active ingredient. They complained that this had been too costly and that they had halved production costs by using a plant, known as *omani* (US$0.90 to US$1.25 per kilogram), from Syaband in the province of Ghor.

Box 2. The making of *Omani F* and *sheesha*[30]

Omani F is produced using the *omani* plant, which is sourced from Syaband in Ghor. The plant is first ground in a flour mill and the powder is then soaked in water for 24 hours. The solution is removed from the barrel and placed in another container where caustic soda and an 'oil from Iran' are added. Next, a 'syrup' is added to the solution and it is allowed to sit for 24 hours. The solution is then filtered through a cloth repeatedly until all the residue is removed. The remaining solution is then kept for a further 12 hours after which a 'mud' forms. This mud is *Omani F* and it can either be sold as is or converted into *sheesha*. Depending on the quality of the plant, it is estimated that between 112.5 and 270 kilograms of *omani* is required to produce 1 kilogram of *Omani F*.

In Bakwa, *sheesha* is methamphetamine and is produced by placing *Omani F* in a glass flask and adding iodine. The mixture reacts, producing a gas. This gas is directed from the flask through a pipe in which it condenses. When dried, this forms *sheesha*.

Apart from this plant, most of the inputs for methamphetamine production – including iodine, caustic soda and an 'oil' that respondents did not identify – were from Iran. Respondents did not discuss where they had learned about methamphetamine production in general or about the transition from a production method based on decongestant (*germani*) to a plant-based method (*omani*). The uptake in the production of a drug with little history in Afghanistan and then a shift to new production methods in response to rising costs and falling profits highlighted just how dynamic lab operations can be, even in some of the most remote parts of Afghanistan (see Figures 14 and 15).

30 Derived from interviews with lab workers, owners and cooks for this research.

Figure 14. Photograph of bottles of decongestant outside lab in Bakwa, Farah

Figure 15. *Omani* soaking in plastic buckets in Bakwa, Farah

4 The targets of the air campaign

4.1 What is a drugs lab?

As indicated in this report and elsewhere, the term 'drugs labs' is a misnomer in the context of drug production in Afghanistan. To many, the word 'lab' suggests a sterile and orderly environment, staffed by people in white coats and equipped with equipment such as Bunsen burners, microscopes, glass flasks and test tubes. In reality, drugs labs in Afghanistan are local buildings in which drugs – for the purpose of this research, opium, morphine, heroin base, heroin hydrochloride and methamphetamine – are processed. Locally, they are known as 'factories'.

The compounds in which drugs labs are housed lack any distinguishing features to differentiate them from any other compounds in the local area (see Figure 16). They are rarely built-for-purpose and they consist of an outer compound wall containing a minimum of two small buildings and either a permanent lean-to (*bandara*) made from wood and mud or a temporary one made from tarpaulin (*sapara*). The compound wall and the internal buildings are made of mud. These compounds have typically been left empty when the owner moved into a new-and-improved home nearby or have been abandoned by tenant farmers or sharecroppers following their departure from the area.

One of the internal buildings in the compound will be used as a store for the basic equipment required for processing: multiple barrels (preferably Iranian), a press, a variety of metal and plastic pots, cloth, possibly wood- and/or gas-fired heaters, as well as some of the more basic chemicals needed such as sulphur (*lime*) and ammonium chloride (*nowshouda*). The second room will be used as living accommodation (for the guards, who are typically the only people who stay overnight) and for preparing the food for those working in the lab.

A larger lab may have more rooms (perhaps as many as six in total) and may include sufficient space for the production of cooked opium or for some of the initial processing of opiates. Later stages of production typically take place under the lean-to, or in the open air to allow for adequate ventilation. The majority of respondents and key informants reported that the heat and the vapour from the chemicals – particularly acid (acetic anhydride) – meant this could not be done at any scale inside a building.

When in operation there are a number of visual signatures of a drugs lab. Multiple barrels are an obvious sign of a working lab, and to some extent a measure of its productive capacity. In the southwest there is a preference for clean and undamaged Iranian barrels. These should not have been used previously to store fuel or chemicals and they should be around

200 litres in capacity. Each barrel will typically cost between US$16 and US$28, with a lower price paid in Bakwa, nearer the Iranian border. As indicated above, labs may have a large number of barrels: this research found lab operators in Gandam Raiz with as many as 200 barrels on the premises.

Figure 16. Imagery showing a drugs lab and a nearby household compound

When a lab is active in producing morphine base, heroin base or heroin hydrochloride, these barrels will require heating. Barrels will be lined up in rows and heat will be applied to each, using either wood or a gas stove like the ones used for cooking food. This means that a lab has a clear visual signature to thermal imagery when it is active, and particularly when processing is undertaken in the open air as opposed to under a lean-to.

When there are no orders and the lab lies dormant, barrels are stored inside. An inactive drugs lab will therefore look much like any other compound in Afghanistan. The only clue to the building's true purpose might be some kind of staining on the ground – effluent – from the chemicals used in processing, an excess of wood in the compound (although this is increasingly stored inside the buildings or is only purchased as required), and potentially some minor landscaping in the compound – typically a series of shallow indentations in the ground where wood or a gas stove is placed and the barrel is then positioned. Where the heating is undertaken in the open, these indentations can be seen in multiple rows, often near the compound wall. These subtle differences in the appearance of a typical household compound and an inactive or dormant drugs lab can make it difficult to identify whether the aerial campaign destroyed a drugs lab or another household compound (see Figure 17).

Figure 17. Imagery showing a drugs lab in Gandam Raiz

4.2 What was hit?

Differentiating between residences and labs in the USFOR-A videos and in high-resolution imagery can be challenging. The low resolution of the videos, the presence in some cases of pixellation, and the limited amount of time offered prior to and after the airstrike can make it difficult to identify some of the distinguishing features listed above. High-resolution imagery offers greater detail but can be hampered by the particular dates for which images are available. Where possible this research combined video and imagery analysis with fieldwork to develop a more complete understanding of the compounds targeted by the airstrikes.

Of the 21 buildings covered by the fieldwork, 17 were identified as having been drugs labs. Four were not. Three of the buildings not identified as drugs labs were destroyed during the first night of the bombing campaign on 19 November 2017 and were located in Musa Qala in northern Helmand. Two were within a single compound and the third was in close proximity and was used as a guest house for Taliban soldiers (see Figure 18). A further compound in Bakwa was not a drugs lab, but rather a shop and fuel station. Fieldwork indicated some collateral damage to a mosque and the neighbouring *hamam* in Gandam Raiz following the destruction of a lab to the west.[31] The damage was largely limited to the loss of windows: no structural damage was reported and repairs were made.

31 Defense Visual Information Distribution Service (2017a). *B-52 Strike Against Taliban Revenue Streams*, Video, 19 November. URL: https://www.dvidshub.net/video/566990/b-52-strike-against-taliban-revenue-streams.

Figure 18. Imagery showing buildings struck during air campaign on 19 November 2017 and the damage caused

The most tragic example of an error in the targeting – and the only civilian casualties reported during this research – was in Musa Qala during the first night of the bombing campaign on 19 November 2017. During that night, the compound of Hajji Habibullah was struck three times, his residence being hit twice. Hajji Habibullah was said to be an opium trader from the Helmandi district of Baghran. His family compound was located to the east of both the opium bazaar and the other buildings that were destroyed on 19 November 2017. That night Hajji Habibullah's adult daughter, her husband and their one-year-old child were said to have been visiting. Hajji Habibullah, his wife and their four children, along with his adult daughter and her child, were sleeping in the family residence in the northeast corner of the compound and all were killed. The son-in-law was in the guest quarters (*hujera*) to the south.

The claim that the building was a residence is further supported by video evidence shared by USFOR-A (see Figure 19). A tethered animal seen in the video in the southwest corner of the compound can be seen panicking after the first strike on Hajji Habibullah's residence.[32] This animal – most probably a dog – is all-the-more frenzied after the second strike on the residence. Discussions with lab owners, operators and key informants indicated that a drug-processing facility is unlikely to have a domesticated animal. The vapour from acetic anhydride, the effluent from processing and the inhalation of opiates are believed to have serious consequences for human health, and according to local narratives 'turn those that work there "mental" (*lewany*) after six months'. It is therefore most unlikely that an animal would be colocated in a drugs lab.

