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RESEARCH

On the Frontiers of Development: Illicit Poppy and the Transformation of the Deserts of Southwest Afghanistan

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The physical and political geography of the deserts of southwest Afghanistan have gone through dramatic change over the last two decades. Located on the periphery of irrigated lands settled by the Afghan state in the 1950s and 1960s, this area has been at the forefront of technical change in Afghan agricultural production since 2003. Initially settled by small numbers of households escaping drought in the 1990s, tracts of these former desert lands were captured by local elites and communities from the adjacent irrigated lands. Access to improved technologies, including deep wells and diesel pumps, and a buoyant opium price, led to dry rocky soils being transformed into agricultural land. Further encroachment of these former desert lands came in 2008 with the drive to curb opium production in those accessible irrigated areas where the Afghan state, and foreign military forces, coerced the rural population to abandon opium. These counternarcotics efforts evicted the land-poor from the centrally irrigated valleys of the provinces of Helmand, Farah and Kandahar, leaving them few options but to seek new lives in the former desert areas. For those that owned land in the former desert areas, this supply of relatively cheap labour, skilled in opium production, encouraged a further expansion in opium poppy cultivation. Even in the wake of repeated low yields between 2010 and 2014, and fluctuating opium prices, farmers in these former desert areas adapted and innovated, exploiting herbicides and solar-powered technology to reduce the costs of opium production, and further increased the amount of land under agriculture. As this paper argues, these former desert areas should not be seen as marginal and remote, far from the reaches of the development programs of the Afghan state and its donors, but understood as engines of growth integrated into the global economic system; these are areas that have been transformed by improved access to modern technologies and an entrepreneurial local population that has fully exploited the opportunities illegal opium production offers.

Keywords: Opium poppy; transformations; Afghanistan; illicit economies; solar power

1. Introduction

The deserts of southwest Afghanistan have changed dramatically over the last two decades. What was largely unsettled, bare land at the beginning of the twenty-first century had become home to up to 2.2 million people in 2016.[1] What is more, this frontier area is located beyond the reaches of the Helmand and Farah rivers and the canal system that the Afghan state built in the twentieth century to increase the agricultural area from which it could extract rent. Yet in 2016, there were 472,838 hectares of agricultural land, where there had only been 254,866 in 2008 and 143,060 in 2003 (see **Figure 1**). This expansion did not occur through state intervention in the kind of large-scale irrigation works that had been seen in the past, but was

[1] This is based on a minimum population density between 0.51 and 0.91 per jerib derived from fieldwork for this paper.

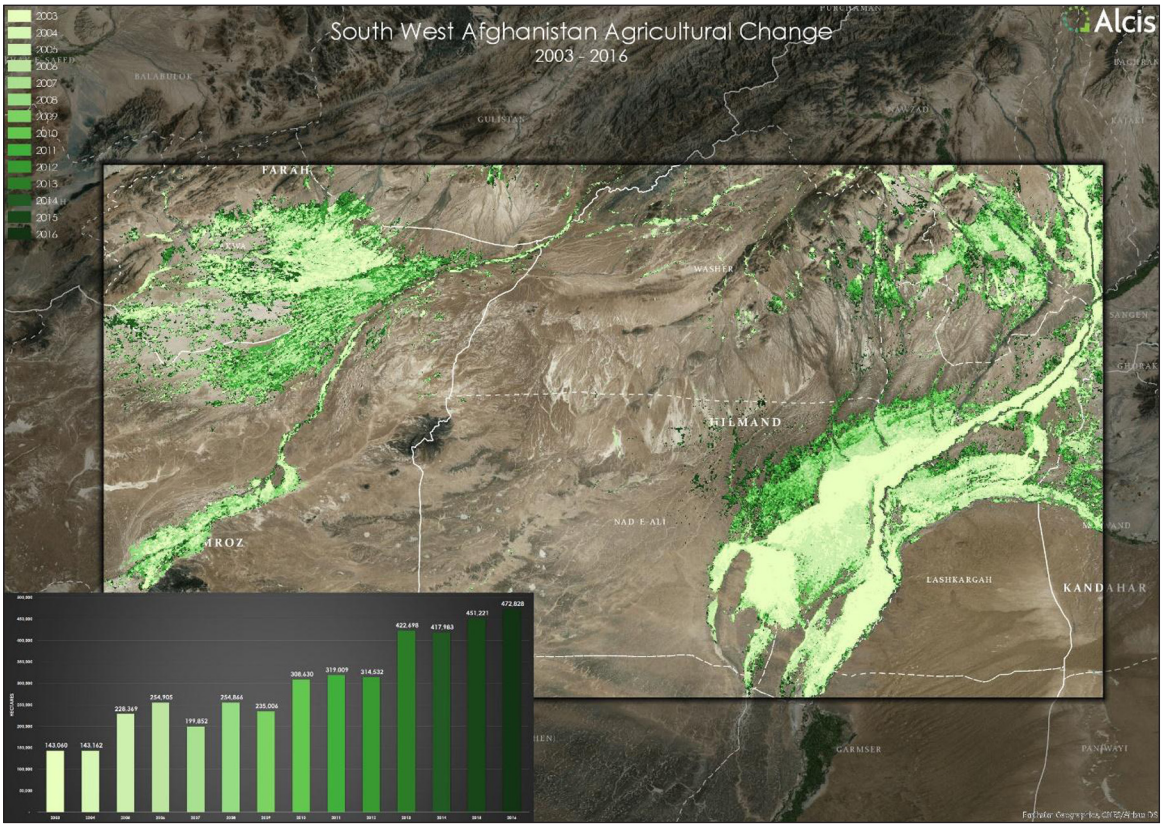

Figure 1: The expansion of land under agricultural production in the deserts of the southwest, 2002–2016.

the result of households capturing and purchasing what had once been designated 'government land' then investing in improved technologies. Over time, and with further encroachment, communities were formed across these former desert areas and distinct patterns of land tenure, systems of taxation and governance could be found. All this was achieved in areas where there had been nothing but sand and rocks twenty years before, and where the Afghan state had no formal presence.

This paper examines the processes that led to the settlement and transformation of this former desert land and shows that, were it not for illicit opium poppy, these developments would not have occurred. This paper is divided into five further sections. Section 2 outlines the methodology. It explains how combining geospatial data with multiple rounds of fieldwork that focuses on household livelihood strategies provides a valuable and robust basis for examining illicit economies, particularly in remote and insecure locations. Section 3 describes how the geographic distribution of opium poppy cultivation in Afghanistan has emerged, consolidated and adapted to statebuilding and counternarcotics efforts. Section 4 focuses on the settlement of the former desert lands of the southwest. It uses the results of geospatial analysis and household interviews to chart the different patterns of settlement in the former deserts of Helmand and Bakwa and the various socio-economic groups involved. Section 5 examines the role of opium as a source and motivation for capital investment and how farmers have adapted to the continuing challenges of desert terrain, including high production costs, diminishing yields, and a falling water table. Section 6 concludes that while opium poppy has served as a lifeline to the burgeoning rural population in these former desert areas, the rapid adoption of solar power and chemical herbicides could threaten the long-term sustainability of agricultural production in these lands and support growing socio-economic differentiation in the communities that live there.

