UNODC
United Nations Office on Drugs and Crime

Government of Afghanistan
Ministry of Counter Narcotics

Afghanistan cannabis survey 2009

April 2010

ABBREVIATIONS

ANDS	Afghanistan National Drug Strategy
AOPS	Annual Opium Poppy Survey
CNPA	Counter Narcotics Police of Afghanistan
ICMP	Illicit Crop Monitoring Programme (UNODC)
MCN	Ministry of Counter-Narcotics
UNODC	United Nations Office on Drugs and Crime

ACKNOWLEDGEMENTS

The following organizations and individuals contributed to the implementation of the 2009

Afghanistan Cannabis Survey and to the preparation of this report:

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The implementation of the survey would not have been possible without the dedicated work of the field surveyors, who often faced difficult security conditions. One of them lost his life during ground truth collection in the south.

The Afghanistan Cannabis Survey 2009 was financed by the United States of America. UNODC's illicit crop monitoring activities in Afghanistan were made possible by financial contributions from the Governments of Germany, Norway, the United Kingdom and the United States of America.

This report is dedicated to the memory Late Amanullah, who was tragically killed in Kandahar in October 2009 while undertaking work for this cannabis survey. He was an honest and dedicated surveyor who had been involved in Afghanistan opium poppy cultivation surveys with UNODC and MCN for some eight years.

We take this opportunity to express our sincere condolences to his family, who have suffered an irreparable loss and their only breadwinner.

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Commentary by the Executive Director

Afghanistan is the world's biggest producer of opium. Less known is the fact that 10,000 to 24,000 hectares of cannabis are grown in Afghanistan every year. While other countries have even larger cannabis cultivation, the astonishing yield of the Afghan cannabis crop (145 kg of resin per hectare as compared to around 40 kg/ha in Morocco) makes Afghanistan the world's biggest producer of hashish, estimated at between 1,500 and 3,500 tons a year.

This first-ever *Afghanistan Cannabis Survey* is based on survey data from 1,634 villages in 20 provinces. It shows that there is large-scale cannabis cultivation in exactly half (17 out of 34) of Afghanistan's provinces.

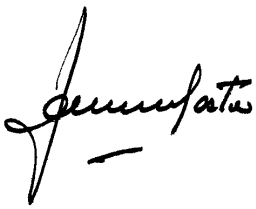
Money is one of the main reasons: cannabis reaps a high return. The gross income per hectare of cannabis (US$ 3,900) is higher than from opium (US$ 3,600). Cannabis does not need much labour cost: in Afghanistan it is three times cheaper to cultivate a hectare of cannabis than a hectare of opium. As a result, the net income of a hectare of cannabis is US$ 3,341 compared to US$ 2,005 per hectare of opium. In the aggregate, however, because opium cultivation far exceeds cannabis cultivation, in 2009 the value of cannabis resin production in Afghanistan was estimated at between US$ 39-94 million, about 10-20% of the farm-gate value of opium production.

Like opium, cannabis cultivation is concentrated in regions of instability, namely the south of the country: actually, two-thirds (67%) of cannabis farmers also grew opium in 2009. Like opium, cannabis cultivation, production and trafficking are taxed by those who control the territory, providing an additional source of revenue for insurgents.

The high concentration of cannabis cultivation in southern Afghanistan marks a shift away from the north which, even five years ago, was the main cannabis-growing region. Illustrative of this trend is the steep increase in cannabis prices in Balkh province – once notorious for its Mazari (Balki) cannabis – due to a governor-led crackdown on drug cultivation since 2007.

Like opium, cannabis trading centres are situated throughout the country. While some cannabis is consumed domestically (as hashish or "charas" as it is known), the main trade flows, so widely commented, follow opium trafficking routes, particularly around hubs in Balkh, Uruzgan and Kandahar provinces. Indeed, in 2008 a massive seizure of cannabis – 245,000 kg – was made in Kandahar close to the border with Pakistan.

This report shows that Afghanistan's drug problem is even more complex than just the opium trade. Reducing Afghanistan's cannabis supply should be dealt with more seriously, as part of the national drug control strategy. As with opium, the bottom line is to improve security and development in drug-producing regions in order to wean farmers off of illicit crops and into sustainable, licit livelihoods, and to deny insurgents another source of illicit income.



Antonio Maria Costa
Executive Director
United Nations *Office on Drugs and Crime*

Fact Sheet Afghanistan Cannabis Survey 2009

	2009
Cannabis cultivation[1]	10,000 – 24,000 ha
Number of provinces without cannabis cultivation[2] Number of provinces with cannabis cultivation	17 17
Average cannabis resin powder (garda)[3] yield from cannabis in mono-crop cultivation	First garda: 68 kg/ha Second garda: 46 kg/ha Third garda: 30 kg/ha Total: 145 kg/ha[4]
Potential cannabis resin powder (garda) production	1,500 – 3,500 mt
Cannabis growing households Average cannabis cultivated per cannabis growing household Average opium poppy cultivated per opium growing households[5] Proportion of cannabis farmers who also grew opium in 2009	40,000 (25,000 - 60,000) 0.4 ha 0.5 ha 67%
Average farm-gate price of cannabis resin at time of resin processing (January 2010)	First Garda: US$ 58/kg Second Garda: US$ 38/kg Third Garda: US$ 20/kg
Total farm-gate value of cannabis resin production (all garda qualities) As % of GDP[6]	US$ 39 – 94 million 0.4% - 0.9%
Average yearly gross income from **cannabis** of cannabis growing households Average yearly gross income from **opium** of opium growing households	US$ 1,553 US$ 1,786
Income from **cannabis** per ha (gross/net) Income from **opium** per ha (gross/net) Income from **wheat** per ha (gross/net)	US$ 3,900 / US$ 3,341 US$ 3,600 / US$ 2,005 US$ 1,200 / US$ 960

[1] Cannabis cultivation includes cannabis cultivated on fields, typically for commercial purposes. Small-scale cultivation, e.g. in kitchen gardens, was not covered by this survey.

