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Watching Brief

MOVING WITH THE TIMES:

HOW OPIUM POPPY CULTIVATION HAS ADAPTED TO THE CHANGING ENVIRONMENT IN AFGHANISTAN

David Mansfield and Paul Fishstein

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INTRODUCTION

There is much speculation that opium poppy cultivation will reach a new peak in Afghanistan in 2016,[1] surpassing the previous high of 2014 when an estimated 224,000 hectares (ha) were grown.[2] Indeed, signs of a potential "unprecedented" year were already visible as early as the fall of 2015. High opium prices,[3] reductions in real wage labour rates, and rising unemployment alongside the growing factionalism and dysfunction within the National Unity Government (NUG) and the deteriorating security situation present a fertile environment for significant expansion.

More recently, press reports from Helmand,[4] Badakhshan,[5] Balkh,[6] and Kandahar (the latter had the third largest area of opium poppy cultivation in 2014-15 after Helmand and Farah, according to the United Nations Office on Drugs and Crime[7]) suggest rising levels of cultivation in each of these provinces, perhaps partly as a consequence of provincial authorities that have neither the will nor the means to counter it. Now that the harvest is almost complete, media reports have gone even further, using the oft-repeated refrains of "bumper crops" and "increased profits for the Taliban," arguing that good rains have led to a "bountiful" crop.[8] However, there is a danger of "generalising the particular": reporting increases in cultivation in one part of a province as representative of a province as a whole or even the entire country. In-depth research in rural areas during the planting season has given some support to the claims of rising levels of cultivation in 2016, but it presents a much more nuanced picture that reflects intra-provincial differences. For example, fieldwork in Nangarhar in December 2015 indicated that there would be significant increases in the amount of cultivation in both government- and Taliban-controlled areas but that production would be largely abandoned in the upper reaches of Achin, which is controlled by Daesh (Islamic State) and subject to an opium ban.[9] Research in central Helmand also showed some return to cultivation in parts of the canal irrigated areas of Nad-e Ali and Marjah, which had previously witnessed significant reductions in the amount of poppy grown following the influx of large numbers of ISAF troops and Afghan National Defence Security Forces (ANDSF) between 2009 and 2011. However, in the former desert areas north of the Boghra canal, it was projected that cultivation would fall, because protracted crop failure had rendered poppy cultivation economically unviable, particularly for the land-poor.[10]

1 Taimoor Shah and Mujib Mashal, "Bountiful Afghan Opium Harvest Yields Profits for the Taliban," New York Times, 4 May 2016, http://www.nytimes.com/2016/05/04/world/asia/taliban-afghan-poppy-harvest-opium.html?_r=0 (accessed 5 May 2016).

2 Shah and Mashal, "Bountiful Afghan Opium Harvest Yields Profits for the Taliban."

3 Prices during the planting season in the fall of 2015 were 80,000-100,000 PKR per man (1 man = 4.5 kg), equivalent to $US770-960.

4 Shah and Mashal, "Bountiful Afghan Opium Harvest Yields Profits for the Taliban."

5 Gul Mohammed Tanha, "Badakhshan: Insecurity Leads to Increase in Poppy Cultivation," Pahjwok, 23 April 2016, http://archive.pajhwok.com/en/2016/04/23/badakhshan-insecurity-leads-increase-poppy-cultivation (accessed 10 May 2016).

6 Daily Outlook Afghanistan, "Poppy Nearing Maturity in Balkh but Authorities Silent," 19 April 2016, http://www.outlookafghanistan.net/national_detail.php?post_id=15027 (accessed 10 May 2016).

7 "Afghanistan Opium Survey 2015: Cultivation and Production" (Kabul: United Nations Office on Drugs and Crime/Ministry of Counternarcotics, 2015).

8 Shah and Mashal, "Bountiful Afghan Opium Harvest Yields Profits for the Taliban."

9 David Mansfield, "The Devil is in the Details: Nangarhar's Continued Decline into Insurgency, Violence and Widespread Drug Production" (Kabul: Afghanistan Research and Evaluation Unit, 2016).

10 David Mansfield, "Helmand on the Move: Migration as a Response to Crop Failure" (Kabul: Afghanistan Research and Evaluation Unit, 2015) as well as follow-up fieldwork conducted in December 2015.

Furthermore, the narrative of "the bumper crop" and reports of good rains obscures a much more complex relationship between opium production and the environment; a relationship that is rapidly evolving on account of both the changing ecological conditions in Afghanistan and the growing availability of new and more affordable technology that is used in what were once considered to be remote rural areas. To understand this relationship, it is important to look beyond aggregate trends and some of the "urban myths" that preoccupy much of the debate on opium poppy and examine not just what farmers say—often to keep themselves entertained while talking to Western soldiers and city-based journalists—but also what they do in practice; that is, how they have drawn on new technologies and opportunities to craft a livelihood in what must be some of the most trying agricultural conditions in Afghanistan.

Figure 1: Young girls clearing the opium capsules from a poppy field in Khogiani, Nangarhar, April 2016

IT IS A CROP THAT NEEDS MORE WATER THAN YOU THINK

Contrary to what many may suggest, opium requires large amounts of water,[11] if it is to deliver a good yield and provide farmers with a reasonable net return. While it is true that opium is relatively drought tolerant[12] compared to wheat, it is not entirely drought resistant, as some commentators have suggested.[13] For example, opium will offer a yield even if water is negligible at key stages during its growing cycle, while wheat will yield very little under the same conditions. However, if opium receives the right amount of water at the right time, its yield will increase significantly. If adequate levels of fertiliser are added, yields will rise even further, thus increasing the economic returns to the farmer.[14]

The relatively high economic returns that opium poppy can generate per unit of irrigated land has made it ideally suited to the changing ecological conditions in Afghanistan, particularly in the wake of new technological advances in agricultural production and the increasing encroachment of cultivation into former desert areas. The threat that climate change poses to Afghanistan, with predictions of rising temperatures, flash floods,[15] and droughts becoming the norm,[16] increases the likelihood of further land being converted to poppy.

11 Shuljgin suggests that the average quantity of water used for irrigation in the Soviet Union was 800 m3/ha. The critical period when the opium poppy requires large amounts of water is during the rapid vegetative growth phase, from the appearance of the stem through to capsule development. During this period, the opium poppy requires soil moisture between 70 and 80 percent saturation as well as moderate temperatures. Adequate irrigation at the budding and flowering stages is also seen as particularly important to opium production. See G. Shuljgin, "Cultivation of the Opium Poppy and the Oil Poppy in the Soviet Union," United Nations Bulletin on Narcotics 1, no. 4 (1969): 2

12 "At the beginning plants need a great deal of moisture in order to take root and develop properly, but at the end of their period of growth they need hot and dry weather; in such weather the alkaloid content increases." See Vladimir Kusvie, "Cultivation of the Opium Poppy and Opium Production in Yugoslavia," United Nations Bulletin on Narcotics 1, no.1 (1960): 4.

13 "The poppy crop in Tasmania [in 1995] was considerably reduced by a short-term drought at the critical time of maximum plant development. The crop in Spain has been reported to be a complete failure, again due to drought." See Lloyd Nystrom et al., "Survey of Opium Production: Practice, Economics and Security in India, April 27—May 11 1995" (St Louis, Missouri: Mallinckrodt Chemical Inc., 1995).

14 V. V. Sheberstov, "The Part Played by Fertilisers in Increasing Opium Poppy Yields," United Nations Bulletin 1, no. 1 (1956): 42-47; Shuljgin, "Cultivation of the Opium Poppy and the Oil Poppy in the Soviet Union," 1-8; Kusvie "Cultivation of the Opium Poppy and Opium Production in Yugoslavia," 5-13.

15 Matthew Savage et al., "Socio-Economic Impacts of Climate Change in Afghanistan: Executive Summary" (Oxford: Stockholm Environment Institute, 2009): 7.