2. Methodology

This paper is based on in-depth fieldwork and high-resolution imagery undertaken between 2011 and 2017 in 20 research sites in two former desert areas (See **Figure 2**). Fieldwork consisted of 1,078 interviews with rural households and supplementary data collection among those providing services to these desert communities. In total, 742 interviews were conducted with farmers in 8 research sites in the area north of the Boghra canal in Helmand Province and 336 interviews with farmers in 12 research sites in Bakwa in Farah

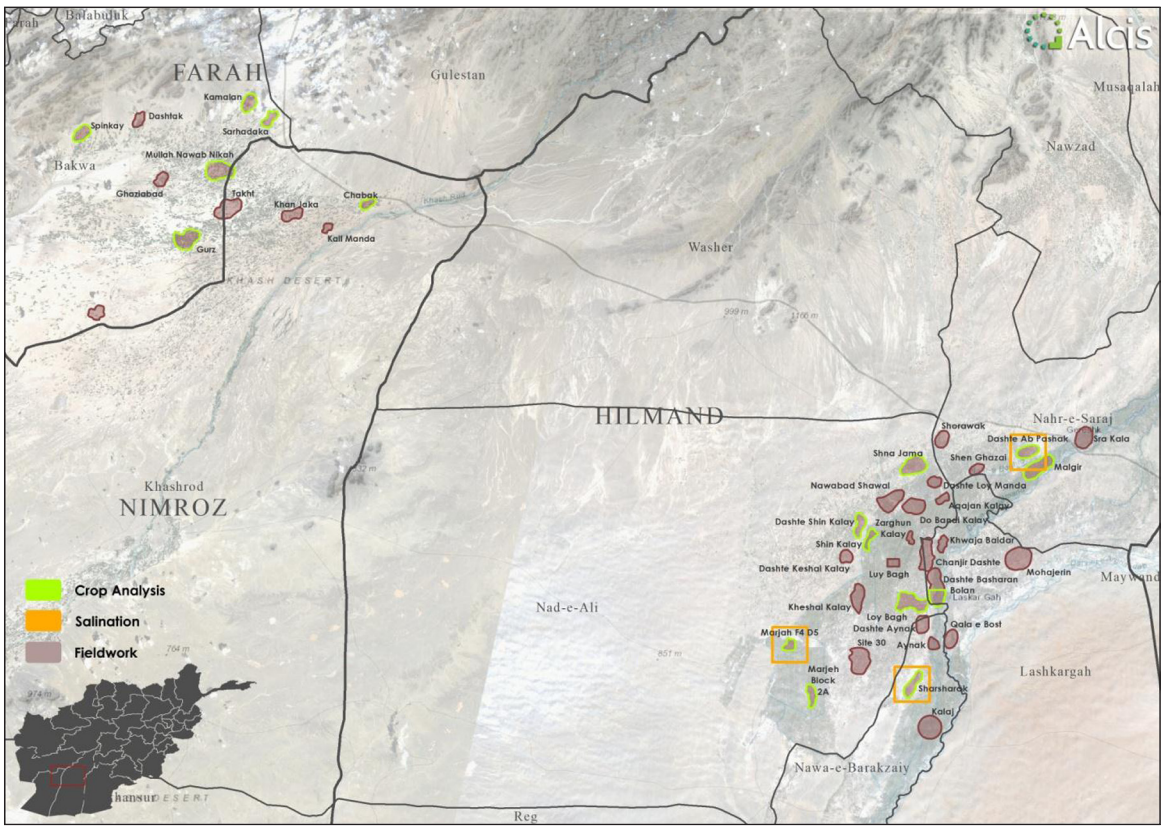

Figure 2: Research sites in the deserts of Southwest Afghanistan.

Province.[2] A further 40 interviews were conducted with individuals involved in the provision of services to the population in the former desert areas in the cities of Lashkar Gah, Gereshk, Farah and Delarem, including those trading solar panels, diesel, pesticides and the leasing of drilling equipment for sinking deep wells.

High-resolution remote sensing imagery was integral to the research design. Geospatial data on vegetation was combined with high resolution imagery to examine the history of settlement in the former desert area. Research sites were then identified based on the duration of settlement, ranging from sites that showed evidence of agricultural production prior to 2003 to those settled in 2013. Remote sensing imagery was then used to verify that fieldworkers had been to the identified sites, and thenthe results of primary data collection were examined. High-resolution imagery allowed further exploration of primary research findings including the identification of crops under cultivation as well as new or damaged physical infrastructure, and the measurement of changes in the area under cultivation. Finally, geospatial analysis supported the extrapolation of research findings over a wider geographic beyond the research sites themselves.

Fieldwork was undertaken by a team of local researchers. The research addressed the inherent problems associated with primary data collection when researching an illegal or underground activity by focusing its inquiry on household livelihood strategies. The pressure to act against opium cultivation and trade has made illicit drugs a more sensitive topic for discussion with farmers and other stakeholders than was the case in the 1990s and early 2000s (Mansfield 2016). However, the rural household remains the most accessible unit of analysis when looking at the opium economy in Afghanistan; 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 opium production in rural livelihood strategies in Afghanistan and elsewhere. Discussions in the field focused on the direct experience of respondents and their households rather than on a wider geographic area, where answers become increasingly speculative (Swedish Committee of Afghanistan, 1992: 1). Individual interviews with farming households were conducted in the field as farmers tended their crops,

[2] The research in the former desert areas was also supported by longitudinal fieldwork in 12 sites in the main canal irrigated area of Helmand where many of those that have settled north of the Boghra originate from. The results of this work can be found in a number of other publications including most recently, "Truly Unprecedented: How the Helmand Food Zone supported an increase in the province's capacity to produce opium" by David Mansfield, AREU, October 2017.

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; are inappropriate for discussing sensitive issues; increasingly represent a security threat in rural Afghanistan, particularly in the south (Mansfield 2016).

3. Changing patterns of opium poppy cultivation in Afghanistan

3.1. The emergence of widespread poppy cultivation

Although opium poppy cultivation is thought to have a long history in Afghanistan, there is little evidence of significant production until the 1980s (Macdonald, 2007: 59), marked by the Iranian Revolution, the proclamation of the Hadd ordinance banning opium production in Pakistan, and—most importantly—the civil war in Afghanistan. During the war years, Afghanistan emerged as global leader in opium production, based on what Goodhand (2012) has referred to as a 'triple comparative advantage of favourable physical, political and economic conditions.' This growth in cultivation can be linked to the political and economic interests of warlords who built patronage networks by taxing cultivation and, in some cases, participating directly in the trade.

Opium production became an ideal agricultural commodity during the war years, in the absence of a functioning state that could either support growth in the legal rural economy or use law enforcement to constrain cultivation. As a drought-resistant crop, a yield could be obtained despite damaged irrigation systems or inconsistent water supply; as a high-value/low-weight commodity, opium could be easily transported on poor roads or across porous borders. Skills involved in cultivation were easily learned and harvesting tools could be produced by local craftsmen or by farmers themselves. Market support was provided by local traders, avoiding long-range transport and transaction costs. Finally, during the war the use of opium increased significantly in Afghanistan and among the Afghan diaspora in Pakistan and Iran, thereby increasing the demand for opium production (Macdonald 2007).

As opium cultivation expanded from the higher valleys into larger landholdings in lower areas, its role in rural livelihoods and in the overall economy began to grow. The expansion of the crop meant that landowning households which did not meet the labour requirements could offer land on a sharecropping basis to land-poor, underemployed males. This practice led to a symbiotic relationship between the landed and the land-poor, fuelling socio-economic differentiation between and within rural areas.

Opium gave the land-poor access to land on which to grow a high-value cash crop and food crops, and to engage in the system of advance purchases on opium that provided liquidity for households during periods of food scarcity, family illness, or life-cycle events such as births, marriages or deaths. Opium poppy also provided wage labour for those who could travel to neighbouring districts during the labour-intensive harvest period.

The multiplier effect created further economic opportunities through the service industries associated with the cultivation, trade and processing of opiates, as well as the resulting disposable income, some of which was reinvested in the local economy. Those with capital and access to the means of violence benefited from asset accumulation and political and military influence.

Given its widespread economic and social benefits, little was done to contain the opium economy during the 1980s and 1990s. Drug control efforts were rare and were largely for show, aimed at encouraging an increase in development assistance from foreign sponsors (Mansfield, 2002). There are considerable doubts as to the effectiveness of campaigns, due to the challenges of estimating levels of cultivation and questions about territorial control (Martin 2014).

These earlier efforts at drug control offered only temporary lulls in production across limited geographic areas. They disrupted political arrangements with local commanders and possibly with drug traders and processors, and appear to have yielded little of the donor assistance and patronage that regional commanders were looking for.

3.2. Consolidation during the Taliban years

The Taliban's arrival in the southern provinces in 1994 did nothing to stop the growth in opium (see **Figure 3**). In fact, under their rule cultivation expanded significantly, facilitated by the removal of checkpoints and militias along the major roads and driven by limited economic opportunities in the legal rural economy (UNDCP, 1998a). The UN Office on Drugs and Crime (UNODC) estimated that the level of cultivation rose from 18,500 hectares in 1987 (US Department of State, 1997) to 91,000 hectares in 1999.