Figure 19. Still from a USFOR-A video of the airstrike on Hajji Habibullah's compound in Musa Qala district centre

Interviews with lab operators, owners, workers and farmers in Gandam Raiz, in Bakwa and in the areas north of the Boghra canal in Helmand, where there are also numerous drugs labs, do not report any civilian casualties after the initial operation in Musa Qala on 19 November 2017. In fact, there is consistent reporting of subsequent air attacks being accompanied by some kind of warning prior to the building itself being struck. Respondents claim these warnings could come in the form of a flyover prior to the building being targeted, flares being released or initial gun fire in the vicinity, with up to 30 minutes notice. It is argued that this gives those in the lab, typically guards, time to escape. As a consequence, injuries are minor: a sprained ankle or a bruised knee, the

32 Defense Visual Information Distribution Service (2017b). *B-52 Strike Against Taliban Revenue Streams*, Video, 19 November. URL: https://www.dvidshub.net/video/566992/b-52-strike-against-taliban-revenue-streams.

result of a fall from fleeing the scene.[33] These reports from lab workers and owners sit in stark contrast to media accounts that claim that as many as 44 people were killed in southern Helmand.[34]

Video analysis also supports the proposition that USFOR-A could be providing warning fire. For example, in one USFOR-A video of an airstrike on a building to the south of Gandam Raiz bazaar, two animals (probably dogs) can be seen running away from the target at some pace prior to the building being struck and destroyed (see Figure 20).[35]

Figure 20. Still from a USFOR-A video of an airstrike in Gandam Raiz

In terms of other errors in targeting, a few further anomalies were identified from the USFOR-A videos. Analysis of these videos suggests that one target is unlikely to have been a drugs lab. Located in the middle of a desert area with no compound wall, obvious buildings or effluent, and surrounded by multiple barrels all in very close proximity to each other (too close for heating), there are none of the usual visual signatures of a drugs lab.[36] It was assessed that this was most probably a fuel depot. Imagery analysis

33 For example, two labourers working in a lab in Sya Ghala in Bakwa claimed they injured themselves escaping a factory prior to it being destroyed.

34 *Xinhua* (2017). 'Airstrikes target heroin labs, killing 44 in S. Afghanistan', *Xinhua*, 22 November. URL: http://www.xinhuanet.com/english/2017-11/22/c_136771984.htm.

35 Defense Visual Information Distribution Service (2017c). *F-16 Strike Against Taliban Revenue Streams*, Video, 29 November. URL: https://www.dvidshub.net/video/569257/f-16-strike-against-taliban-revenue-streams.

36 Defense Visual Information Distribution Service (2018a). *B-52 Conducts Strike on a Taliban Narcotics Production Facility in Helmand Province*, Video, 2 February. URL: https://www.dvidshub.net/video/583065/b-52-conducts-strike-taliban-narcotics-production-facility-helmand-province.

also pointed to a further two targets where the compound's location – adjacent to well-tended, irrigated fields – presented it as a farm rather than a functioning lab (see Figure 21).[37] The analysis of these different data sources – videos, imagery and fieldwork – indicated that with the exception of these seven cases, there is every reason to believe that the other 36 compounds destroyed in the aerial campaign could have been used to process drugs.

Figure 21. Still from a USFOR-A video showing a possible farm

4.3 Were the labs active and what damage was done?

Those working in and operating labs report that they typically work around 50 per cent of the time, and a maximum of 20 days in a given month. Respondents and key informants report that this is largely because labs work to order, processing only when they have a specific request from a trader. Thus, even a lab that is operational may lie idle for days, perhaps weeks, at a time.

The videos from USFOR-A typically show the destruction of buildings and not active drugs labs. It is possible that this is intentional, with the intent of avoiding civilian casualties. There is only one video where barrels can be seen in the open and are then subsequently

37 Defense Visual Information Distribution Service (2018b). MQ-9 Performs a Historic Multirole Mission, Video, 26 February. URL: https://www.dvidshub.net/video/586439/mq-9-reaper-performs-historic-multirole-mission. Defense Visual Information Distribution Service (2017d). *A-29 Strike Against Taliban Revenue Streams*, Video, 19 November. URL: https://www.dvidshub.net/video/566980/29-strike-against-taliban-revenue-streams.

destroyed by an airstrike, but as described above these barrels are not laid out in a way that indicates it is an operational lab. It is likely that this airstrike destroyed a fuel depot (see Figure 22).[38]

Figure 22. Still from a USFOR-A video showing a possible fuel depot

The only evidence of an active lab being destroyed was found in a still image – a thermal image – published by USFOR-A. The image shows two adjacent compounds in Gandam Raiz before and after destruction (see Figures 23 and 24). The compound to the south contains 120 barrels, the one to the north around 75. These barrels are in the open and are concentrated along the compound wall. The reporting from USFOR-A and high-resolution imagery shows that these two compounds were struck twice: once on 19 November 2017 and then again on 25 April 2018. USFOR-A's own video shows that the first time these compounds were struck there were no barrels present and the lab was not active (see Figure 25).[39]

38 Defense Visual Information Distribution Service (2018c). *B-52 Conducts Strike Against Narcotics Production Facility in Helmand Province*, Video, 2 February. URL: https://www.dvidshub.net/video/583065/b-52-conducts-strike-taliban-narcotics-production-facility-helmand-province.

39 Defense Visual Information Distribution Service (2017a).

Figure 23. Image showing the destruction of a drugs lab in Gandam Raiz

Figure 24. Image showing the immediate aftermath of the aerial campaign on the drugs lab in Gandam Raiz

Figure 25. Image showing the same drugs lab in Gandam Raiz after being struck in November 2017 and the subsequent rebuild

The conclusion from the analysis of both the USFOR-A videos and high-resolution imagery is that most of the targets hit during the air campaign were in fact inactive labs; they may have been operational at some point, perhaps even a few days before – or, in the case of the two labs in Gandam Raiz, after – but they were not processing drugs at the time at which they were struck.

Interviews with lab operators and workers support this conclusion. For example, an inventory of the damage caused by the strikes included only one respondent who reported that drugs were present in the building when it was struck. This individual was in Bakwa and reported that 2 *man* (9 kilograms) of opium had been destroyed (US$797), along with acetic anhydride (US$179) and a carton of 'tablets' (US$1,260) used in the production of methamphetamine. The combined value of these items was US$2,235.

None of the other respondents in Bakwa, Gandam Raiz or Musa Qala reported losses of either opium or acetic anhydride, the two inputs that account for about 80 per cent of the value of heroin production. Children scouring the ruins of the buildings in Musa Qala the morning after they were struck reported that they found nothing but limited traces of opium.

This finding would seem to be in line with both the video and imagery analysis and also with the reports from key informants and those working in labs that inventory is typically

not kept on the premises.[40] As noted above, lab operators in Gandam Raiz actively look to schedule their processing activities to minimise the potential for losses, by working to order and removing processed opiates from the premises at night, when the risk of robbery or visits from law enforcement efforts is greater. The airstrike on the active lab in Gandam Raiz captured by the thermal imagery is likely to have occurred at the stage when opium is converted to morphine base, which is a more protracted part of the process, requiring opium to be heated in water with lime until it boils and then allowed to cool naturally, and therefore has to take place over night. The report of the destruction of drugs in Bakwa – albeit a small amount – is also in keeping with the more 'mom and pop'-style production methods there.

Rather than drugs, the bulk of the costs incurred due to the airstrikes relates to the compound and the drug-processing equipment it contained. Here, the losses were much higher in Gandam Raiz than in Bakwa and Musa Qala due to the size of the compounds, the scale of production and the higher cost of living. For example, the compounds in Gandam Raiz were larger than in Bakwa and Musa Qala, typically containing more rooms and household items. While a typical compound in Bakwa might cost between US$2,500 and US$3,500, respondents in Gandam Raiz reported the loss of household compounds worth anything from US$3,400 to US$5,700. The destruction of doors, and household items such as blankets, generators, solar panels and cooking items, rarely added more than US$1,000 in losses in either Gandam Raiz or Bakwa (see Table 1).