16 Matthew Savage et al., "Socio-Economic Impacts of Climate Change in Afghanistan: A Report to the Department of International Development" (Oxford: Stockholm Environment Institute, 2009): 6.

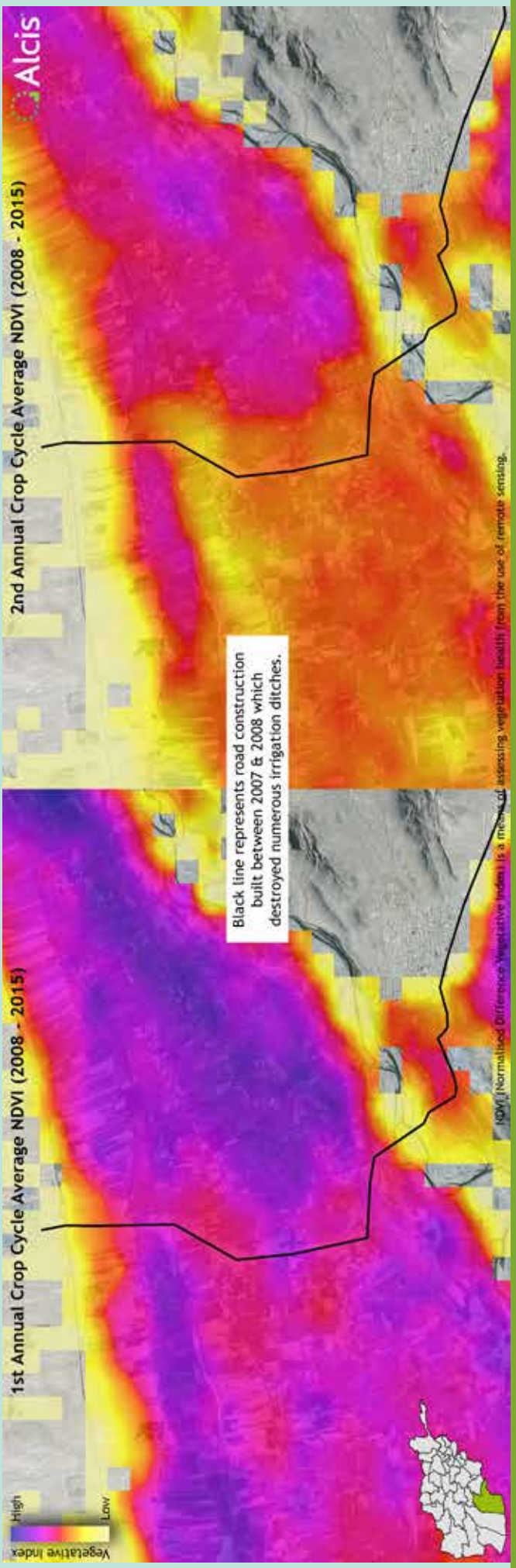

Figure 2: Changes in the Normal Difference Vegetation Index, first and second crop cycle, in Zharai, Kandahar 2008-15

A RATIONAL RESPONSE TO DROUGHT

As early as the late 1990s, increased opium poppy cultivation became a common response to the protracted (1995-2002) drought in southern Afghanistan. Faced with the complete loss of their high-value perennial crops and dwindling markets for their produce, farmers in the lower reaches of the Arghandab Valley, Kandahar Province, cut down some of their vineyards, pomegranates, and apricots to cultivate opium poppy. While some saw this as indicative of farmers' pursuit of maximum profit, others drew a more nuanced conclusion: farmers' attempt to respond to changing environmental conditions through increased access to improved technology.

Many areas in Kandahar where opium poppy became most concentrated in the 1990s were also those that experienced the worst of the drought and were vulnerable to the complete failure of their perennial crops. To avoid losing their entire crop, farmers installed shallow wells, known as *bawre*, to irrigate their land. They paid for both the installation of these wells and the hefty recurrent costs using the returns from their opium crop. As such, opium poppy did not simply substitute for the orchards and vineyards of farmers in districts like Zharai and Panjwai as some claim, but rather it subsidised farmers by allowing them to maintain some of their perennials and grow other field crops such as wheat. It thus provided the funds by which farmers could pay for the irrigation that was so vital to crop viability.

Later, as technology improved and existing irrigation canals fell into further ruin, returns from opium poppy supported the establishment of deep wells (*barma*) and paid for the high cost of extracting water using diesel-powered pumps in these very same areas (Fig. 3). For example, imagery shows a particularly high incidence of tubewells and high levels of opium poppy cultivation in the lower part of the Arghandab canal, where the irrigation system is damaged and the vegetative index has been systematically lower than in the upper areas where little poppy is grown.

The same pattern of a high concentration of poppy cultivation and tubewells was seen in the southern districts of Nangarhar in the early years of the post-Taliban government (Fig. 4). These areas likewise have problems gaining access to sufficient and consistent irrigation during the winter months. When opium poppy was banned in the province in 2005, 2008, 2009, and 2010, these tubewells lay relatively idle, because farmers could not afford to run them with the cultivation of wheat alone.

Figure 3: Rig for drilling a deep well in the desert area north of the Boghra canal, Helmand, 2012.

IMPROVING ACCESS TO TECHNOLOGY AND LAND

Between 2003 and 2013, opium production supported some dramatic shifts in the geographic and political landscape in southern and southwestern Afghanistan. During this time, the amount of agricultural land in these two regions alone increased from 150,000 to 433,000 ha (Fig. 5).

This rapid expansion was not an outcome of the efforts of Western donors and the Afghan government, but rather largely due to a process of encroachment and settlement of former desert areas that were formally recognised as "government land." Initially captured by local powerbrokers starting in 2002, the land was then distributed through patronage networks and sold at a profit. In the area north of the Boghra canal in Helmand, many of these powerbrokers were linked to the former governor Sher Mohammed Akhundzada and the Karzai government.[17] In the deserts of Bakwa in Farah Province, desert land was distributed among the dominant Noorzai tribe.[18] Similar processes of land acquisition and cultivation expansion also took place in Zharai and Arghandab districts of Kandahar. In some areas, 30 percent of the population is said to have migrated to the newly settled areas of the desert.

17 David Mansfield, "From Bad they Made it Worse: The Concentration of Opium Poppy in Areas of Conflict in the Provinces of Helmand and Nangarhar" (Kabul: Afghanistan Research and Evaluation Unit, 2014); David Mansfield, "Between a Rock and a Hard Place: Counternarcotics Efforts and their Effects in Nangarhar and Helmand" (Kabul: Afghanistan Research and Evaluation Unit, 2011).

18 David Mansfield, "Ready to Burst? Examining the Role of the Balloon Effect in the Expansion of Opium Poppy into the Desert Frontiers of Afghanistan" (Unpublished Paper for LINKSCH Project, EU, March 2015).

Figure 4: Tubewell in upper Shinwar, Nangarhar, April 2006.

As time passed and the rural population realised that the government was not going to take action to prevent this encroachment on desert land, the initial settlers were joined by even more farmers. The newcomers were not just part of a burgeoning rural population unable to find land in the main irrigated valleys; they were also fleeing violence and conflict as well as the government's efforts to ban opium production in central Helmand and other areas where the Afghan state and its foreign backers had gained a foothold. Many were the land-poor—sharecroppers and tenant farmers—who found themselves evicted from the main irrigated valleys once opium poppy was banned by initiatives such as the "Helmand Food Zone."[19]

It was these farmers—with their knowledge of the opium crop and their need for land and shelter—who provided the momentum for the surge in poppy production in these former desert areas after 2008. Land owners in the desert were presented with a bountiful labour force, skilled in the husbandry of opium poppy. Desperate for land and shelter, these sharecroppers were willing to work for a smaller share of the final crop than in the main river valleys, where poppy cultivation was becoming more challenging due to the growing presence of Afghan and international military forces.