During the 1990s, opium expanded beyond its traditional centres of production in the South, East and Northeast to parts of the North and Centre and more districts in the Eastern Region (UNDCP 1998a). Those households with insufficient land in the core production areas sent family members to other provinces

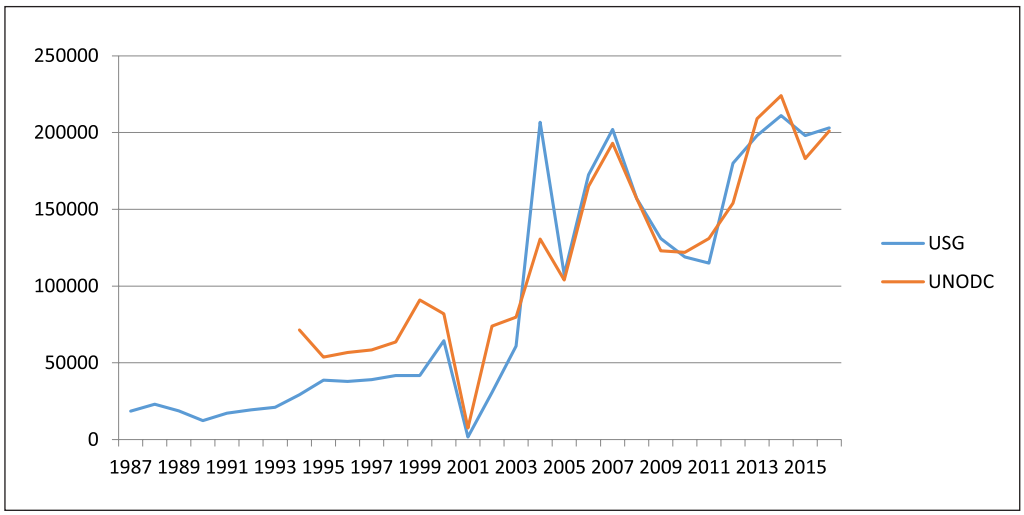

Figure 3: Opium poppy cultivation in Afghanistan, 1987–2017 (hectares).

where they had ethnic or familial ties. There they leased or sharecropped land, sharing their skills in opium production with the local population (UNDCP, 1998a, 1999). Then these itinerant harvesters returned to their own land and applied their new skills (UNDCP, 1998a).

There was also growing experimentation by farmers who attempted to cultivate opium poppy for the first time, limiting production to small plots of land situated among crops like wheat and onion in case their poppy failed (UNDCP, 1998a). The proactive role of the rural population expanding cultivation, combined with what Byrd (2008: 17) has referred to as the 'footloose' nature of the drugs economy, points to the degree of autonomy in rural areas and the economic opportunities that opium offered a wide range of actors (Mansfield 2016).

During the Taliban's rule, the opium trade became consolidated within the Afghan economy. Before the ban in July 2000, the Taliban did little to hamper production or trade, beyond a few flurries of activity at the behest of the UN Drug Control Programme (UNDCP): closing some laboratories, small-scale eradication, proclamations prohibiting opium production (Mansfield 2016). Opium was dried and traded on the streets of district bazaars, close to the highway. Marketing hubs in the East and South proliferated and moved closer to the arterial roads (UNDCP, 1998b). Finally, heroin processing facilities were found in the main valleys, often near the district centre where Taliban soldiers were located.

Some viewed this expansion, coinciding with the Taliban's territorial gains, as evidence of the Taliban's control of the trade. But the relationship was more complex, reflecting local political settlements and bargains. In some cases, local Taliban leadership tolerated drug production and trade, unwilling to challenge powerful local interests. In others, Taliban commanders were actively involved in opiate trade and taxation.

These local arrangements came undone with the imposition of the Taliban ban in July 2000. After numerous requests by the UN and international donors to act against the drugs trade, the Taliban imposed an effective ban on opium production in the 2000–01 growing season, reducing cultivation from 82,000 hectares in 2000 to 8,000 hectares in 2001 (see **Figure 2**). Although UN officials billed it as 'one of the most remarkable [drug control] successes ever' (cited in Jelsma, 2005: 1), it was an event that many would come to regret.

For the Taliban, the ban imposed hardships on the rural population that enabled Western military forces to encourage rebellion against the regime (UNODC, 2003; Mansfield, 2004). For the Interim Administration and its successor, the Government of the Islamic Republic of Afghanistan, cessation of production led to a rapid rise in the price of opium that made cultivation profitable even in marginal areas. Combined with the return of the *mujahidin* leadership to provinces they had presided over in the 1980s and 1990s, opium became a mainstay of the Afghan economy and a metric by which both the Afghan government and the international project in Afghanistan came to be judged (Mansfield 2016).

3.3. Expansion and shifting patterns of cultivation under the statebuilding project

Giustozzi (2007: 9) argues that for political entrepreneurs the drugs economy became a source of power during the initial years of the Karzai regime. Members of Parliament, government ministers, regional power brokers and elements of the security apparatus were thought to be directly involved in the drugs trade or to have received payments for their role as 'security providers' (Mankin, 2009). Byrd and Jonglez (2006)

reported growing market integration, while others claimed that trafficking had become concentrated in the hands of a few key individuals, many with close links to the Ministry of Interior (Buddenberg and Byrd, 2006: 201).

Evidence of market concentration was less obvious in the provinces following the Taliban's collapse in 2001. In fact, cultivation expanded significantly in areas with few pre-existing market linkages and limited production experience (Mansfield, 2006). This was prompted by the fact that high prices were sustained following the collapse of the ban and the launch of counternarcotics efforts. Increased cultivation was also seen in the traditional areas of production as farmers took advantage of high prices and the absence of government control to make up for the loss of income and rising debts that many had incurred under the Taliban ban (UNODC, 2003; Mansfield, 2004). By 2004, opium poppy could be found in 194 out of 364 districts and in all 34 provinces, compared to only 54 districts in eight provinces in 1994 (UNODC/MCN, 2004).

After 2005, national opium poppy cultivation fluctuated widely, falling between 2008 and 2010, only to rise again in 2011. However, aggregate levels mask regional, provincial and district-level variations. Dramatic reductions in Helmand and Nangarhar provinces had a significant impact on aggregate statistics: a fact that helped meet the demand of the UK and US governments.

Counternarcotics efforts are one factor in these reductions. Cultivation fell significantly in Nangarhar—a province that had been second only to Helmand as a major producer of opium—after the imposition of bans by two governors. The most striking example is Helmand itself where the Helmand Food Zone (HFZ) was introduced in 2008. With financial and logistical backing from the UK and US governments, this initiative consisted of three activities: a counternarcotics information campaign aimed at deterring planting, distribution of wheat seed and fertiliser, and eradication (Mansfield et al., 2011). Within the HFZ, cultivation in 2009 fell from 103,590 to 69,833 hectares (see **Figure 4**). By the spring of 2011, there was a 40% reduction in cultivation compared to the 2007–08 growing season (UNODC/MCN, 2012).

A second factor in the downward trend in cultivation in 2008 and 2009 was the shift in terms of trade between wheat and opium (Mansfield et al., 2011; Mansfield and Pain, 2008). The rapid rise in world cereal prices in late 2007, combined with insecurity in Pakistan following the assassination of Benazir Bhutto, restricted cross-border trade in Pakistani wheat flour and led to higher wheat prices in Afghanistan. And high levels of opium production between 2002 and 2007 led to opium prices falling from US$700/kilogramme in September 2001 to less than US$60/kilogramme in the 2007–08 growing season (Mansfield and Pain, 2008: 14).

With this shift in prices, farmers across Afghanistan became increasingly concerned about food security; many opted to cultivate wheat rather than cash crops. In the less fertile areas where opium had little tradition and the population lacked experience and skills, farmers realised that they could produce wheat on their own land rather than using opium profits to purchase wheat. Under these conditions, farmers did not need to be coerced to abandon opium production, although this did not stop the political leadership or counternarcotics community from taking credit for reduced cultivation (Mansfield and Pain, 2008; UNODC/MCN, 2008: 2).