Typically, the second most expensive item destroyed in the airstrikes was the equipment used for drug processing. As opposed to the destruction of the compound, where the owner absorbed the losses, damage to the equipment used in drug production was incurred by the lab owner. Here again, losses were higher in Gandam Raiz than in Musa Qala and Bakwa, reaching as high as US$8,100.

By far the greatest proportion of these costs was for barrels, and for large and small presses. In Gandam Raiz respondents reported the loss of as many as 200 barrels. At a cost of US$26 per barrel, these costs soon mounted (US$5,200). Whereas in Bakwa, with a much smaller scale of operation and many fewer barrels, the cost of losing 10–15 barrels did not exceed US$300. The destruction of a large press – which respondents report can weigh up to 12 metric tonnes – inflicted further losses of up to US$2,115, while a small press could cost as much as US$1,220. Again, these costs were much less significant in Bakwa as none of those interviewed used a large press, and the reported cost of a small press did not exceed US$730. In both Bakwa and Gandam Raiz the various metal dishes, plastic buckets and bowls, gas heaters and other paraphernalia used in drug production did not exceed

40 Former UK intelligence official, personal communication, January 2018.

US$750. The destruction of other inputs such as wood, sulphur and ammonium chloride rarely added more than US$300.

The final item in the inventory of items destroyed, reported by five of those interviewed, was a car or motorbike. A car might cost between US$2,200 and US$4,800, depending on its age and size, and a motorbike between US$120 and US$210.

Table 1. Typical losses incurred during strikes on drugs labs in Gandam Raiz and Bakwa

		Gandam Raiz			Bakwa		
		No.	**Unit price (US$)**	**Total**	**No.**	**Unit price (US$)**	**Total**
Household compound	Building	1	3253	3253	1	2776	2776
	Doors	5	32.5	162.5	0	0	0
	Solar panels	10	57	570	0	0	0
	Beds/blankets	1	122	122	0	0	0
	Kitchen items	1	122	122	1	32.5	32.5
	Generator	0	0	0	1	650	650
	Subtotal			4229.5			3458.5
Lab equipment	Barrels	150	24.4	3660	10	16.3	163
	Large press	1	1870	1870	0	0	0
	Small press	1	976	976	1	529	529
	Metal pots	15	122	1830	4	4	16
	Plastic pots	20	12.2	244	8	40.65	325.2
	Cloth	1	122	122	0	0	0
	Subtotal			8702			1033.2
Inputs	Ammonium chloride	10	56.9	569	0	0	0
	Sulphur	20	5.7	114	0	0	0
	Wood	0		0	0	0	0
	Opium	0		0	9	88.5	796.5
	Acetic anhydride	0		0	1	178.8	178.8
	'Tablets'	0		0	1	1260.20	1260.20
	Subtotal			683			2235.50
	Total			**13614.50**			**6727.20**

5 The impact of the strikes

5.1 Denying revenue to drug trafficking organisations

Assessing the impact of the lab strikes has largely fallen to USFOR-A, the same institution that implemented the air campaign. The last assessment of the campaign was published in August 2018. This assessment claimed that the Taliban had been denied US$46 million in revenue and that the combined efforts of USFOR-A and the Afghan Air Force had destroyed as many as 200 drugs labs.[41]

Whereas the statement in August 2018 did not provide an estimate of the loss of revenue to drug traffickers, USFOR-A had already reported to the Special Inspector General for Afghanistan Reconstruction (SIGAR) that it estimated that the Taliban received 20 per cent of the total value of narcotics in Afghanistan, 'including from profits in direct ownership, fees for transportation and protection, licensing fees to traffickers and taxation at harvest'.[42] Given this, and previous statements that offered estimates consistent with this 20 per cent figure, it is safe to assume that USFOR-A would claim the air campaign had denied US$230 million in revenue to drug trafficking organisations, as of August 2018.

In stark contrast, this report highlights that few if any drugs were destroyed during the air campaign, largely due to labs being hit when they were inactive – possibly to minimise civilian casualties. This means that the most significant costs incurred by those actually involved in drugs processing was the loss of their equipment. Depending on the scale of operation and the level of destruction, these losses could be as much as US$10,000 for one of the largest labs in Gandam Raiz and little more than US$2,000 in Bakwa.

Other costs were largely borne by those who owned the household compounds in which drugs were processed and not necessarily by the drug traffickers themselves. These costs were direct: a loss of property and household fittings and the costs of any subsequent reconstruction. These costs amounted to between US$3,500 and US$6,700 depending on the size of the compound, the number of rooms it contained and its location, with Gandam Raiz commanding a premium.

It is worth noting that none of these costs were incurred by those who owned the drugs lab, unless the lab owner and the building owner were one and the same. This does not fit with either model of operation in Gandam Raiz and Musa Qala – where properties are typically

41 Nissenbaum (2018).

42 SIGAR (2018a). *Addendum to SIGAR's April 2018 Quarterly Report to the US Congress*, Report, 30 April, p. 2. URL: https://www.sigar.mil/pdf/quarterlyreports/2018-04-30qr-addendum.pdf.

rented – but is more common in Bakwa, where an owner–operator model is typical. The result is direct losses to the lab operators in the order of US$6,000–8,000.

Other losses to those involved either directly or indirectly in drugs processing may be potential rather than actual. For example, those that own the household compound face a loss of rent: from US$180 per month in Bakwa to US$1,220 per month in Gandam Raiz. There are also a variety of employees, largely labourers responsible for the physical work and supporting the 'cook', who would lose up to US$8.13 per day for the period in which the lab is not operational. There are other service providers such as those collecting wood who could lose around US$6.50 per day, although they are likely to sell their supplies to other customers. Given their relatively rare knowledge and skills, the 'cook', who is typically paid US$16–20 per kilogram of product, is unlikely to be without work for long, particularly when we consider that most of the labs in both Gandam Raiz and Bakwa relocated to other areas and did not abandon processing altogether.

The losses documented here are dramatically lower than those cited by USFOR-A, where a single lab strike is estimated to have resulted in losses of up to US$12.6 million in revenues to the Taliban alone and, based on the calculations offered by USFOR-A, US$63 million to the traffickers themselves.[43] The basis for such calculations is far from clear. According to SIGAR, USFOR-A estimates that a drug trafficking organisation can expect approximately US$205,000 in future revenue per barrel and they value the revenue denied to traffickers based on the number of barrels a lab contains.[44] As this report has shown (using examples from Bakwa and Gandam Raiz), there is some validity to the assessment that the capacity of a lab is a function of the number of barrels it contains.

It is, however, a leap to argue that each barrel will generate US$205,000 in future revenue. Evidence suggests that at the point at which the barrels were destroyed the vast majority were in fact empty – stored away in one of the buildings in the compound – and could easily be replaced at a cost of between US$16 and US$28 per barrel. In particular, the experience of the Drug Enforcement Administration (DEA) and 'Commando' Force 333 – an elite counternarcotics unit mentored by the UK – shows that labs can be replaced within three to four days.[45] Given this, it is hard to argue that the future revenues of drug traffickers would be dramatically impacted by the lab strikes.

43 Defense Visual Information Distribution Service (2018e). *Afghan and US Special Operations Forces Seize Taliban Revenue in Helmand*, Video, 20 April. URL: https://www.dvidshub.net/news/273792/afghan-and-us-special-operations-forces-seize-taliban-revenue-helmand.

44 SIGAR (2018b). *Quarterly Report to the US Congress*, Report, 30 July, p. 186. URL: https://www.sigar.mil/pdf/quarterlyreports/2018-07-30qr.pdf.

45 Mohammed Stanekzai and Girish Gupta (2017). 'US strikes on Taliban opium labs won't work, says Afghan farmers', *Reuters*, 23 November. URL: https://uk.reuters.com/article/uk-afghanistan-drugs/u-s-strikes-on-taliban-opium-labs-wont-work-say-afghan-farmers-idUKKBN1DN1BW.