Yet this was high-cost agricultural production. The desert land needed to be cleared, levelled, and fertilised. Machinery had to be hired and wells drilled into the underground water supply in order to irrigate the land. In the early days of settlement, the wells were shallow *bawre*, but as more people came to farm in these former desert areas, the water table dropped and deeper *barma* had to be drilled. Generators, pumps, and piping were also needed to draw and distribute the water. These represented extra costs that were not associated with farming in the main river valleys. And then there was also the diesel required to run the pumps and generators, which was purchased from local traders in 200 to 220 litre barrels; each hectare of opium poppy required the best part of two barrels of diesel per season, representing a significant cost of nearly US$500 per hectare at 2014 prices. Without the premium associated with the illicit opium production, this land would not have been economically viable and would not have been settled.

Ultimately, opium production in these former desert areas has been buoyed by cheap and skilled labour driven out of the main river valleys, more affordable technology from Pakistan, Iran, and China, and the growing availability of herbicides that have eased the burden of the spring weeding—previously, a tiring chore for the entire household and a limiting factor for households with limited available labour (Fig. 6). Further spurred on by a spike in opium prices accompanying the crop failure in Helmand in 2010 and by concerns that the increased presence of military forces during the US troop "surge" would deter production in the major opium growing districts of central Helmand, these former desert areas of southern and southwestern Afghanistan became awash with opium poppy.

19 Mansfield, "From Bad they Made it Worse."

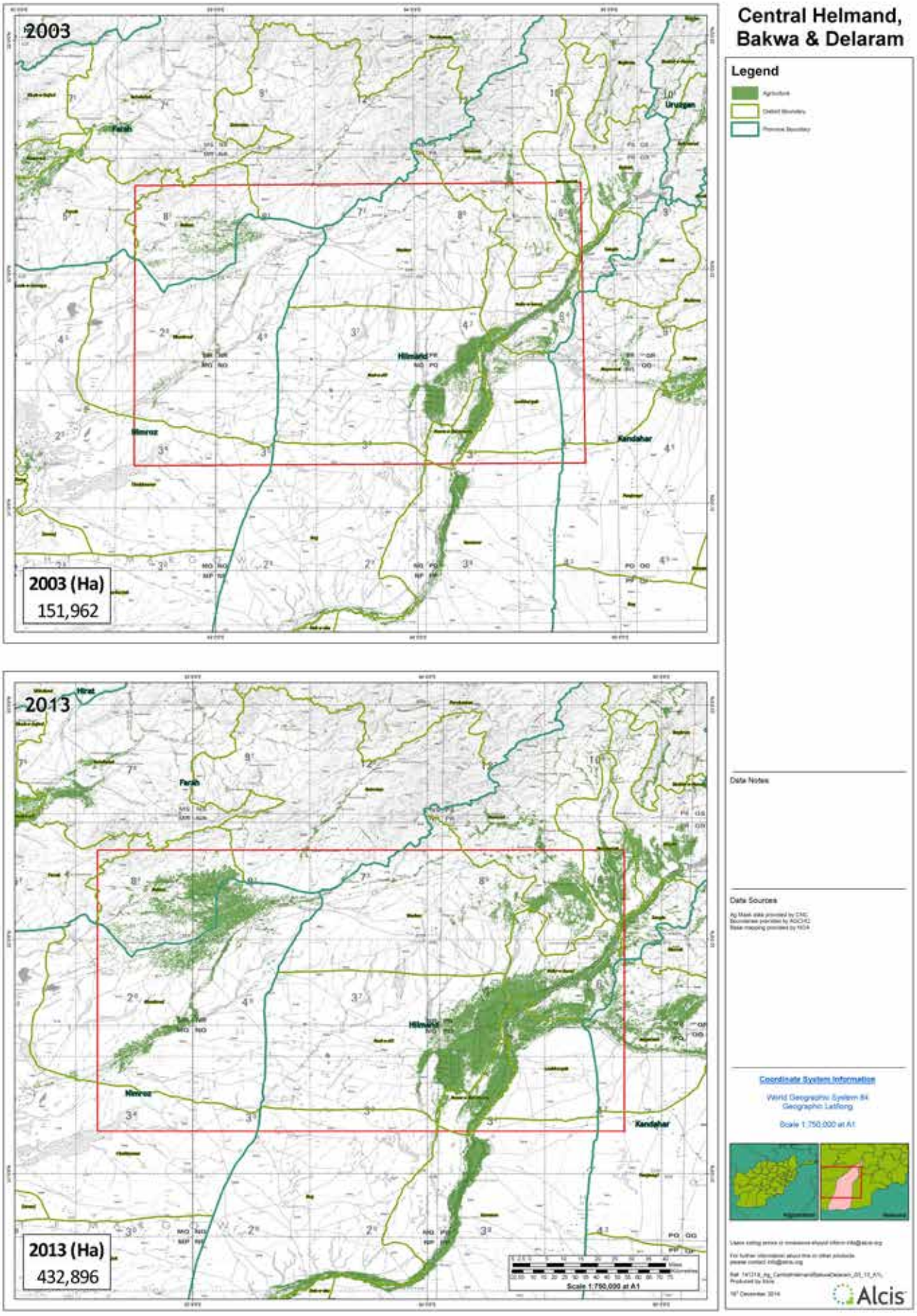

Figure 5: Expansion in agricultural land in southwest Afghanistan, 2003-13

Figure 6: Herbicide used for weeding opium in Helmand and Bakwa (Farah Province)

Indeed, by 2013, the population of these former desert areas in the southern and southwestern region swelled from an estimated 660,000 to 1.2 million inhabitants.[20] In the area just north of the Boghra canal and south of Highway 1, there were 26,032 household compounds in 2013, compared with only a handful ten years prior.

The same patterns of expansion could be seen in the former desert areas of Zharai in Kandahar north of Highway 1, where tracts of desert land had also been captured and settled. In Nowzad in upper Helmand, Bakwa and Gulistan in Farah, and Maiwand in Kandahar, the desert land surrounding the original *karez* (traditional underground, gravity-fed irrigation system) in irrigated villages was absorbed by the original residents and turned into cultivable land, the vast majority of which was dedicated to poppy. There were now fewer and fewer isolated farms surrounded by barren land, as had been the case during the initial stages of settlement. Instead, there was almost contiguous farmland, which in the case of the former desert areas north of the Boghra, stretched almost as far as Camp Bastion near Highway 1.

In their heyday, these former desert areas were a potential route out of poverty for some and a source of asset accumulation for others. The desert offered affordable land to those who had none and who could never afford land in the canal irrigated areas where land costs were 20 times higher.

With a reasonable yield of opium poppy, even a sharecropper could afford to eat meat and fruit three times a week and purchase medicine for sick family members, and, in a very good year, his share of the opium crop might even pay for a motorbike to travel to the nearest bazaar or buy a solar panel to light the house at night. Those with larger landholdings fared much better and could purchase motor vehicles or solar panels, or even invest in some of their fallow land, which could in turn be parcelled off to be worked by new sharecroppers and tenant farmers, thus allowing even more money to be earned.[21]

20 This calculation is based on the population density determined by previous fieldwork in the desert spaces of Bakwa (N 170) of 0.51 people per jerib and in the area north of the Boghra canal (N 602) of 0.9 people per jerib. See Mansfield, "Ready to Burst?."