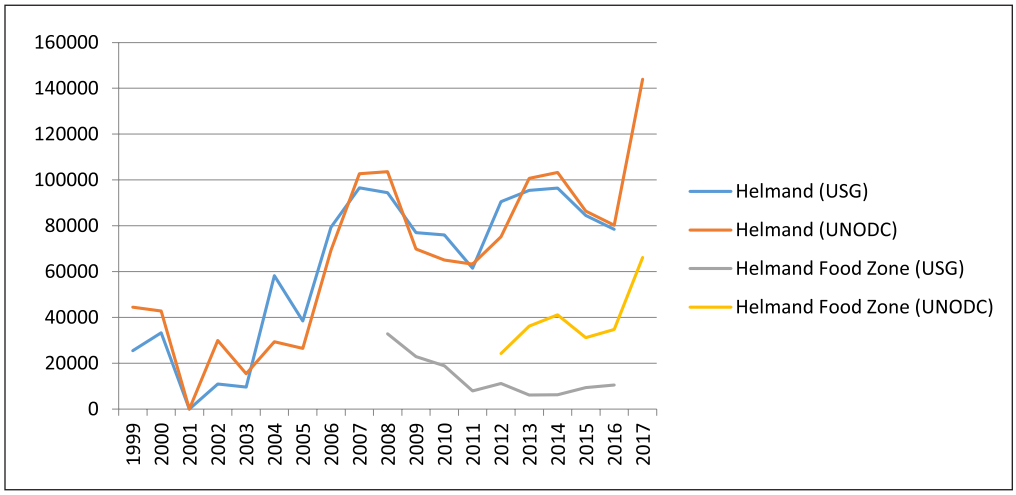

Figure 4: Opium Poppy Cultivation in Helmand, 2001–2017 (hectares).

A third factor in reductions during this period was the growth of opportunities in the legal economy, particularly in the lower valleys where most development assistance had been provided. The World Bank estimated that between 2002 and 2012, US$55 billion of aid was given to Afghanistan, and the average annual growth rate in gross domestic product was 9% (cited in Goodhand, 2012). Major poppy-growing provinces like Helmand received an estimated US$600 million of development assistance between 2009 and 2011, the years in which the Helmand Food Zone was implemented (USAID, 2014: 29).

Even as early as 2008, the areas around provincial centres in most opium-growing provinces showed increasing signs of agricultural diversification and more complex cropping systems that included high-value, short-season horticultural crops and the cultivation of a variety of crops on a single unit of land. This allowed farmers to better manage the risk of crop failure and increase on-farm income (Mansfield and Pain, 2008; Mansfield, 2008). Households in these areas exploited wage-labour opportunities in the service sector and construction industry, further diversifying their income base.

A fourth reason for falling levels of cultivation was the rollout of national and international security forces to the regions. From 2004 on, communities began to mobilise through the establishment of Provincial Reconstruction Teams (PRTs). By 2008, the perceived failures of centralised statebuilding, the growing insurgency and the new counter-insurgency doctrine led to a shift towards bottom-up state building and devolution to the districts. A typical trajectory was for opium cultivation to fall in areas around the provincial centres. In provinces like Helmand where military presence extended into the districts, production was also deterred. The impact of military operations on levels of cultivation was most stark in Marjah District in Helmand Province where, following the deployment of 15,000 US Marines and the Afghan National Defense and Security Forces (ANDSF) in February 2010, the amount of land dedicated to opium poppy fell from 60% to less than 5% the following season (Mansfield, 2012: 3).

The combination of these factors—provincial drug control efforts, the shift in terms of trade between wheat and poppy, the uptake in economic opportunities within the legal economy and the deployment of military forces to key provinces—led to reduced opium production, even in provinces where the crop had a long history and was most concentrated. While initially lauded as the success of counternarcotics interventions and the statebuilding effort, reduced cultivation in some provinces in the south and southwest were offset by dramatic increases in production in more remote desert areas within the same provinces—areas that had not been under opium poppy cultivation before or, indeed, under any kind of agricultural production. The following section examines the expansion into two desert areas, Helmand and Bakwa, and shows how existing patterns of land ownership in the irrigated areas, and interventions by the state, affected the settlement of these lands and led to a number of provinces with desert frontiers increasing their capacity to produce more opium than ever before (Mansfield 2017).

4. Settlement of the desert lands

This section traces the structural factors that have shaped the settlement of two desert spaces. The first is the area north of the Bogra canal, in Helmand province, southwestern Afghanistan. The Boghra canal is the primary artery of a major Afghan government infrastructural program funded by international donors, primarily the US government, in the 1950s, 1960s and 1970s. This intervention brought thousands of hectares of land under irrigation, much of it in the districts of Nad-e Ali and Marjah where around 5,500 families were settled from different parts of Afghanistan (Dupree, 1997: 499–507). The initial settlement of the former desert areas north of the Boghra canal did not begin until the 1990s. At this stage encroachment was limited to a small number of households from Washir who left their villages to escape the drought. It was not until after the collapse of the Taliban government in late 2001 that larger numbers of families began to move into the former desert areas north of the Boghra, facilitated by the weak central government in Kabul and rise of powerful local actors who captured the land and distributed it through their patronage networks. By 2016 there were over 45,000 hectares of agricultural land in the lands to the north of the Boghra canal and south of Highway 1, with much of the land being improved, commoditized and traded. An area that consisted of a few scattered settlements and rudimentary farms a decade earlier, had become a place of innovation, vibrant development and home to over 200,000 people.[3]

The second desert area is in Bakwa, some 120 km to the northwest of the Boghra, where a similar process of agricultural transformation had occurred. Considered locally as ‘the same desert’, this former barren land straddles the border of the provinces of Farah and Nimroz and is dominated by the Bahadarzai and

[3] This estimate is based on a population density of 0.9 persons per jeribs of cultivated land.

Chalakzai tribes of the Noorzai. Originally, the population was found in 13 villages fed by an estimated 360 underground water systems known as *karez* (Goes et al., 2017). However, in the 1990s the area began to transform as more and more farmers moved from their original village lands out into the desert, driven by the drought that beset the southwest region during much of the decade and was at its most acute between 1998 and 2002. By 2016, there were 125,462 hectares of land under agricultural production in Bakwa, up from 21,089 hectares in 2003. Over the same period the population had increased by from an estimated 53,788 to 319,928 people.[4]

4.1. Patronage, sales and rent

The transformation of the former desert lands north of the Boghra and Bakwa have been molded by patterns of land ownership in the irrigated lands in the nearby irrigated lands. While desert land in the southwest, and elsewhere, is officially government land, and over time has become a commodity to be bought and sold, the capacity to own and develop former desert lands is largely a function of force, underwritten by claims of tradition. It is not an open and unrestricted market where anyone with the ability to pay can purchase land and use it as they see fit.

In the case of the area north of the Boghra, settlement has been shaped by the dominant southern tribes of the canal irrigated areas of central Helmand. These tribes have gained almost sole access to the former desert lands, to the exclusion of those tribal groups from others parts of the country who were settled in central Helmand—known locally as the *naqel*—during the state sponsored irrigation project of the 1950s to 1970s. For example, of those interviewed, 95% were from the Barakzai, Ishaqzai, Noorzai, Alizai, Alkozai, compared to only 5% from minor tribes such as the Sulemankhel, Kharoti and Taimani (Mansfield, 2014: 49).

This concentration of land ownership amongst those who are considered locally as indigenous, is a function of the initial wave of land grabs that took place after the fall of the Taliban regime in late 2001. Following the collapse of the Taliban regime the land north of the Boghra was captured by politico-military actors and their supporters in the villages located on the southern banks of the canal. Many of these actors were associated with the then provincial governor Sher Mohammed Akhunzade and the Karzai administration in Kabul. Once captured by powerful commanders the desert lands were then distributed to their family, friends and military subordinates. Thus in the initial years of settlement many desert areas were dominated by the particular tribal group of the commander who had initially captured the land. For example, in Shna Jama, an area taken by Haji Tahir, a Noorzai and former security commander in Nad e Ali, 65 percent of farmers were Noorzai. In Dashte Ab Pashak 61.5 percent of farmers were Barakzai. This was an area that was initially grabbed by Hajji Abdul Qadoos, a former commander of Moallem Mirwali of the 93rd division of the Afghan National Army and Member of Parliament. Both strongmen were Barakzai (Mansfield, 2014: 49).