Moreover, the kinds of estimate of the revenue denied to drug trafficking organisations offered by USFOR-A are hard to reconcile even with active labs such as the two destroyed in Gandam Raiz, as shown in thermal imagery. The larger lab in this image contains 120 barrels. To produce morphine base, these barrels would be filled with around 3,780 kilograms[46] of opium, worth the equivalent of US$460,975. The ammonium chloride required would cost US$22,615.[47] Heating the barrels would need up to 9,000 kilograms of wood, at a total cost of US$276.[48] If acetic anhydride was required to convert the morphine base into heroin stored in the lab – something respondents say they do not do – it would be worth around US$116,000.[49] When combined with the value of the compound and its fittings, as well as the lab equipment – the large and small presses, the barrels, etc. – those running this lab might have lost as much as US$615,000; this is significantly less than the US$24.6 million that USFOR-A would estimate in lost revenue for a lab of this size based on the number of barrels present.

5.2 Denying revenue to the insurgency

There are further challenges regarding the estimates of the revenues denied to the insurgency, with USFOR-A's estimate being widely overstated. This is not just because the labs were largely not active at the time that they were destroyed, or because inventory is not stored on site, but also because of the assumed rate of taxation that the Taliban impose.

While USFOR-A reports that the Taliban receive 20 per cent of the total product value, those operating and working in the labs who were interviewed for this work suggest much lower payments on production.[50] Respondents and key informants talked of payments being governed by a 'rule' – accepted rates – that local Taliban commanders expected but that would be negotiable based on patronage, the prevailing economy and individual circumstances. These rules differed from area to area, with indications that they also change over time.[51]

46 Each barrel contains between 5 man and 7 man of opium, the equivalent of 22.5–31.5 kilograms. At time of research, dry opium cost between 8,000 and 15,000 PR per kilogram: the equivalent of US$65–122.

47 Around 300 grams of ammonium chloride is required for each kilogram of opium. At time of the research, ammonium chloride cost 7,000 PR per kilogram.

48 Respondents reported using 20 khwar of wood for a lab this size, and a price of 1,700 PR per *khwar*. One *khwar* is the equivalent of 100 man, or 450 kilograms.

49 Respondents in Gandam Raiz reported using 1 kilogram of 'acid' for each kilogram of heroin produced.

50 SIGAR (2018a).

51 For example, reports in November 2018 indicate that the tax rate on labs in Bakwa was changed to a fixed payment of 5,000 PR per month for each lab, whether it was active or not, as opposed to a tax on the output of the lab. Locally, it was claimed that there were as many as 4,700 labs (active and inactive) in the district of Bakwa alone.

For example, in Gandam Raiz respondents claimed that the 'rule' outlined payments equivalent to US$2.40 per kilogram for cooked opium and to US$4 per kilogram for 'powder', which covered everything from morphine base to heroin hydrochloride. In Bakwa the rule articulated higher tax rates for both morphine base and methamphetamine, at US$5.70 per kilogram, but lower rates for cooked opium, at US$1.62 per kilogram. In Musa Qala the tax on cooked opium was only US$0.95 per kilogram, while rates on powder, at US$17.60 per kilogram, were far higher than in either Bakwa or Gandam Raiz. With cooked opium prices at US$100–120 per kilogram at the time of the research, and the price of 'powder' ranging from US$1,220 to US$2,765 per kilogram depending on quality and location, tax payments to the Taliban were typically around 1 per cent of product value, and they did not exceed 3 per cent.

Any other payments by lab owners were largely irregular and were not referred to as tax per se but as 'charity' or a 'gift', albeit coerced. The amount paid in this form was more shaped by patronage, the prevailing economy and individual circumstances than was the case for the regular taxes on lab output. Typically, such payments were made directly to the local commander and were undeclared and, unlike payments on production, unreceipted. In Gandam Raiz respondents reported payments of up to US$400 as a 'gift', and they reported making these on a 'seasonal' basis. In Bakwa payments were much lower, sometimes as little as US$80. Further inquiries indicated that these payments were largely a function of the profitability of an individual lab, which was variable and far from guaranteed. For example, two lab owners in Gandam Raiz complained that their profit over a year was only US$8,373, which had to be shared equally. Others talked of losses: a function of fluctuations in opium prices, poor-quality opium and acetic anhydride, and inexperienced cooks. Fieldwork in Musa Qala showed profits of up to US$70 per kilogram for heroin and potential losses of US$633 per kilogram.[52] In Gandam Raiz profits were $764 per kilogram for morphine base, falling to US$45 per kilogram for brown heroin (see Figure 26).

These low net returns and taxation rates would suggest that the kind of estimates provided by USFOR-A of revenues denied to the insurgency are grossly inflated. For example, fieldwork indicates that the larger Gandam Raiz lab – with 120 barrels – would have had direct losses in tax revenue to the Taliban of US$2,100, plus any other irregular payments made over the course of a few months. The USFOR-A methodology, on the other hand, would have estimated a loss in revenue to the Taliban of US$4.9 million.

52 Mansfield (2018a).

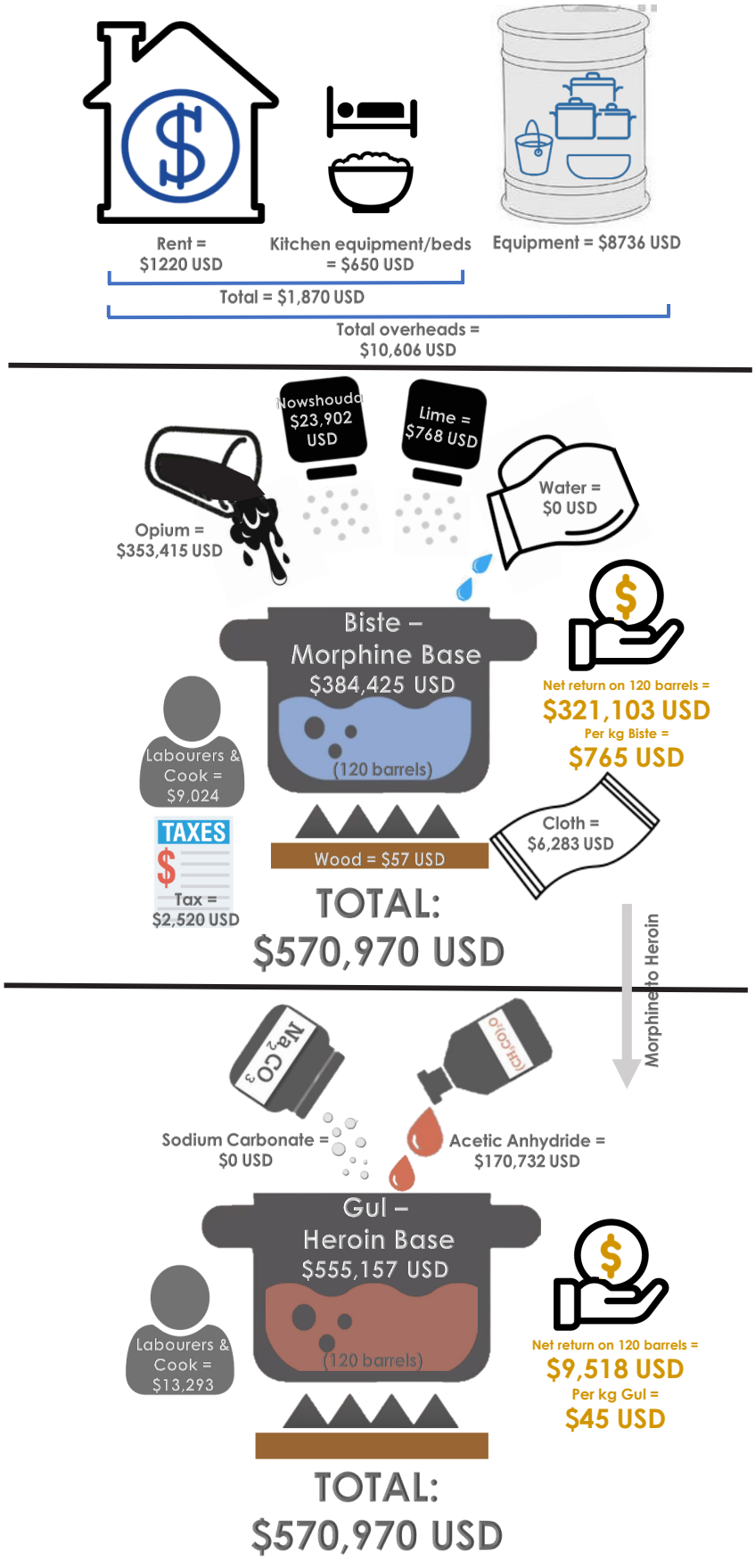

Figure 26. Costs, revenues and profits from the production of morphine base and brown heroin in Gandam Raiz, Helmand