21 Mansfield, "From Bad they Made it Worse."

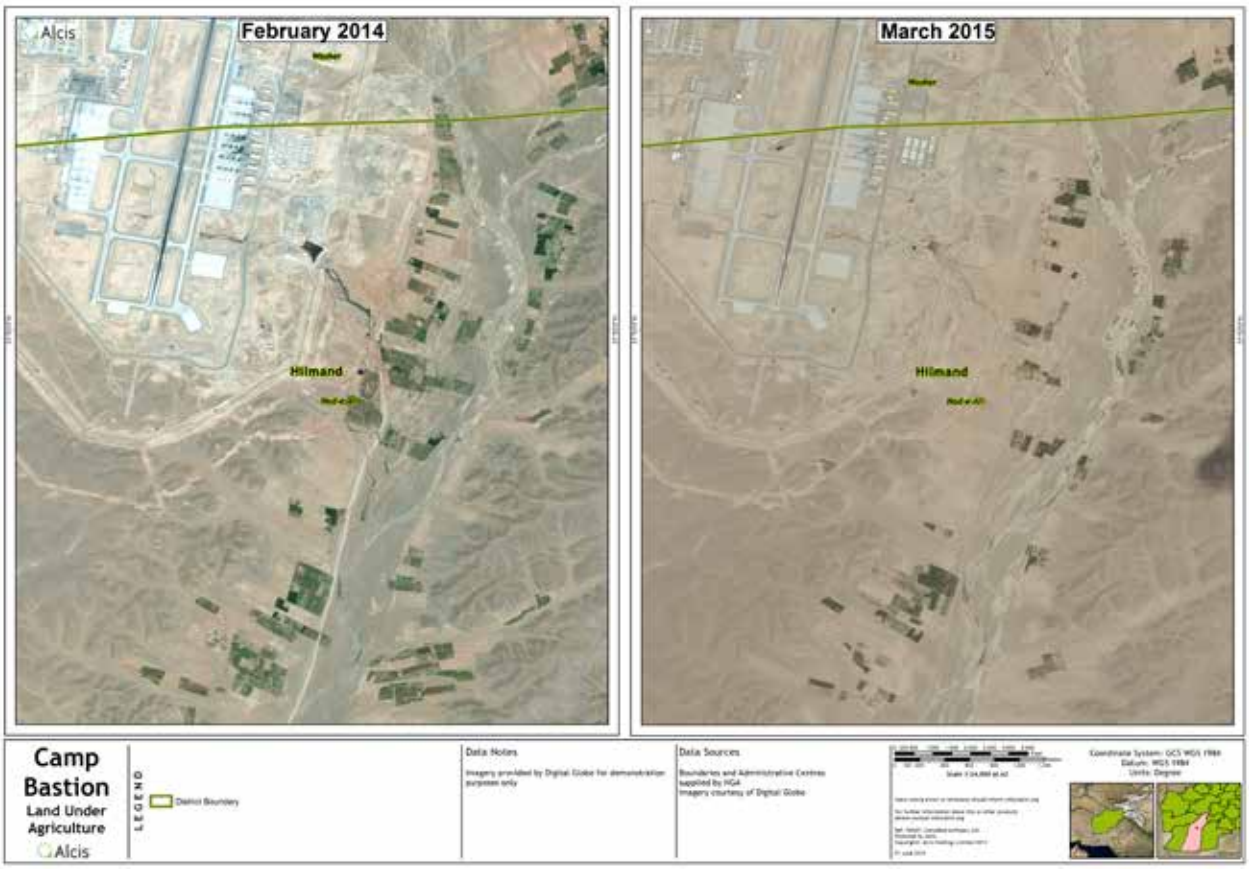

Figure 7: Opium poppy cultivation grown using the run-off water from Camp Bastion, Helmand before and after base closure

With the growing population and increased disposable incomes came more trading and other commercial opportunities. The bazaars that straddled the Boghra canal in Helmand grew, expanding the range of goods sold and the number of trading days. Informal markets also began to appear much further into the desert.

INCREASINGLY UNSETTLED SPACE

By 2013, however, it looked like the good times were over, and the process of expansion into the desert areas had reached its peak. Although new settlements continued in these former desert areas until as late as 2014, there were widespread reports of falling opium poppy yields as early as 2012 (Fig. 8).

The situation changed further in 2015, as repeated crop failure compelled some households to leave the desert. The "disease" that had struck poppy plants in the area north of the Boghra canal in 2012 not only hit the same land again, but it also began to spread. The story was the same no matter where you went in the desert. Farmers reported that the poppy leaves withered during the capsule formation stage. When the capsules formed, they were smaller than usual and yielded much less fresh opium than the 3 *man* per *jerib* (equivalent to 67.5 kg per ha) to which farmers were accustomed.

During the initial years of the disease, farmers north of the Boghra canal would often lance their crop early, before the disease took full effect, but this did little to compensate for the falling yields. By late 2013, farmers in Bakwa in Farah complained of the same problems, although they did not feel it quite as acutely as those just north of the Boghra canal.[22] Some sharecroppers even relocated from the desert areas of Helmand to Bakwa to mitigate the risk of crop failure. However, by the summer of 2015, the opium crop failed yet again. This time yields were at an all-time low at just over 1 *charak* per jerib (equivalent to 5.6 kg per ha) compared to yields of 3 *Charak* per jerib in a good year.[23]

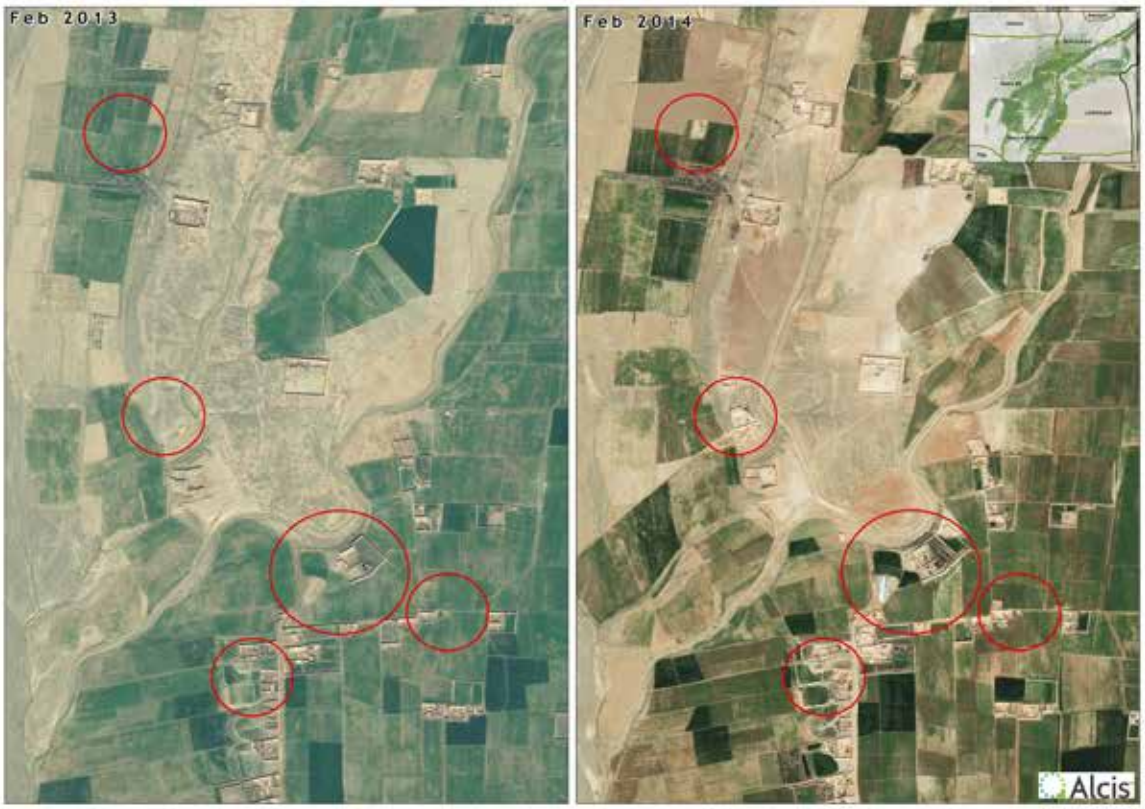

Figure 8: New houses built in the former desert areas north of the Boghra canal, Helmand, 2013-14

22 Mansfield, "Ready to Burst?."

23 Mansfield, "From Bad they Made it Worse."

Farmers blamed it on the Americans, reporting the noise of airplanes at night and claiming that their crops had been sprayed. The poor desert soils, high levels of salination across the area, and poor cropping practices—such as monocropping, the reuse of diseased seed, and the absence of nutrient-rich legumes—are dismissed as neither here nor there. It is the foreigners and the corrupt Afghan government who are to blame.