Over time the former desert land north of the Boghra was commoditized and sold on. Some of the land was improved; it was cleared of stones, fertilized, a house was built and the all important deep well was sunk. Land prices began low at the equivalent of US$400 to US$1200 per hectare until as late as 2007, but as the model of encroachment and land improvement proved successful, and more farmers began to leave the irrigated canal area, prices rose, reaching as much as US$2,000 PR per hectare in 2011 (Mansfield, 2014: 50). By late 2016 land prices north of the Boghra had reached as high as US$3,835 to US$7,190 per hectare depending on the location, with the highest prices paid for land nearest to the Boghra canal, the irrigated lands on the southern bank, and ease of access to the public and private sector services in the city of Lashkar Gah.

However, the market for land north of the Boghra remains restricted. Even in 2017 it is the indigenous tribes of Helmand that still dominate land ownership, tenancy and sharecropping arrangements. Access continues to be structured around familial and tribal links, and the numbers of *naqel* households in the former desert areas is limited to a few isolated sharecropping families.

Patterns of land ownership in Bakwa have also been dominated by those considered indigenous to the area. In Bakwa, the original settlers were the Noorzai villages and it is the Noorzai that continues to dominate land ownership in the desert lands, making up over 98 percent of those interviewed during fieldwork.

In contrast to the iterative process of moving further north of the Boghra canal as seen in Helmand, it is the original karez irrigated villages that are the focal point for expansion into the desert lands of Bakwa. In Bakwa the population of each village moved into the desert lands that surround them, absorbing land some distance from the epicenter of their original village. Within each village this newly acquired desert land was

[4] This estimate is based on a population density of 0.51 persons per jeribs of cultivated land.

distributed according to local traditions, with the amount of land allocated to each household determined by the proportion of land they owned in the original karez irrigated village. Thus a household with 5 jeribs of land in the original karez irrigated village of 400 jeribs would get as much as 70 jeribs of the 5,600 jeribs of desert land that the village had absorbed. With thousands of jeribs of desert land available, and no government able to prevent the incursions, these settlers often received as much as 80 of 100 jeribs of land to be divided amongst their family.

Those who initially settled in this desert space looked to find ways to fund the drilling and establishment of deep wells that would bring their newly acquired land under agricultural production. Some sold parcels of their land to migrants from other parts of the south, including from other districts of Farah, such as Gulistan, Bala Bulok and Shindand. Known for its quality soil, and facing both population pressures and a shortage of land in their home villages, a number of farmers came to the area from these districts seeking a better quality of life. These initial land sales helped finance the capital required to bring new land under cultivation, which in turn produced opium that could be then sold and the money earned reinvested to bring further land under agricultural production. It is claimed that through this process some of the original settlers have acquired as many as three or four deep wells, each of which irrigates between 15 to 20 jeribs of land.

As in Helmand all of those that have migrated to Bakwa on both a permanent and temporary basis have pre-existing contacts in the area and the vast majority are from tribes indigenous to the southwest of Afghanistan. All are bound to the area by family or friends. Most of those working as tenant farmers or sharecroppers came to Bakwa because they did not have any land, or sufficient land in their own village. They came to the area looking to escape the conflict in northern Helmand and in other parts of Farah, particularly Gulistan. A sizable population arrived in Bakwa in 2006 and 2007 from the district of Farah, all looking for land in direct response to the imposition of an opium ban in those areas around the provincial centre (see **Figure 5**). A further wave came between 2010 and 2012 from central Helmand, districts such as Nad e Ali, and Marjah, escaping the impact of the opium poppy ban imposed by the government. Only a minority came from more distant provinces such as Ghazni and Wardak, but even these had existing contacts in the area, initially working as skilled labourers building mud brick houses before obtaining land to cultivate opium poppy.

As opposed to the area north of the Boghra canal, land in Bakwa has not been commoditized and sold on a large scale. In fact, after an initial flurry of sales to help finance the development of their own land, the original Noorzai settlers looked to retain ownership within the tribe. Instead of selling land, the Noorzai landowners hired tenant farmers and sharecroppers. These individuals offered a cheap and skilled labour force, improved the land through their toil, and in some cases provided the capital investments required to bring the land permanently under cultivation. This labour force has been critical to the transformation of these former desert lands.

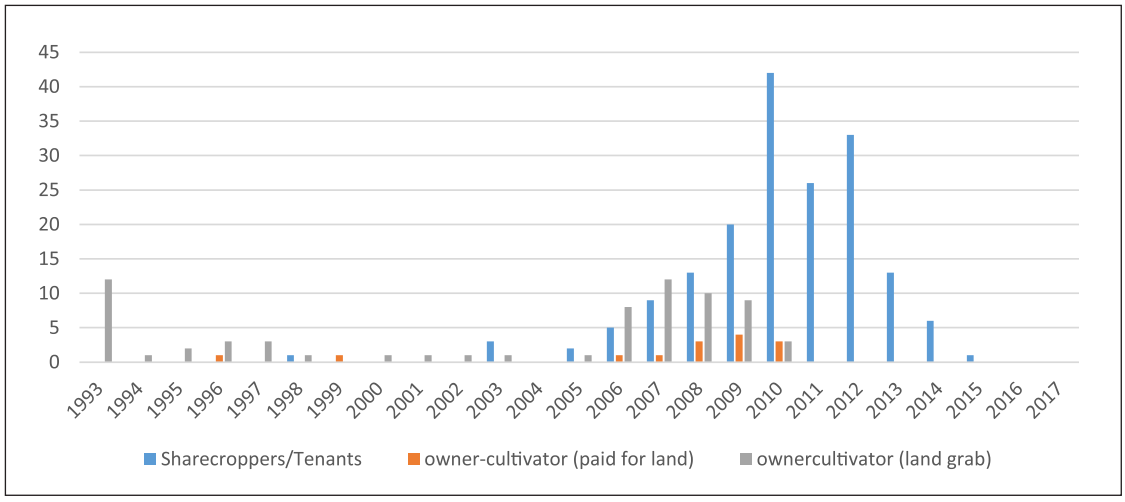

Figure 5: Year of settlement in Bakwa, by land tenure (n = 257)[5].

[5] This chart does not include all 336 respondents in Bakwa because many (n = 79) did not offer a year of settlement. These respondents cited that they were 'from this village' and 'had always lived there', reflecting the local claim that the desert land that surrounded the original karez irrigated village had always belonged to them.

4.2. Access to a cheap and skilled labour force

The encroachment and land grabs that followed the collapse of formal government in southwestern Afghanistan did not allow for these former deserts areas to be transformed into productive land immediately. Agricultural production in these areas is capital intensive and requires deep wells costing as between US$ 2,000 and US$ 5,000. The opium crop opium crop that dominates the landscape, and is the only viable crop given the costs of transforming this desert land into agriculture, is labour intensive requiring up to 360 person days per hectare. As such both capital and labour are required.

In Bakwa, the concentration of land ownership amongst the Noorzai, and the amount of land owned by the original settlers, constrained agricultural production in the early years of settlement of the desert land. To overcome this problem land tenancy arrangements adapted to support investment in the former desert area. The mechanism to do this was the *lekha*, a five year rental agreement under which a tenant farmer pays the annual costs of production but pays the landowner only 1/6th or 1/7th of the final crop. Under this arrangement the landowner is only responsible for providing a deep-well and generator at the start of the tenancy. It is the tenant that is responsible for clearing the land, levelling it, improving the soils and making the farm a productive enterprise. At the end of tenancy, the tenant is required to ensure that the deep well is still operating.