Furthermore, the reasons for USFOR-A calculating tax at a rate of 20 per cent of value are unclear. USFOR-A's statement to SIGAR indicates that this figure includes multiple payments, some of which are not applicable at the point of processing, the most obvious being that of 'taxation at harvest'. The official narrative is typically that the Taliban collect a 10 per cent tax on the final opium crop: an agricultural tithe often referred to as '*ushr*'.[53] While there is considerable evidence to suggest that the rate of payment at the farmgate is significantly less than the 10 per cent figure, and that there are methodological problems that have led to this inaccurate assessment,[54] it is far from apparent why USFOR-A would include a tax already collected at the farm as part of the calculation of the revenue lost when a drugs lab is destroyed. Its inclusion in the USFOR-A calculation seems to be based on the false assumption that the destruction of labs would destroy the value chain and the Taliban's ability to collect tax along it. Either that or the inclusion of the tax at harvest indicates a degree of double counting by USFOR-A, and that the revenue denied – even if active labs were destroyed – is significantly lower than estimated.

5.3 The wider impact

USFOR-A has reported that its estimates of the revenue denied to the Taliban are only one measure by which the aerial campaign against drugs labs is assessed.[55]

In a briefing in Kabul, Major General Hecker of USFOR-A suggested that intelligence was also being drawn on and that this indicated that the air campaign against labs was 'throwing the [Taliban] off their game. It's putting turmoil into their process and that's exactly the effect we are looking to get.'[56]

This research did not seek to interview Taliban commanders or their soldiers to assess the campaign. Instead it focused on those directly targeted – the lab owners and operators – and those residing in the areas where the air campaign was conducted.

Fieldwork revealed a market structure that consisted of multiple lab owners and operators working as independent actors, each responsible for the running and profitability of their businesses. While these businesses paid a tax on their output and made irregular payments

53 UNODC/Government of Afghanistan Ministry of Counter Narcotics (2008). *Afghanistan Opium Survey 2008*, Report, November. URL: http://www.unodc.org/documents/crop-monitoring/Afghanistan_Opium_Survey_2008.pdf (accessed 22 January 2018).

54 David Mansfield (2017b). *Understanding Control and Influence: What Opium Poppy and Tax Reveal about the Writ of the Afghan State*, issues paper for the Afghanistan Research and Evaluation Unit, August, pp. 35–36. Kabul: AREU.

55 SIGAR (2018b, p. 187).

56 US Department of Defense (2018).

to the Taliban in their area, the capital, assets, running costs and decisions on production were all the responsibility of the lab owner. In some cases, these labs were owned by a number of individuals and operated out of a rented property, as in the case in Gandam Raiz cited above; in others, they were run by sole proprietors from their own compounds, as was often the case in Bakwa.

Interviews with those more directly involved in the opium economy revealed a campaign that was widely unpopular. This is perhaps not surprising given the location of the labs and the likelihood that a large proportion of the local population either had direct involvement in opium production – as farmers, traders, lab workers or transporters – or accrued indirect benefits from the multiplier effect of the opium economy.

The lab owners and operators themselves complained bitterly about the losses they had incurred and the impact on their livelihoods. There were reports of some lab owners and operators moving to neighbouring districts and provinces to restart their operations there. One lab owner in Bakwa reported that he had returned to opium trading – his previous job – after losing his lab to an air attack. Those that owned the buildings in which labs had been located talked of the destruction of their property and how 'nothing was left'.[57] In Musa Qala, Gandam Raiz and Bakwa the buildings destroyed in the campaign remained damaged and there was little attempt to restore them. In Musa Qala a temporary wall had been built around parts of Hajji Habibullah's house, primarily to secure the property, but the other buildings remained as they were in November 2017: in a state of ruin (see Figure 27). While one of the labs struck in Gandam Raiz had been rebuilt after an initial strike, this too was abandoned after being targeted a second time. As of January 2019, all 29 of the targets identified by this research remained damaged and out of operation (see Figures 28 and 29).

On the whole, both the local population and those targeted by the air attacks responded with a combination of fear and anger. Reports of civilian casualties during the initial days of the campaign travelled widely and were cited even in central Helmand, some distance from Musa Qala. In Musa Qala itself, people remained concerned about the potential for future bombing some months after the initial strikes, and the sound of aircraft continued to instil fear. In Bakwa there were reports of women and children being afraid of the 'noise of the plane' following the airstrikes.[58] Concerns about the bombing campaign were such that in Gandam Raiz local shopkeepers approached the Taliban, as the local authorities in charge of the area, to request that those running the labs move their operations away from the main bazaar.[59]

57 Fieldwork, respondent Bakwa #2, May 2018.

58 Fieldwork, respondent Bakwa #4, May 2018.

59 M. Barker and S. Yousafzai (2018). 'Taliban commander orders closure of opium labs in towns and cities', *The Guardian*, 28 May. URL: https://www.theguardian.com/world/2018/may/28/taliban-commander-orders-closure-of-opium-labs-in-towns-and-cities.

Figure 27. Destroyed drugs lab in Bakwa district, Farah

There was also an overwhelming consensus that the military operation against the drugs labs made people 'more opposite with the government and the foreigners'.[60] In central Helmand, farmers were vitriolic about the role that foreign military forces had played in the aerial campaign against labs and argued that it was part of a wider effort to subdue the Afghan population.[61] On the whole, respondents failed to differentiate between the lab campaign and the wider counterinsurgency campaign that had led to more ordnance being dropped on Afghanistan in 2018 than in any other full year since documentation began in 2006.[62] Moreover, frustration and anger at the campaign were heightened further by a sense that the lab campaign was not targeting Taliban revenues – due to the low rates of tax imposed – but was instead endangering the local population and their property and, by destroying drugs labs, undermining the local economy.

60 Fieldwork, respondent Bakwa #1, May 2018.

61 David Mansfield (2018c). *Stirring up the Hornet's Nest: How the Population of Rural Helmand View the Current Counterinsurgency Campaign*, issues paper for the Afghanistan Research and Evaluation Unit, October. Kabul: AREU.

62 Phillip Walter Wellman (2018). 'The US has dropped more munitions in 2018 in Afghanistan than it has in any year in over a decade', *Stars and Stripes*, 30 November. URL: https://www.stripes.com/news/the-us-has-dropped-more-munitions-in-2018-in-afghanistan-than-it-has-in-any-year-in-over-a-decade-1.558577.

Figure 28. Imagery of Hajji Habibullah's compound in Musa Qala district centre, February 2019

Figure 29. Imagery of repairs to drugs lab in Gandam Raiz

Locally, the economic effects of the lab strikes were seen to have had a wider effect, impacting not just on those directly involved in processing but also on those who farmed and traded the crop. In particular, the aerial campaign against labs was seen as being directly responsible for the dramatic fall in opium prices that occurred between 2017 and 2018. Whereas farmers in Helmand might sell their opium crop for up to US$135 in May 2017, the price was as low as US$30 by May 2018. While the reasons for this reduction were

complex – linked to the devaluation of the Iranian rial following the US imposition of sanctions, to the announcement of an unprecedented year of opium production in 2017 of 328,000 hectares, and to a season in the south that showed the potential to yield similar results – it was the campaign against the labs that was blamed for what was seen as a precipitous fall in opium prices. The loss of income – and purchasing power – associated with this fall in opium prices only added to the acrimony.