Ultimately, under current conditions, these former desert areas are economically unviable without opium poppy. Many farmers simply cannot afford the high production costs—diesel, maintenance, and labour—without a decent yield from their opium crop. As a recent AREU report showed, farmers growing opium in these areas experienced losses of US$1,500 per hectare and some even higher.[24]

The landless were the first to leave, searching out new areas to cultivate opium poppy as they did in the fall of 2013 when they left the desert areas north of the Boghra canal in Helmand for Bakwa on the Nimroz/Farah border. Some had already moved back to the main canal irrigated areas of Helmand, trying their hand at opium, but even there the crop failed. Others began the search for land in the summer months in the hope that they might find somewhere to stay during the coming winter. Most recognise that there is much less land available for sharecroppers in the main canal area. With the poppy gone, the demand for labour is not the same, as the legal crops that have replaced opium—wheat, cotton, mung bean, and maize—do not require as much labour. But what are households to do? They need not only the land to grow both opium and wheat, but they also need the house that comes with the land and the irrigation that provides water for their crops, family, and livestock.[25]

Between 2013 and 2015, 11,000 ha of agricultural land were lost in the former desert areas just north of the Boghra canal. In the former desert areas of Bakwa, Maiwand, and Nowzad, there were similar losses in agricultural land and a drop in the vegetative index (Figure 9). Indeed, the 11,000 ha north of the Boghra canal that was agricultural land in 2013 but lay idle in 2015 would have sustained an estimated 50,000 people (Fig. 10).[26] Where did these people go? And what of the others experiencing the same opium poppy crop failure in the other former desert areas of southern and southwestern Afghanistan? A conservative estimate would indicate that a further 15,000 ha of land was lost in the former desert areas of Nowzad, Maiwand, and Bakwa over the same period of time. This could be anything from 65,000 to 120,000 people on the move. Without land and jobs, what were these people to represent to make ends meet?

24 Mansfield, “From Bad they Made it Worse.”

25 Mansfield, “Helmand on the Move,” as well as follow-up fieldwork in December 2015.

26 This calculation is based on the population density determined by previous fieldwork in the desert spaces of Bakwa (N 170) of 0.51 people per jerib and in the area north of the Boghra canal (N 602) of 0.9 people per jerib. See Mansfield, “Ready to Burst?.”