It is an arrangement that can be mutually convenient to both sides. For what is typically a land poor tenant farmer, the *lekha* provides access to land on which they can grow both food and cash crops, obtain water for their family and livestock, a home, and an agricultural income that is, in most years, higher than the cost of production. Meanwhile, the landowner obtain a relatively small income for 5 years but at the end of the arrangement receives a fully productive farm on which a sharecropper can then be employed for only 1/5 of the final opium crop.

North of the Boghra in Helmand, the *lekha* tenancy arrangement is rarely recorded, a function of smaller landholdings and a relative abundance of cheap labour in the area. Here, sharecropping has provided a relatively cheap labour force to those landowners with sufficient capital, offering them 4/5 of the final opium crop, compared to only 2/3 in the canal irrigated areas of the Helmand canal.

In particular, those owning desert lands north of the Boghra have benefited from government and donor backed interventions in the canal irrigated area of Helmand, most notably the Helmand Food Zone. After all, it was the Helmand Food Zone—a counternarcotics effort funded by the UK and US governments—with its emphasis on extension of wheat that compelled a large number of the land-poor to leave the canal area after 2008 (see **Figure 6**). Unable to find land in the canal command area once the more labour intensive opium poppy was banned, these farmers and their families settled in the desert lands north of the Boghra Canal where there was a demand for their services as sharecroppers and tenant farmers. Desperate for land, they accepted a smaller share of the final opium crop than they had when they cultivated opium in the canal command area before the ban was imposed (Mansfield 2014, 51).

This influx of cheap and relatively skilled labour provided an impetus for increasing both the amount of land under agriculture and the percentage dedicated to opium poppy. As such, between 2008 and 2012 the

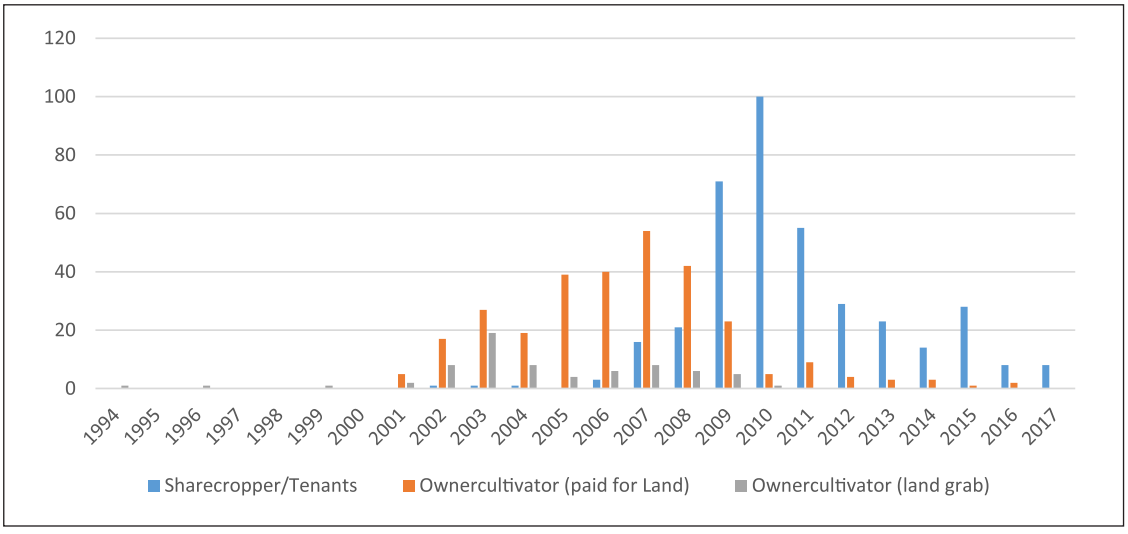

Figure 6: Year of settlement in area north of Boghra, by land tenure (n = 742).

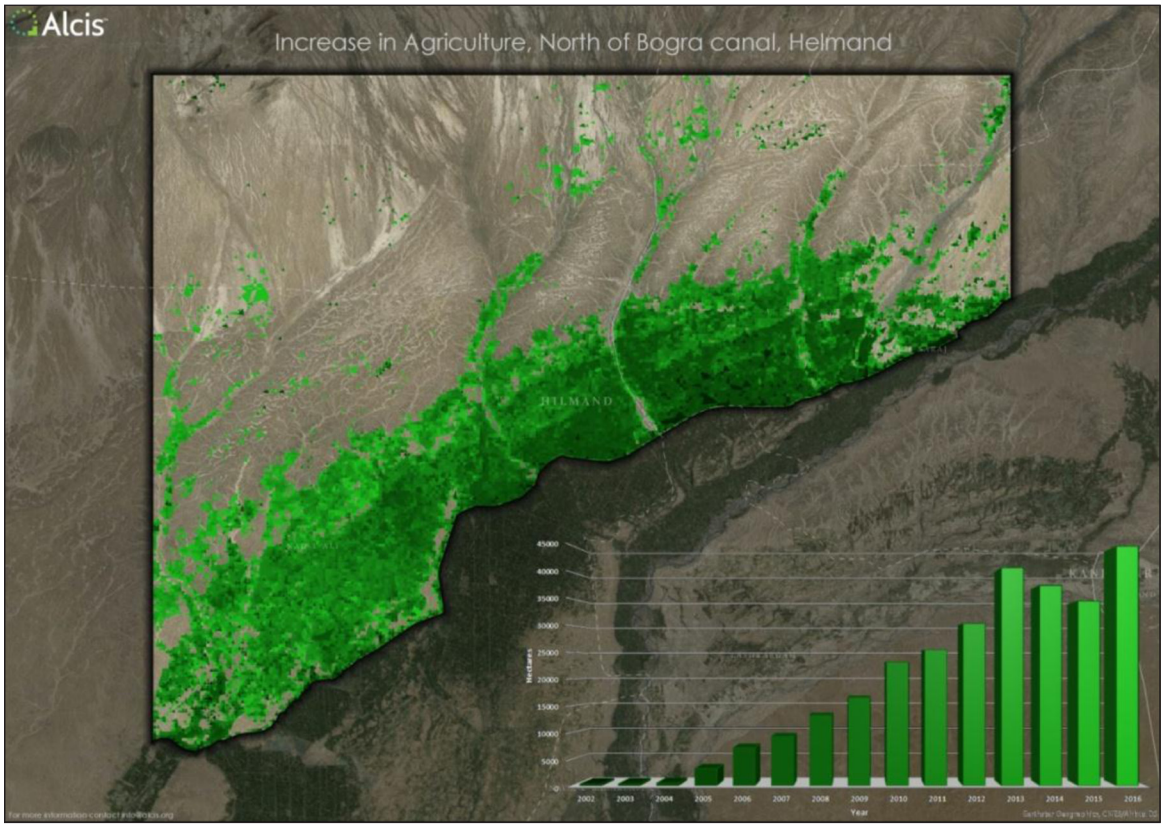

Figure 7: Increase in agricultural land, north of Boghra, Helmand 2003–2016.

amount of land under agriculture north of the Boghra canal more than doubled, the vast majority of which was cultivated with opium poppy (see **Figure 7**).

5. The role of capital in transforming deserts into flowers

Transformation of the desert lands of the southwest has required the acquisition of land and labour, but it has also needed the funds for capital investment. Illegal opium has been the source of this capital: it has paid for the initial investment in the deep wells that have been critical for bringing the former desert lands under agriculture, for the recurrent costs of running these wells, and for subsequent innovation to cope with successive years of falling yields. Without illegal opium these lands would have remained barren and the innovation that has been instrumental in transforming these desert lands and settling the population would not have occurred.

5.1. Illicit opium as a source of investment

It is notable that in the 1990s the desert lands of southwest Afghanistan saw little encroachment. While shallow well technology was available and being used in the drier parts of the canal irrigated areas of Panjwai and Zahre in Kandahar province in the late 1990s, settlement in the deserts of Bakwa and north of the Boghra was limited to all but a few isolated families. One of the reasons for this was the low price of opium in the 1990s, rarely exceeding US$30 per kilogram. It was not until after the Taliban opium ban in 2000–01, and the persistence of high opium prices until 2004, that the conversion of these desert areas into agricultural land became a worthwhile proposition. At prices of more than US$200 per kilogram it was opium that paid for the initial investments in land—the shallow wells—and subsequently the deep-well technology, without which the land would not continue to be cultivated.