Ultimately, it was the sense of the futility of the aerial campaign that stood out the most. As one farmer north of the Boghra in Dashte Loy Manda exclaimed: 'There are too many factories everywhere. When one factory is bombed there are another 1,000 present. This campaign will not have any benefit for the government.'[63]

6 The airstrikes and the return on investment

The final analysis conducted for the purpose of this assessment was a comparison of the costs of the airstrikes and the financial value of the damage to the labs (see Table 2). The primary focus of the analysis was the 23 USFOR-A videos as these provided a detailed account of the planes used in each strike and, in some cases, the ordnance.

The estimated total cost of the airstrikes includes the cost of the overwatch, the planes used and the number of flying hours required, as well as the ordnance deployed. Costs such as personnel, refuelling and logistical support were not included as these could not be estimated with any degree of accuracy. The estimated costs provided below should therefore be viewed as a minimum: real costs are likely to be much higher.

63 Fieldwork, respondent Dashte Loy Manda #4, May 2018.

Table 2. A comparison of the costs of the airstrikes and the damage inflicted

Airstrike	Date	Target	Strike means	Ordnance	Estimated minimum cost of strike 1	Comments	Probability compound is a drugs lab?	Processing at time of strike?	Estimated maximum loss due to strike[1]
#1	19/11/2017	1 compound	A-29[2]	1+ bomb[3]	US$116,296		Low: surrounded by agricultural land	N	US$8,000
#2	19/11/2017	1 compound	A-29	1 bomb	US$116,296	Ordnance missed buildings	Medium	N	US$0 missed main buildings
#3	19/11/2017	9 buildings	B-52,[4] F-22;[5] and M142 HIMARS[6]	9 bombs[7]	US$1,247,280[8]		Mixed: fieldwork indicates six labs and three not	N	US$120,000
#4	19/11/2017	3 compounds	B-52	3 bombs (6 based on commentary)	US$529,128		Medium: sign of lean-to	N	US$48,000
#5	19/11/2017	3 compounds	F-22	3 bombs	US$299,448	Tethered animal bottom-mid screen	N: residence	N	US$0 already destroyed
#6	19/11/2017	1 compound	B-52	3+ bombs	US$448,128		Medium: multiple lean-tos and in state of disrepair	N	US$16,000
#7	20/11/2017	1 compound	F-16[9]	1 bomb[10]	US$144,574		Medium: lean-to on south wall	N	US$16,000
#8	20/11/2017	5 buildings	M142 HIMARS	5 bombs	US$588,296		Medium	N	US$80,000
#9	29/11/2017	1 compound	F-16	1 bomb	US$144,574	Two objects moving prior to explosion	U: too distant	U: too distant	U
#10	07/12/2017	1 compound	F-18[11]	1 bomb[12]	US$125,796		Medium	Possible: barrels in wreckage	U
#11	07/12/2017	4 compounds	F-18	5 bombs	US$233,796		U: too distant	U: too distant	U
#12	08/12/2017	1 compound	M142 HIMARS	2 bombs	US$288,296		U: too distant	U: too distant	U
#13	29/12/2017	1 compound	B-52	2 bombs	US$421,128		U: too distant	U: too distant	U
#14	31/01/2018	1 compound	A-10[13]	1 bomb[14] (and 1 prior)	US$148,240		U: too distant	U: too distant	U

Table 2. (Continued)

Airstrike	Date	Target	Strike means	Ordnance	Estimated minimum cost of strike	Comments	Probability compound is a drugs lab?	Processing at time of strike?	Estimated maximum loss due to strike[1]
#15	02/02/2018	Multiple targets, at least five buildings	B-52	Flare and at least 5 bombs	US$502,128		U: too distant	U: too distant	U
#16	02/02/2018	No compound; open	B-52	1 or 2 bombs	US$394,128		Low: possible fuel depot	N: barrels but too close	NA
#17	26/02/2018	1 compound	MQ-9 Drone[15]	4 bombs[16]	US$180,552		Low: could be farm with reservoir for solar-tube well	N	US$8,000
#18	08/03/2018	1 compound	A-10	2 bombs	US$106,128		U: too distant	U: too distant	U
#19	03/04/2018	1 compound	A10 and F-16	3 bombs	US$183,518	No gate, no cars, no people; no signs of life	Medium	N	US$16,000
#20	03/04/2018	1 compound	A-10 & F-16	2 strikes; 3 bombs	US$183,518		Probable	N	US$16,000
#21	03/04/2018	1 compound	A-10	2 strikes: one bomb; two bursts machine gun fire[17]	US$186,240	Possible barrels in first building in second strike imagery	U	U: too dark	U
#22	20/04/2018	1 compound	No details	2 bombs	NA		U: blurred	U: blurred	NA
#23	21/04/2018	1 compound	A-10	3 bombs	US$175,240	Second strike as the building and walls have been hit already	U	N	U

1. Maximum building value US$8,000; if lab then an additional maximum value of US$8,000 for equipment (barrels, press, etc.). 2. A-29 @ US$1,000/hr (https://www.defensenews.com/digital-show-dailies/dubai-air-show/2017/11/02/new-a-29-order-brightens-aircrafts-prospects-in-middle-east/). 3. A-29 flies with MK82 smart bomb @ US$27,000 (http://characterisationexplosiveweapons.org/studies/annex-e-mk82-aircraft-bombs/). 4. B-52 @ US$69,708/hr (http://nation.time.com/2013/04/02/costly-flight-hours/); B-52s are based in Al Udeid air base in Qatar and would require a minimum of 4 hours for a return flight to southern Afghanistan (https://www.nytimes.com/2017/12/11/world/asia/taliban-isis-afghanistan-drugs-b52s.html). 5. F-22 @ US$33,538/hr (http://nation.time.com/2013/04/02/costly-flight-hours/); the F-22 is based out of the UAE and would require 4 hours for a return flight to southern Afghanistan from Dubai (https://www.popularmechanics.com/military/aviation/a13820424/f-22-drug-lab-afghanistant/). 6. M142 HIMARS @ US$100,000–200,000 per rocket (https://breakingdefense.com/2017/11/marines-seek-anti-ship-himars-high-cost-hard-mission/). 7. Both F-22 and B-52 use MK82 smart bombs. 8. Assume 7 strikes from HIMARS, 1 strike by B-52 and 1 strike by F-22. 9. F-16 @ US$8,278 (http://nation.time.com/2013/04/02/costly-flight-hours/). 10. F-18 use maverick @ US$48,000–US$269,000 (http://www.f-16.net/f-16_armament_article4.html). 11. F-18 @ US$10,500/hr (https://www.forbes.com/sites/niallmccarthy/2016/08/16/the-hourly-cost-of-operating-the-u-s-militarys-fighter-fleet-infographic/#7e53c86f685f). 12. F-18 carries MK82 smart bomb (https://www.airforce-technology.com/projects/fa18/). 13. A-10 @ US$5,944/hr (http://nation.time.com/2013/04/02/costly-flight-hours/). 14. A-10 use MK82 smart bombs. 15. MQ-9A @ US$4,672/hr (http://nation.time.com/2013/04/02/costly-flight-hours/). 16. MQ-9A uses GBU-12 Paveway II @ US$21,896 each (https://en.wikipedia.org/wiki/GBU-12_Paveway_II). 17. A-10 uses a GAU-8/A Gatling 30mm gun, which fires 3,900 rounds per minute (https://en.wikipedia.org/wiki/GAU-8_Avenger); each round costs US$100.

The overwatch was calculated on the assumption that an MQ-1B predator drone was used for a total duration of 24 hours at a cost of US$3,679 per hour.[64] All other costs are based on the particular plane and ordnance used. The cost per hour for most US military planes is public record and can be obtained online. Apart from the B-52, F-22 and F-35, all other planes are based in Afghanistan and are assumed to require a minimum of 1 hour flying time to reach their target, strike and return to base.[65] The B-52 is based at Al Udeid air base in Qatar[66] and would require a minimum of 4 hours for a return flight to southern Afghanistan at a cost of US$69,708 per hour.[67] The F-22 is based out of the United Arab Emirates (UAE)[68] and would also require a minimum of 4 hours for a return flight to southern Afghanistan at a cost of US$33,538 per hour.[69]

Estimating the costs of the ordnance used was a little more challenging. While the costs of ordnance, as for planes, are public record, it is not always obvious what weapons were deployed in each of the airstrikes covered in the USFOR-A videos. In some cases, the particular ordnance used is referred to in the commentary linked with the USFOR-A video. In others, it was possible to research the type of ordnance used by the particular plane deployed in the airstrike and make an educated guess. An assessment of the ordnance used and its costs combined with a count of the number of airstrikes in each video (or the number referred to in the commentary) could be used to calculate a total cost for the ordnance used in each strike.