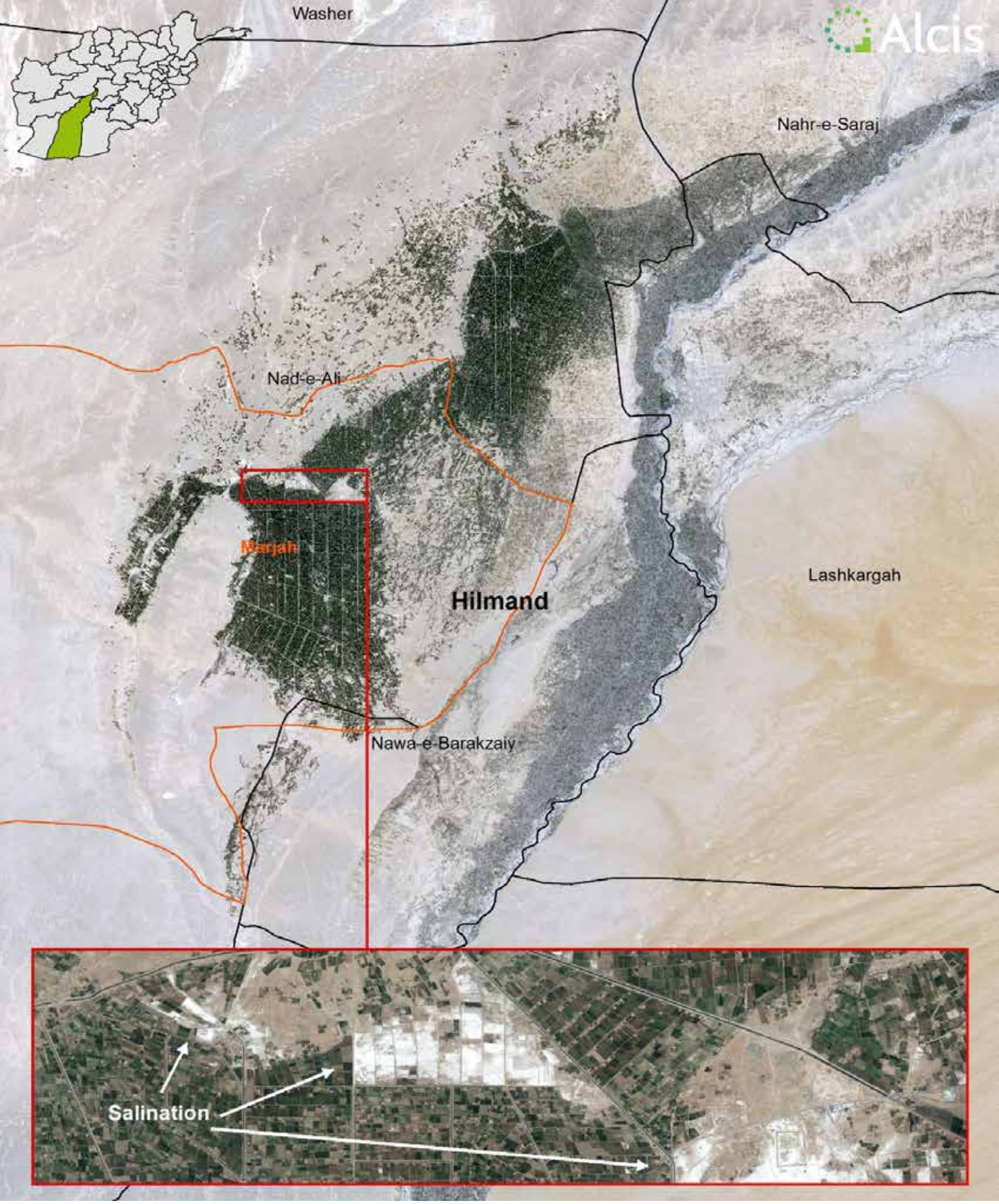

Figure 9: Example of salination in central Helmand, 2015

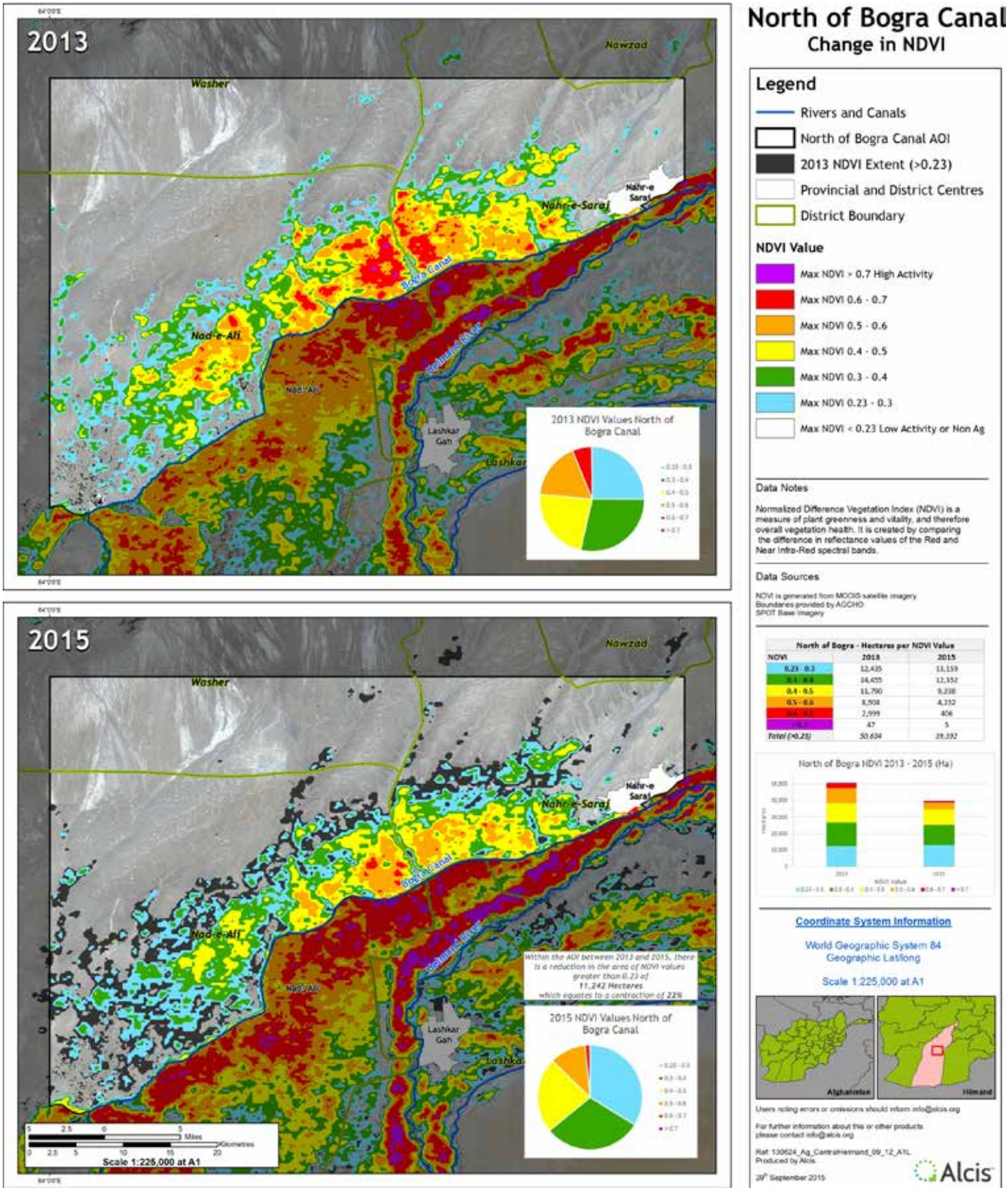

Figure 10: Changes in the Normal Difference Vegetation Index north of the Boghra canal, Helmand, 2013-15

Figure 11: Cultivated land irrigated by solar-powered tubewell north of the Boghra canal, Helmand, 2015

FURTHER ADAPTATIONS IN 2016

There is little to suggest that the agro-ecological situation of farmers in the former desert areas of Helmand has improved much in 2016. Imagery shows lower levels of land under cultivation and even more dramatic reductions in opium poppy.

Some farmers have sought to offset falling yields by sourcing poppy seeds from northern Helmand from places like Musa Qala. However, a much more environmentally significant response to the falling opium yields has been the uptake of solar-powered tubewells.

And it is not just one or two farmers who have turned to this technology. Earlier instances were seen in Spin Boldak in Kandahar and in Bakwa in late 2013,[27] but the uptake in the 2015-16 growing season is dramatic in the former desert area north of the Boghra canal. It now seems that in some areas, everyone has a solar-powered tubewell. These can be identified using high resolution imagery, with the tell-tale sign of a large reservoir where the water from the solar-powered tubewell is stored (Fig. 11 and 12). Although not as widespread as in Helmand, during the 2015-16 planting season, a number of households in Zharai and Arghandab districts of Kandahar have reported using solar-powered tubewells.

Some of these reservoirs are up to 1,000 square metres in size with a depth of around 1 to 2 metres, and as a result, they can hold large amounts of water. Easily built using tractors and soil, these unlined reservoirs are topped up constantly. However, the implications for the groundwater in this area could be dire. In the past, farmers estimated an annual fall in the water table of between 0.5 and 1 metre. Driven by the high recurrent costs of diesel—which rose to as much as 80 Afs per litre in 2014—farmers were prompted to pursue options that allowed for more cost-effective water extraction. Indeed, solar-powered tubewells allow farmers to fill their reservoirs for free.

27 Mansfield, “Ready to Burst?.”

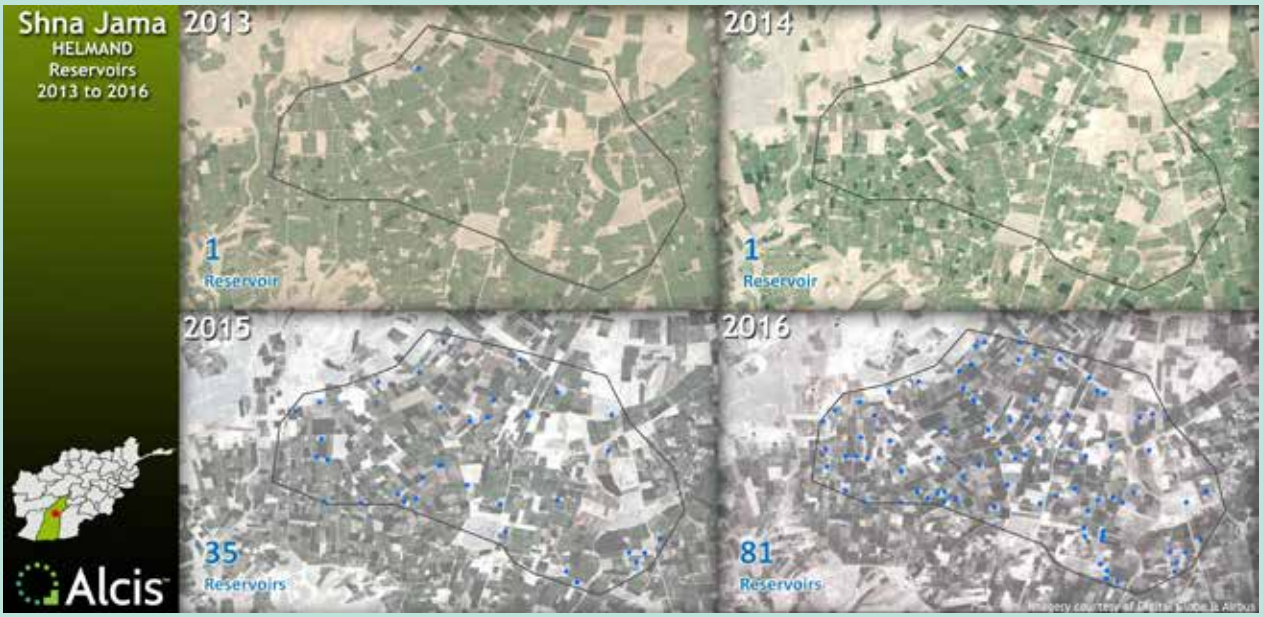

Figure 12: Expansion in the number of solar-powered tubewells in Shna Jama, north of the Boghra canal, Helmand, 2013-16

A contributing factor to the significant uptake of solar-powered tubewells has been the high price of opium in the 2015-16 growing season. With prices up from around 40,000 PKR per *man* in the planting season of the fall of 2014 to between 80,000 and 100,000 PKR ($US770-960) per *man* 12 months later, the shift away from diesel has become much more affordable. A solar-powered tubewell costing just short of US$6,000[28] is not inexpensive, but with this rise in opium prices, it is the equivalent to the production of 10 to 12 *jeribs* of land even with the low yields of 2015.