In Bakwa, shallow wells were first dug in response to repeated crop failure in the karez irrigated areas, caused by the drought that began in southwest Afghanistan in 1996. At the peak there was an estimated 5,000 shallow-wells in the Bakwa area alone. Locally, farmers argue that it was these wells that drove down the water table further, drying up the karez completely, and rendering the water supply unreliable. However, while the sinking of shallow wells supported continued agricultural production in the original settled villages of Bakwa, and some expansion into desert space, it is the introduction of deep well

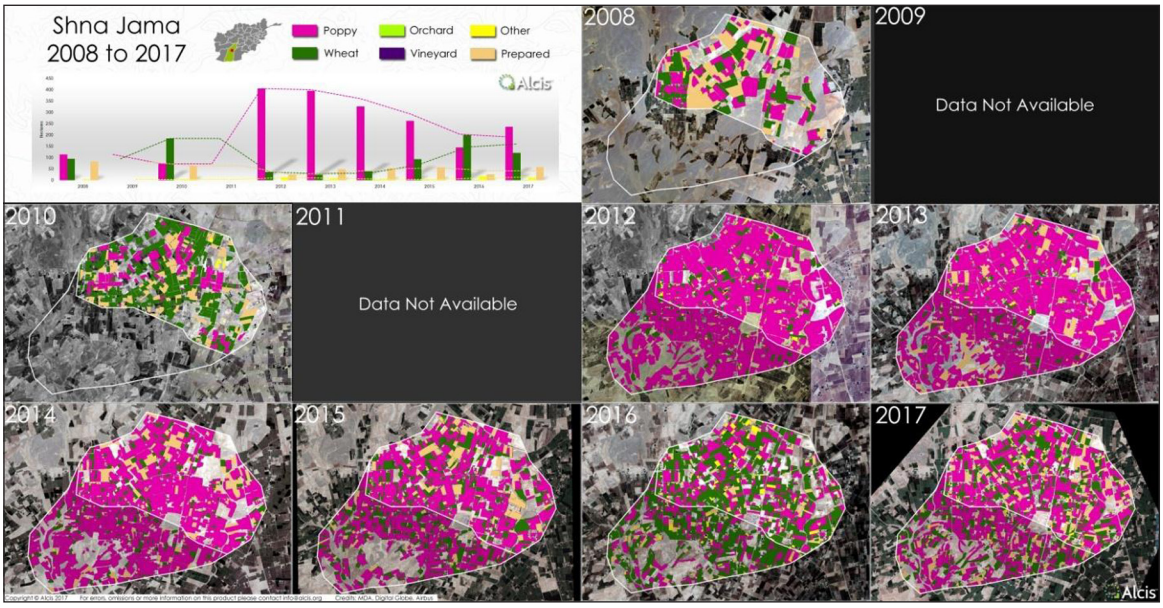

Figure 8: Crop mapping in Shna Jama, north of the Boghra, Helmand, 2008–2017.

technology that facilitated the dramatic encroachment of desert lands of southwestern Afghanistan over the last decade. Locally, farmers report that this technology came from Pakistan in the early part of the 21st century, brought in by both Non Governmental Organisations (NGOs) and a rural population with knowledge of the equipment—the percussion drills, water pumps, and generators—from their time as refugees in Balochistan.

Sinking these deep wells was not cheap and required start-up capital, as well as the necessary income to meet recurrent costs. In Bakwa the wells are particularly deep, ranging from 100 to 120 metres, in some areas almost twice the depth of those in the former desert areas north of the Boghra. Establishing a diesel powered deepwell typically costs US$1,700 and can irrigate up to 20 jeribs of land (Mansfield and Fishstein, 2016: 20). Recurrent costs would not only include the cost of diesel but also the repair and replacement of the water pump, generator and pipes that would may only last up to 2 years. As such recurrent costs could be as high as US$1,000 per year for these items alone (Mansfield, 2014: 49).

Therefore even after the initial investment has been made in sinking the well and purchasing the associated equipment, agricultural production in the former desert areas remains expensive. There is no other crop that has been able to meet these costs of production in these former desert areas. Historical crop mapping north of the Boghra shows just how prevalent opium poppy cultivation is, typically occupying the majority of land under agriculture each year (see **Figure 8**).

However, since 2013 the profitability of opium poppy has been under threat. Consistent low yields due to disease, along with a doubling of the price of diesel in 2014, have led to some farmers experiencing losses (Mansfield and Fishstein, 2016: 28). Farmers have been compelled to respond. Some, particularly sharecroppers and tenants, have sought to relocate, hoping that they might find land back in the canal irrigated areas where opium poppy has returned following the departure of foreign military forces. Others—most notably the landed—have invested in new technologies, looking to reduce the recurrent costs of opium production and thereby return to economic viability.

5.2. Adaptation, innovation and change

The incursion into former desert lands has been supported by significant technological innovation in agricultural production. Shallow wells were replaced by deep wells, and more recently there has been a move to substitute diesel powered pumps and generators with integrated solar systems. The use of herbicides and pesticides—although not exclusive to the former desert areas in the southwest—has also supported more extensive opium poppy cultivation.

The uptake of solar power has been dramatic and is likely to have a significant already effect on the socio-economic composition of those that have settled in the former desert areas, as well as on the environment. What was initially only a source of lighting for the household has quickly become a major source of power for both the home and the farm. In the fall of 2013, research in the former desert areas of Bakwa, Helmand

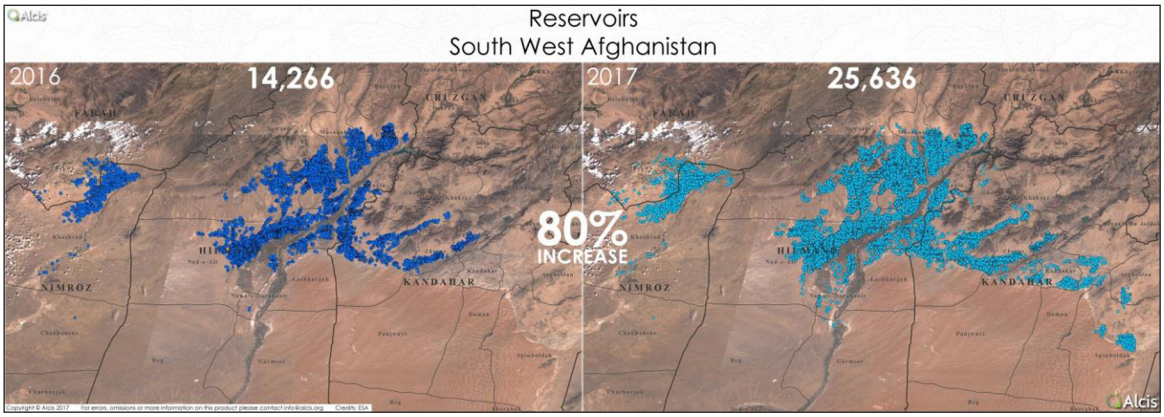

Figure 9: Increase in the number of reservoirs (and associated solar powered deepwells) in the deserts of southwest Afghanistan, 2016–2017.

Table 1: Cost of installation of a solar powered deepwell in Helmand in 2017.

Item	Price (PR)/Unit	Number of Units	Total (PR)	Total (USD)
Water Pump	45,000	1	45,000	410
Plastic Pipes	220 PR/metre	30	6,600	60
Transformer	22,000	1	22,000	200
Solar Panels (300 Amp)	14,000	30	420,000	3,818
Electric Wire	3,000/bundle	2	6,000	55
Frame	8,000	5	40,000	364
Installation	6,000	1	6,000	55
Total			547,600	4,960

and Kandahar revealed only a handful of solar powered deepwells. However, by the spring of 2017, there were over 25,000 solar powered systems in the southwest alone (see **Figure 9**), and in Bakwa 68% of those interviewed had solar powered deepwells.