With regard to estimating the maximum value of the damage caused by the strikes, an assessment was made of whether a lab was active or not at the time of being struck. This was based on the criteria outlined in Section 4. Given that in some circumstances it was not possible to identify the specific location of the target, a lab with equipment was valued at a maximum of US$16,000, while a compound with no equipment was valued at US$8,000. These valuations are in line with the larger drug-processing facilities seen in Gandam Raiz, even though in some cases much smaller facilities were destroyed.

64 Mark Thompson (2013). 'Costly flight hours', *Time*, 2 April. URL: http://nation.time.com/2013/04/02/costly-flight-hours/.

65 International Institute for Strategic Studies (2018). *The Military Balance 2018*, p. 59. London: IISS.

66 Eric Schmitt (2017). 'Hunting Taliban and Islamic State fighters, from 20,000 feet', *New York Times*, 11 December. URL: https://www.nytimes.com/2017/12/11/world/asia/taliban-isis-afghanistan-drugs-b52s.html.

67 Thompson (2013).

68 Kyle Mizokami (2017). 'An F22 just blew up a drugs lab during its first combat mission in Afghanistan', *Popular Mechanics*, 21 November. URL: https://www.popularmechanics.com/military/aviation/a13820424/f-22-drug-lab-afghanistant/.

69 Thompson (2013).

Table 2 provides a comparison of the costs of the airstrikes and the financial value of the damage inflicted to property. While this might be considered a rather crude calculation, it does reveal how ineffective the aerial campaign was. Typically, the cost of an airstrike was ten times higher than the financial value of the damage incurred by those owning and running the drug-processing facility. Some strikes were particularly cost ineffective because they either missed their target (#2) or struck a target that had already been destroyed (#5). Given that none of the targets in the USFOR-A videos appear to have been active at the time they were struck, the financial impact on the Taliban was negligible, raising further questions over the return on investment.

7 Conclusion

The primary objective of the aerial campaign against drugs labs was to deny revenue to the insurgency. The intention was to replicate what was seen to have been a successful campaign against Islamic State in Syria, which targeted the oil supplies from which they earned a large proportion of their income. That campaign was said to have reduced IS revenue by nearly 90 per cent over three years, reducing monthly revenue from US$50 million to only US$4 million.

The aerial campaign in Afghanistan sought to achieve the same results against the Taliban by targeting the opium economy. Concerned about the political and economic ramifications of targeting farmers and their crops – a strategy that had been pursued before and that had proven deeply unpopular with the Afghan population, with the Afghan government and with many NATO allies – USFOR-A targeted the drugs labs where opiates were produced.

A number of assumptions appear to have underpinned this campaign. The first was that the Taliban as an organization earned 60 per cent of its income from narcotics. The second was that the Taliban earned a 20 per cent tax from those involved in the drugs economy, and that any loss in the amount of money earned by drug trafficking organisations would impact on the insurgency's revenue and its ability to fight. The third assumption related to the market structure of drugs labs: that there was a finite number – a figure of up to 1,000 labs was often cited[70] – and that these labs could be destroyed more quickly than they could be replaced. Finally, USFOR-A seems to have made an assumption that the rural population would not oppose the destruction of drugs labs: possibly because these labs were believed to be funding the insurgency and the conflict; maybe because they produced

70 Lower estimates typically cite 400–500 labs. See Mujib Mashal (2017). 'Afghan Taliban awash in heroin cash, a troubling turn for war', *New York Times*, 29 October. URL: https://www.nytimes.com/2017/10/29/world/asia/opium-heroin-afghanistan-taliban.html.

morphine and heroin rather than opium, a traditional crop in many of the areas being targeted; or even because farmers would take the view that at least the target was not their opium crops. All these assumptions were factually incorrect.

This research suggests that the campaign did not serve its primary purpose of denying revenue for a number of reasons. First, while the campaign was largely successful in striking targets that were likely to have been compounds in which drugs were processed at some point, very few of them were active at the time that they were destroyed. In the absence of any drugs on site, the financial losses to drug traffickers were nominal. Second, this research argues that had these labs been active at the time they were destroyed, the financial impact on the insurgency would have been much more limited than the estimates provided by USFOR-A due to much lower rates of taxation and protection monies being paid to the insurgency. On this basis it is hard to see how the campaign offered anything in terms of value for money, with the cost of the strikes and ordnance used far outweighing the value of the losses to those involved in drugs production or potential revenues to the Taliban.

More broadly, the aerial campaign against the drugs labs fuelled antipathy towards the Afghan government and US military forces. By targeting compounds, sometimes in densely built-up areas, it instilled a sense of fear and trepidation in the local population. The reports of civilian casualties during the initial days of the campaign, the perceived effect on the local economy, and the disconnect in the minds of the rural population between the air campaign and Taliban revenue further alienated the rural population.

Table 3. Review of USFOR-A videos: assessment of costs of operations and damage inflicted

Link	Date	Target	Strike means	Ordnance	Estimated minimum cost of strike (overwatch + flight + ordnance)[1]	Comments	Probability compound is a drugs lab?	Processing at time of strike?	Effluent?	Warning fire?	Estimated maximum loss due to strike[2]
www.dvidshub.net/video/566980/29-strike-against-taliban-revenue-streams	19/11/17	1 compound	A-29[2]	1+ bomb[3]	US$116,296		Low: surrounded by agricultural land	No	No	None	US$8,000
www.dvidshub.net/video/566986/29-strike-against-taliban-revenue-streams	19/11/17	1 compound	A-29	1 bomb	US$116,296	Ordnance missed buildings - struck in middle of compound	Medium	No	Yes: top left	None	US$0 missed main buildings
www.dvidshub.net/video/566987/b-52-f-22-and-himars-strike-against-taliban-revenue-streams	19/11/17	9 buildings	B-52[4], F-22[5]; and M142 HIMARS[6]	9 bombs[7]	US$1,247,280[8]		Mixed: fieldwork indicates 6 labs and 3 not	No	No	None	US$120,000
www.dvidshub.net/video/566990/b-52-strike-against-taliban-revenue-streams	19/11/17	3 compounds	B-52	3 bombs (however, 6 x 500lb bombs according to commentary)	US$529,128		Medium: sign of lean-to	No	Unsure	Yes: dogs flee site and head east when bomb strikes	US$48,000
www.dvidshub.net/video/566992/b-52-strike-against-taliban-revenue-streams	19/11/17	3 compounds	F-22	3 bombs	US$299,448	Tethered animal can be seen bottom-mid screen	No: residence	No	No	Unsure: second strike	US$0 already destroyed
www.dvidshub.net/video/566995/b-52-strike-against-taliban-revenue-streams	19/11/17	1 compound	B-52	3+ bombs	US$448,128		Medium: multiple lean-tos and in state of disrepair	N	Possible	No	US$16,000
www.dvidshub.net/video/567411/f-16-strike-against-taliban-revenue-streams	20/11/17	1 compound	F-16[9]	1 bomb[10]	US$144,574		Medium: lean-to on south wall	No	Yes	No	US$16,000

Table 3. (Continued)