Furthermore, the technology is much more readily available. The proliferation of shops selling solar technology in cities like Farah, Lashkar Gah, Kandahar, and even Delaram (Nimruz province) is remarkable. And these shops offer a full service by providing engineers to ensure that clients receive the specification and final product that corresponds to their exact needs.

While monocropping of opium poppy was previously widespread, what is now notable is the dramatic increase in wheat production in these former desert areas in 2016, and in some areas, it even surpasses the amount of land dedicated to poppy for the first time since 2010. There are even some signs of crop diversification in these former desert areas and reports of farmers growing melon, watermelon, pomegranates, and even experimenting with grapes, albeit on a limited scale due to concerns over the effect of salination.

Ironically, the move to solar-powered tubewells may well support this trend toward the cultivation of wheat and other licit crops by reducing the costs of drawing water and thus the need to grow poppy as a way of cross-subsidising the production costs of food crops. It is notable that such a significant reduction in opium poppy is occurring in these former desert areas at the same time that the price of opium has almost doubled.

28 Paul Fishstein, "Briefing Note on Fieldwork in Kandahar Province, December 2015-January 2016: Opium Poppy and Rural Livelihoods" (Kabul: Afghanistan Research and Evaluation Unit, 2016).

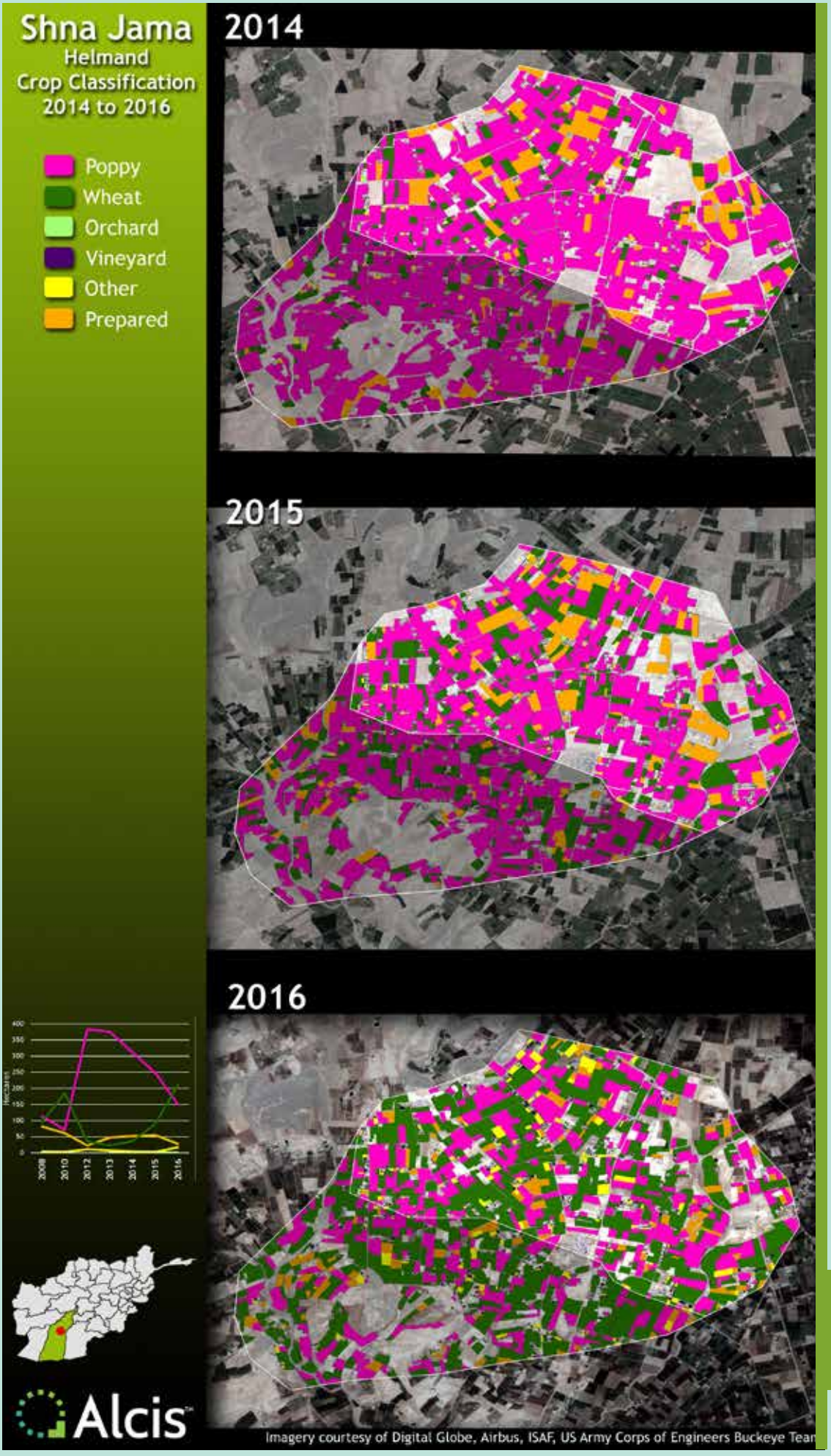

Figure 13: Changes in cropping patterns in Shna Jama, north of the Boghra canal, Helmand, 2014-16

Figure 14: Opium harvest in Khogiani, Nangarhar, April 2016

CONCLUSION

This "watching brief" has described a number of trends with respect to agriculture, land settlement, and opium poppy in several areas of Afghanistan. It highlights two separate but highly related issues. First, what will be farmers' response to changes in technology and agro-economic conditions? While cost-reducing technology such as solar-powered tubewells may allow the cultivation of crops with lower returns than that of opium poppy, will farmers choose to grow these crops or will they stay with poppy? Will they even look to cultivate a second crop of opium poppy in May as some reports from the field suggest?[29] Second, while the new technology has allowed the expansion of agricultural production to former desert areas and supported livelihoods for marginalised households, given Afghanistan's tenuous water resources (leaving aside climate change) and population growth rate, how sustainable is an agriculture that continues to deplete groundwater resources by allowing their use on an essentially "free" basis?

In the immediate term, it is too early to say what will happen to this year's overall opium figures in Afghanistan. While there are claims of rising levels of cultivation in some provinces, the accuracy and representativeness of these claims remains unclear. Local circumstances and factors have always had a significant effect on planting patterns, with the scale of poppy cultivation varying significantly, not only across regions, but also within provinces and individual districts.

29 Fieldwork in May 2016 suggests some farmers are taking advantage of solar-powered tubewells in th desert area to cultivate a second crop of opium poppy. This crop is planted in May in furrows, like cotton, and harvested at the end of July. It is grown in rows alongside a maize crop which serves to shade the opium poppy from the summer sun.

Much depends on what happens in individual areas and whether increases in some areas will be greater than the decreases in others. For example, while it is apparent that poppy has increased in some parts of Marjah and Nad-e Ali in Helmand where the crop has been absent for several years, it has not increased in all areas and there are even signs of some reductions around Loy Bagh and the district centre of Marjah. Moreover, there are signs of significant reductions in poppy cultivation in the former desert areas to the north of the Boghra canal. Similarly, increases in poppy in districts like Shinwar, Rodat, Chapahar, Khogiani and Bati Kot in Nangarhar are in part likely to be offset by the ban imposed in the Daesh-controlled areas in the mountains of upper Achin and Nazian (Fig. 15, 16, and 17). There are also conflicting reports about yields, with claims of bumper crops in some areas and signs of disease in others. In central Helmand, farmers report figures that vary from 3 to 13 kg per *jerib* (Fig. 18).