In part, the rapid uptake of solar technology was due to the availability of improved Chinese technology. The price of solar panels has fallen by more than half in the last four years alone.[6] There was also a proliferation of outlets selling solar powered systems, as what were once more remote parts of Afghanistan have been more closely integrated into markets through improvements in roads, communications and transport. While in 2013 farmers in Helmand and Bakwa had to travel to Kandahar city to purchase solar technology, 'now traders are selling it in the village'. There are even support services in the form of experienced engineers to install the solar system. Once installed there are much lower recurrent costs and fewer maintenance problems than with diesel powered deep wells.

When solar was first introduced farmers would use as many as sixty of the smaller 150 Amp (1.5 metre) panels to power their deepwells. By 2016 much larger panels were being used, typically 300 Amp (2.5 metre). Thirty of these panels generate more power and allow a greater amount of water to be pumped, an advantage given the falling water table. Further innovations can be seen in the way that the solar panels are mounted. Once positioned loosely on the roof of the house, five or six large panels are now set in metal frames. Some of these frames can be rotated to allow farmers to position their solar panels to best exploit the sunlight over the course of a day. More recently, improvement in technology have led to integrated systems, including the ability to store solar power in batteries, making solar a more attractive and reliable energy source than before. The result is after an initial outlay of around US$5,000, solar technology can be used with very few recurrent costs (see **Table 1**).

[6] This is based on a price of 8,000 Afs for a 150 Amp solar panel in Bakwa in 2013, compared with 7,500 Afs for a 300 Amp solar panel in May 2017.

While improvements in technology and availability have supported farmers to innovate, the pressure to adopt new technologies has been driven by the growing environmental and economic challenges of farming in these former desert areas since 2013, in particular by fluctuations in the price of diesel, the lowering of the water table and opium yields. These factors led farmers to look for ways to reduce the risks of making a loss on their opium crop during what appears to be fairly regular bouts of disease and crop failure. For example, farmers in Bakwa reported they had not had a good opium crop since 2011 and that the harvest in 2017 had resulted in yields as low as 2.5 kg per hectare. In the former desert area of Helmand farmers experienced four consecutive years of poor crops since 2012, with yields of less than 11.25 kg per hectare in 2015. It wasn't until 2016 that the opium crop recovered, with yields of 22.5 to 45 kg per hectare, followed by what many farmers considered a 'good year' in 2017 of up to 67.5 kg per hectare.

A further innovation in the cultivation of opium poppy in the deserts of the southwest has been the adoption of herbicides. By 2017 herbicides were almost universally used on the opium crop in Helmand and Bakwa, whereas in 2013 farmers were just experimenting with these products. Here, too, there were rapid developments. Initially farmers used broad-based herbicides—products like paraqat and 2,4 D—and had to cover the individual plants they wished to keep with soil, or with the lid of the herbicide bottle. These herbicides were known locally as 'pata dawar' and were produced in Iran, Pakistan and China. By 2015, crop specific herbicides were more common. These were products like Topik that does not kill broad leafed crops like opium poppy and therefore does not require farmers to cover the individual plants that were to be retained. These products known collectively as 'loosah dawar' typically came from China and greatly reduced the preparation time required for weeding.

Pesticides were also introduced in 2016 and farmers report that 'each year a new chemical arrives on the market'. Many of these products include images of opium poppy on the label, others specifically refer to the disease and insects that they will counter. As such, products are being tailored to the local environment and sold with labels in Dari and Pashto. Some products are named to appeal to the local market such as 'Gandam Kush' (wheat killer), 'Cruise' (as in Cruise Missile) and 'Zanmargai' (suicide bomber).

While innovation has been rapid and helped farmers cope with falling opium yields the adoption of new technologies is changing the socio-economic composition of these former desert lands The use of herbicides is reducing the demand for hired labour during the weeding season as well as the need for hiring labour on a sharecropping basis. In Bakwa, there are already signs that the shift to solar technology is reducing the number of farmers taking land under the *lekha* arrangement. Once a solar powered system is installed landlords have little interest in hiring sharecroppers only to receive 1/7th of the final crop. This made sense with a diesel powered deep well given the high recurrent costs but with a solar system landlords can employ sharecroppers, incur almost no recurrent costs and receive 4/5ths of the final yield. As an example, a landlord in Bakwa who had three diesel powered wells, each worked by a sharecropper under the *lekha* arrangement for nine years. In the fall of 2016 this landlord replaced one of these systems with solar technology. In doing so he also hired a sharecropper on a 1/5th share to work this land. Overall 65 percent of those employed under a *lekha* in Bakwa in 2017 had a diesel powered deep well compared to the sample as a whole where 68 percent had a solar powered system.

Solar technology is likely to lead to greater levels of socio-economic differentiation and limit the ability of the land-poor to purchase desert land in the future, particularly given the frequency of years in which there are low opium yields. Those with small landholdings are not able to forego cultivable land to build a reservoir, which can be as large as 1,000 square meters; while those with insufficient capital—also the land poor—are unable to afford the financial outlay for a solar powered deep well. In the face of this new technology, diesel powered wells are too vulnerable to what can be dramatic fluctuations in diesel prices, and too unreliable (and therefore costly) due to their tendency to breakdown due to the adulterated diesel used. With the anticipated growth in the sale of solar panels in Helmand in the summer of 2017 following a particularly good harvest, the local perception is that 'only the poor who will use diesel powered generators in the future'.

Of course, there is a further potential downside to the uptake of solar technology and that is the impact it will have on groundwater. In 2017 farmers already reported that the water table was dropping from 1 to 2 metres per year, compared to only 0.5 to 1 metre per year prior to the introduction of solar powered deep-wells. There are growing fears in the former desert areas of both Helmand and Bakwa that the current rate of growth in solar powered deepwells will have long-term detrimental effects on agricultural production and therefore hamper their ability to remain in the former desert lands they have settled and call home. Given the size of the population in these former desert lands and the shortage of agricultural land in the main irrigated valleys, it is unclear where these settlers would go were they to experience repeated crop failure or were the returns on opium to repeatedly fail to meet production costs. While illegal opium continues to provides the means by which farmers can settle new lands, meet their living costs and generate sufficient income to pay recurrent costs and innovate, one has to wonder how long it will be before the water runs out.

6. Conclusion

As this paper has shown, illegal opium has been at the forefront of development and innovation in the former deserts of southwest Afghanistan. While viewed by the government in Kabul and its donors as marginal, remote and ungoverned space, these desert areas have been transformed from a rocky and sandy outcrop on the frontier of the Afghan state into engines of growth and a place where those excluded from the kinds of development driven by the central state can escape.

The transformation of these former desert areas has been dramatic. In just over a decade over 300,000 hectares of land have come under agricultural production in the southwest of the country alone. This has not been at the behest of the kind of state-funded irrigation systems that we have seen in the past in Afghanistan but the result of both collective and individual action by farming communities themselves. Initially the desert land was captured by local powerbrokers and distributed amongst their supporters. Investment in the land itself has been done on an individual basis. Access to improved technology has allowed ground water to be exploited. Further advancements and innovations in the form of solar technology and herbicides has supported farmers to respond to dwindling yields and rising production costs. The illegal opium crop, and the price premium that it generated, funded these developments; it has spurred on a process of land settlement and agricultural transformation in the frontier that otherwise would not have taken place.

It is possible that with the recent uptake in solar powered technology and herbicides, these former desert areas will undergo a further stage of development, one where land and capital is increasingly concentrated in the hands of a smaller number of landowners and where there are fewer opportunities for leasing land or wage labour opportunities for the land poor. As such, there is a risk that these former deserts areas will no longer have the absorptive capacity they once did, and an increasing number of those who once leased or sharecropped land north of the Boghra and in Bakwa may return to the villages where they came from. In Helmand this is likely to lead to a return to the canal irrigated areas of the districts of Lashkar Gah, Nad-e Ali and Marjah, increasing the pressure for these areas to return to widespread opium poppy cultivation once again. In Bakwa, those departing may return to Farah district, as well as central Helmand. It would appear that for those that wish to see opium poppy cultivation curtailed there is little room for optimism, other than a falling water table that could devastate the local economy.

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Competing Interests

The author has no competing interests to declare.

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