Link	Date	Target	Strike means	Ordnance	Estimated minimum cost of strike (overwatch + flight + ordnance)[1]	Comments	Probability compound is a drugs lab?	Processing at time of strike?	Effluent?	Warning fire?	Estimated maximum loss due to strike[2]
www.dvidshub.net/video/567422/us-himars-strike-against-taliban-revenue-streams	20/11/17	5 buildings	M142 HIMARS	5 bombs	US$588,296		Medium	No	Unsure	No	US$80,000
www.dvidshub.net/video/569257/f-16-strike-against-taliban-revenue-streams	29/11/17	1 compound	F-16	1 bomb	US$144,574	Two objects moving rapidly from the southwest corner of compound prior to explosion	Unsure: too distant	Unsure: too distant	Unsure: too distant	Yes: dogs exiting to south west prior to final strike	Unsure
www.dvidshub.net/video/571362/us-navy-f-18-super-hornets-conduct-strike-taliban-narcotics-facilities	07/12/17	1 compound	F-18[11]	1 bomb[12]	US$125,796		Medium	Possible: barrels in wreckage	Unsure: too close	No	Unsure
www.dvidshub.net/video/571359/us-navy-f-18-super-hornets-conduct-strike-taliban-narcotics-facilities	07/12/17	4 compounds	F-18	5 bombs	US$233,796		Unsure: too distant	Unsure: too distant	Unsure: too distant	No	Unsure
www.dvidshub.net/video/571772/m142-himars-conducts-strike-taliban-narcotics-production-facility-helmand-province	08/12/17	1 compound	M142 HIMARS	2 bombs	US$288,296		Unsure: too distant	Unsure: too distant	Unsure: too distant	No	Unsure
www.dvidshub.net/video/578700/us-aircraft-conduct-strike-taliban-narcotics-production-facility-helmand-province-december-29-2017	29/12/17	1 compound	B-52	2 bombs	US$421,128		Unsure: too distant	Unsure: too distant	Unsure: too distant	No	Unsure

Table 3. (Continued)

Link	Date	Target	Strike means	Ordnance	Estimated minimum cost of strike (overwatch + flight + ordnance)[1]	Comments	Probability compound is a drugs lab?	Processing at time of strike?	Effluent?	Warning fire?	Estimated maximum loss due to strike[2]
www.dvidshub.net/video/582740/10-thunderbolt-ii-conducts-strike-taliban-narcotics-production-facility-helmand-province	31/01/18	1 compound	A-10[13]	1 bomb[14] (but prior 1 bomb)	US$148,240		Unsure: too distant	Unsure: too distant	Unsure: too distant	Unsure: second strike	Unsure
www.dvidshub.net/video/583532/us-b-52-striking-taliban-narcotics-production-facility-helmand-province	02/02/18	Multiple targets, at least 5 labs	B-52	Flare and at least 5 bombs	US$502,128		Unsure: too distant	Unsure: too distant	Unsure: too distant	No	Unsure
www.dvidshub.net/video/583065/b-52-conducts-strike-taliban-narcotics-production-facility-helmand-province	02/02/18	No compound; open	B-52	1 or 2 bombs	US$394,128		Low: possible fuel depot	No: barrels but too close	No	No	NA
www.dvidshub.net/video/586439/mq-9-reaper-performs-historic-multirole-mission	26/02/18	1 compound	MQ-9 Drone[15]	4 bombs[16]	US$180,552		Low: could be farm with reservoir for solar-tube well	No	No	No	US$8,000
www.dvidshub.net/video/589498/us-10-strike-taliban-narcotics-production-facility-helmand-province	08/03/18	1 compound	A-10	2 bombs	US$106,128		Unsure: too distant	Unsure: too distant	Unsure: too distant	No	Unsure
www.dvidshub.net/video/593293/us-10-and-f-16-aircraft-strike-taliban-narcotics-production-facility-farah-province	03/04/18	1 compound	A10 and F-16	3 bombs	US$183,518	No gate, no cars, no people; no signs of life; empty building?	Medium	No	Possible: stains on ground and white powder	No	US$16,000

Table 3. (Continued)

Link	Date	Target	Strike means	Ordnance	Estimated minimum cost of strike (overwatch + flight + ordnance)[1]	Comments	Probability compound is a drugs lab?	Processing at time of strike?	Effluent?	Warning fire?	Estimated maximum loss due to strike[2]
www.dvidshub.net/video/593288/us-f-16-strikes-taliban-narcotics-production-facility-nimroz-province	03/04/18	1 compound	A-10 & F-16	2 strikes. Strike 1: 2 bombs. Strike 2: 1 bomb	US$183,518	No gate	Probable	No	Possible: stains on ground	No	US$16,000
www.dvidshub.net/video/593283/us-10-strikes-taliban-narcotics-production-facility-farah-province	03/04/18	1 compound	A-10	2 strikes. Strike 1: 1 bomb. Strike 2: 2 bursts machine gun fire (10 secs)[17]	US$186,240	Possible barrels in 1st building in second strike imagery	Unsure	Unsure: too dark	Unsure: too dark	No	Unsure
www.dvidshub.net/video/595952/us-10-strike-taliban-narcotics-production-facility-farah-province	20/04/18	1 compound	No details	2 bombs	NA		Unsure: blurred	Unsure: blurred	Unsure: blurred	No	NA
www.dvidshub.net/video/595909/us-10-strike-taliban-narcotics-production-facility-helmand-province	21/04/18	1 compound	A-10	3 bombs	US$175,240	Second strike as the building and walls have been hit already	Unsure	No	Unsure: second strike	Unsure: second strike	Unsure

1. Total minimum costs are based on the cost of the overwatch, the plane used and the number of flying hours and the ordnance. The overwatch is calculated on the assumption that an MQ-1B predator drone is used @ US$3,679 per hour for a total duration of 24 hours. All other costs are based on the particular plane and ordnance used. Apart from the B-52 and F-22, all other planes are based in Afghanistan and require a minimum of 1 hour flying time. See *The Military Balance 2018*, International Institute for Strategic Studies (IISS), London, p. 59. 2. A-29 @ US$1,000/hr (https://www.defensenews.com/digital-show-dailies/dubai-air-show/2017/11/02/new-a-29-order-brightens-aircrafts-prospects-in-middle-east/). 3. A-29 flies with MK82 smart bomb @ US$27,000 (http://characterisationexplosiveweapons.org/studies/annex-e-mk82-aircraft-bombs/). 4. B-52 @ US$69,708/hr (http://nation.time.com/2013/04/02/costly-flight-hours/); B-52s are based in Al Udeid air base in Qatar and would require a minimum of 4 hours for a return flight to southern Afghanistan (https://www.nytimes.com/2017/12/11/world/asia/taliban-isis-afghanistan-drugs-b52s.html). 5. F-22 @ US$33,538/hr (http://nation.time.com/2013/04/02/costly-flight-hours/); the F-22 is based out of the UAE and would require 4 hours for a return flight to southern Afghanistan from Dubai (https://www.popularmechanics.com/military/aviation/a13820424/f-22-drug-lab-afghanistant/). 6. M142 HIMARS @ US$100,000–200,000 per rocket (https://breakingdefense.com/2017/11/marines-seek-anti-ship-himars-high-cost-hard-mission/). 7. Both F-22 and B-52 use MK82 smart bombs. 8. Assume 7 strikes from HIMARS, 1 strike by B-52 and 1 strike by F-22. 9. F-16 @ US$8,278/hr (http://nation.time.com/2013/04/02/costly-flight-hours/). 10. F-18 uses maverick @ US$48,000–US$269,000 (http://www.f-16.net/f-16_armament_article4.html). 11. F-18 @ US$10,500/hr (https://www.forbes.com/sites/niallmccarthy/2016/08/16/the-hourly-cost-of-operating-the-u-s-militarys-fighter-fleet-infographic/#7e53c86f685f). 12. F-18 carries MK82 smart bomb (https://www.airforce-technology.com/projects/fa18/). 13. A-10 @ US$5,944/hr (http://nation.time.com/2013/04/02/costly-flight-hours/). 14. A-10 uses MK82 smart bombs. 15. MQ-9A @ US$4,672/hr (http://nation.time.com/2013/04/02/costly-flight-hours/). 16. MQ-9A uses GBU-12 Paveway II @ US$21,896 each (https://en.wikipedia.org/wiki/GBU-12_Paveway_II). 17. A-10 uses a GAU-8/A Gatling 30mm gun, which fires 3,900 rounds per minute (https://en.wikipedia.org/wiki/GAU-8_Avenger, each round costs US$100).

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