Figure 15: Increasing levels of opium poppy cultivation near AND and SF base in Shinwar, Nangarhar, 2013-16

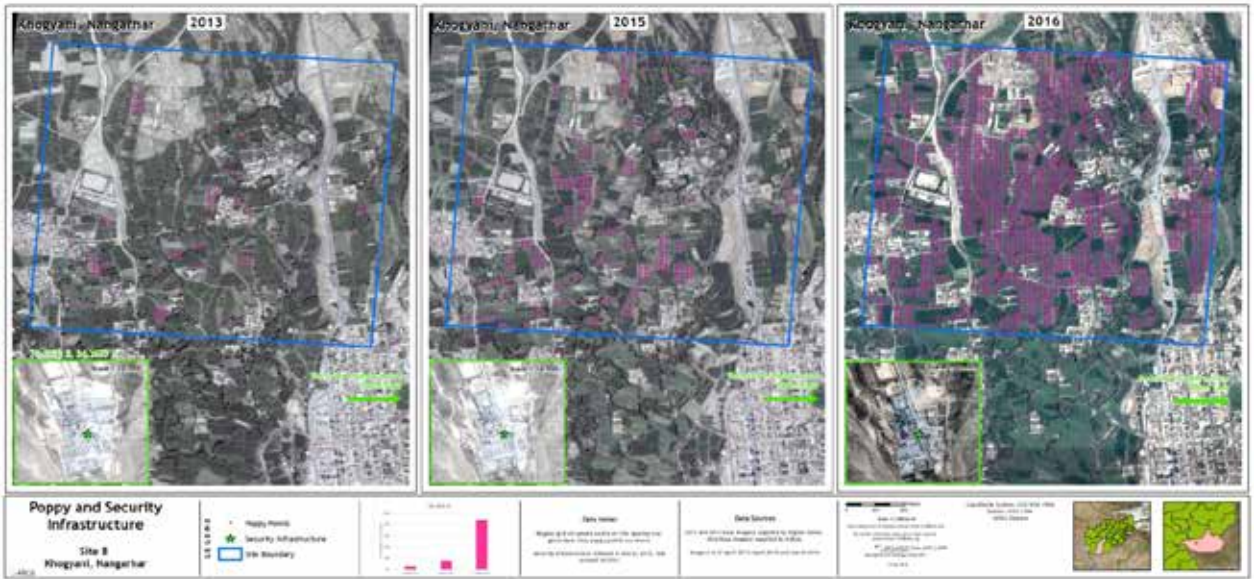

Figure 16: Increasing levels of opium poppy cultivation to the north of Karga bazaar, the district centre of Khogiani, Nangarhar, 2013-16

Figure 17: Imagery showing cropping patterns in southern valleys of Achin, Nangarhar, April 2016.

Looking more toward the long term, regardless of this year's final figures, whatever social and political costs it has imposed on the country, it is clear that poppy has formany years provided support to improving livelihood resilience and adaptation in Afghanistan. It has supported populations that have experienced prolonged drought by allowing farmers to sink shallow wells and retain the perennial crops that some have grown for generations.

The crop has also facilitated the expansion of agricultural production into a hostile environment by providing the funds for investment in deep-well technology that has transformed the physical landscape and provided a means of livelihood for a burgeoning rural population, many of whom had not owned land for generations, if at all.

Finally, the capital generated by opium is supporting the adoption of solar-powered technology, which could in turn decrease the need for farmers to grow opium by reducing the costs of water extraction.

What is much less apparent is the sustainability of this situation, whether economically or environmentally. With salination, repeated crop failures, and falling groundwater in the former desert areas, as well as the wider challenges of increasing temperatures and floods associated with climate change, there is a growing population in Afghanistan whose livelihoods are at risk. High opium prices, lower production costs, and improved opium yields have helped farmers to adopt new technologies in 2016, which may help

build livelihood resilience. However, much of the rural population is likely to remain heavily dependent on high opium prices and/or yields due to the maintenance costs. The collapse of both prices and yields would have a significant impact on large sections of the rural population, particularly those in the former desert areas who have transformed once barren earth into agricultural land. There is every likelihood that as climate change takes a grip, opium poppy will be a source of resilience for ever larger numbers of the Afghan population.

Figure 18: Crop showing signs of failure in Loy Bagh, Nad e Ali, Helmand, March 2016

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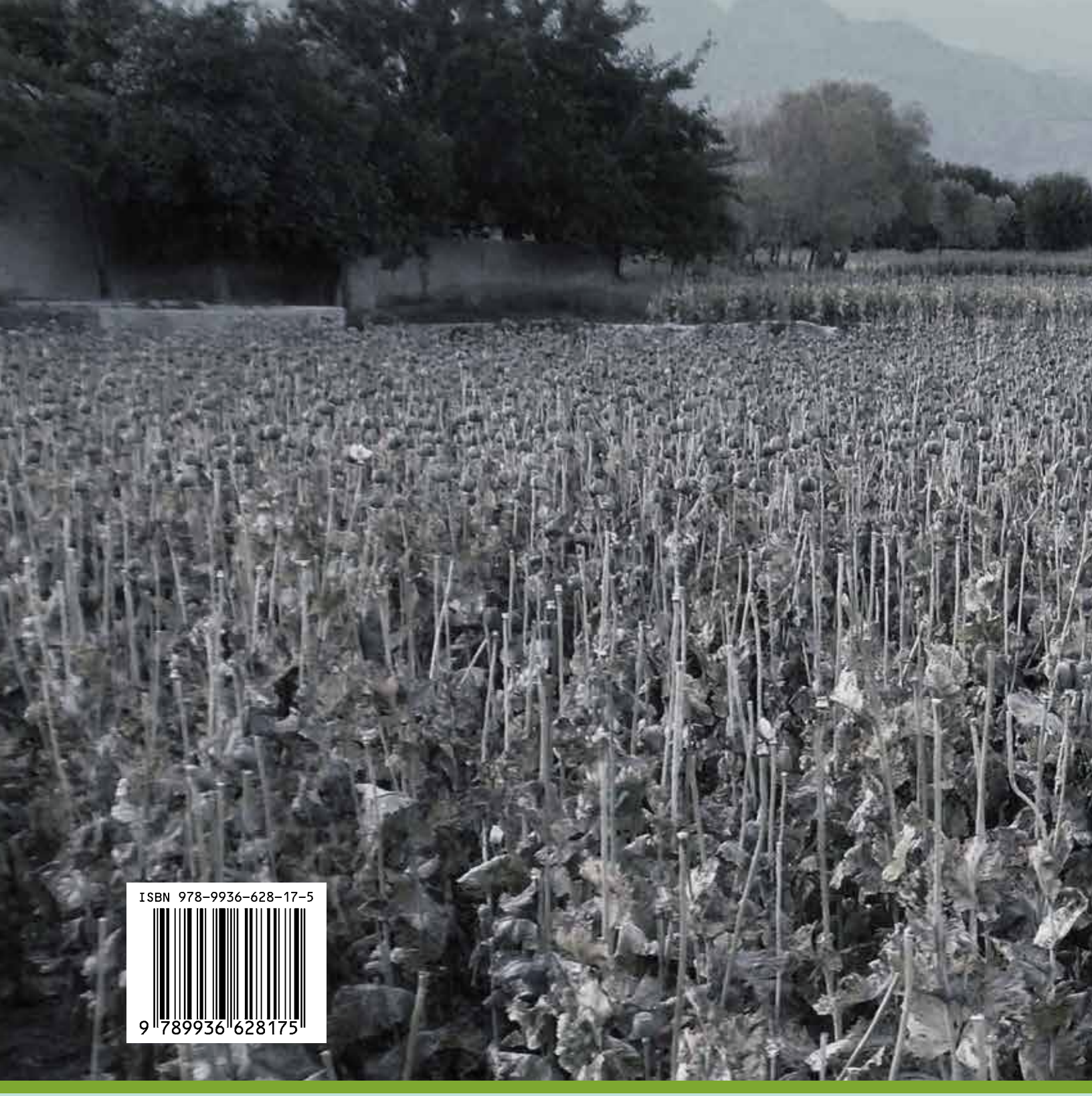

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