[2] Provinces without cannabis cultivation include 3 provinces, which were surveyed but no cannabis fields were found, and 14 provinces, which fell outside the cannabis risk area (the 2009 survey area). Field information gathered in 2008 and 2009 indicated that provinces outside the risk area had no significant cannabis cultivation.

[3] Garda is the local term used in Afghanistan for the powder obtained by threshing and sieving the harvested and dried cannabis plants. This process is repeated several times and results in different quality of garda (first, second, …). Garda is further processed into hashish, which is the traded product.

[4] In southern Afghanistan, some farmers produced fourth garda. As this was not common practice, fourth garda was subsumed under third garda, here. The total yield differs from sum of gardas due to rounding.

[5] Estimated from total area under opium cultivation and number of households involved in opium cultivation.

[6] GDP for 2009: US$ 10.7 billion (Afghan fiscal year 2008/2009), source: Gov. of Afghanistan, Central Statistical Office.

KEY FINDINGS

- The total area under cannabis cultivation in 2009 was estimated between 10,000 – 24,000 ha. Total cannabis resin production was 1,500 - 3,500 mt. This makes Afghanistan the world's largest producer of cannabis resin.
- In 2009, cannabis cultivation was found in 17 of the 34 Afghanistan's provinces. No significant cannabis cultivation was reported in the remaining 17 provinces.
- The area under cannabis cultivation in 2009 is not comparable with previously indicative estimates, as this was the first systematic cannabis survey carried out in Afghanistan. However, auxiliary data such as cannabis prices and seizures do not indicate major changes in the overall national level of cannabis production since 2006.
- The regional distribution of cannabis cultivation has changed in the last five years. In 2005, the northern part of Afghanistan had a large share of cannabis cultivation. Between 2005-2009 the regional centre of cannabis moved to the southern part of the country.
- Cannabis cultivation is geographically associated with opium cultivation and insecurity. Most cannabis is cultivated in the insecure South of the country where also most of the opium is produced. Over two thirds of cannabis farmers also cultivated opium in 2009.
- Gross income from cannabis (US$ 3,900/ha) cultivation equalled or exceeded income from opium (US$ 3,600/ha). Due to lower expenditure for harvesting cannabis, net income from cannabis is higher than net income from opium by 66%.
- The high sale price of cannabis and the relatively low costs of cultivation were the most frequently mentioned reasons for cultivating cannabis.
- The government ban on cannabis cultivation and religion were the most frequently mentioned reasons for having stopped cannabis cultivation.
- Farm-gate prices of cannabis resin powder (garda) vary considerably across regions, probably reflecting differences in quality (proportion of resin to plant material) as well as other factors such as the degree of supply and demand.
- Overall, cannabis prices in Afghanistan have been relatively stable since 2006 when price monitoring started. However, some regions have experienced strong price movements.
- Most cannabis farmers, and almost all in the south, reported paying the informal usher tax on cannabis.
- In Afghanistan, cannabis is a 'summer' crop. The planting season of cannabis is between April and June and harvesting is done between October and January.
- The yield of cannabis resin powder (garda) of 145 kg/ha exceeds by far the yield found in Morocco in 2005[7].
- Cannabis is mainly cultivated as a mono crop but some farmers also cultivate cannabis mixed with other crops or on the edges of fields. Most cannabis fields are irrigated.

[7] Royaume du Maroc/UNODC (2005): Maroc. Enquête sur le cannabis 2005. Janvier 2007.

1 INTRODUCTION

Evidence from cannabis resin seizures have long pointed to Afghanistan as one of the main producer of the drug, similar in magnitude only to Morocco. Information collected by UNODC and the Ministry of Counter Narcotics (MCN) on cannabis cultivation in past years with specific studies8 and during the Annual Opium Poppy Surveys, confirmed the existence of cannabis cultivation in many provinces of Afghanistan. However, a systematic survey to precisely estimate the area under cannabis cultivation and production, was never undertaken before 2009.

Previous attempts to estimate cannabis cultivation in Afghanistan were based on assumed seizure rates and yield information from other countries. This information indicated the existence of several tens of thousands of hectares of cannabis cultivation.

New research is presented in this report, based on a survey with village level interviews with farmers and headmen, yield studies and satellite image interpretation.

The survey benefitted from the experiences and results of a pre-study done in November 2008[9]. The main village survey with headmen and farmers interviews was implemented between July and September 2009. The complex area of cannabis resin yield was investigated with focus group interviews in over 45 villages, the information from headmen and farmers given during the village survey, and a yield observation study undertaken in January 2010, when the actual resin production from the 2009 cannabis harvest took place. The cannabis area was estimated based on the interpretation of 128 very high resolution satellite images.

The investigation of cannabis cultivation and production is in many ways more complicated than opium poppy. The amount of small-scale cannabis cultivation in kitchen gardens and on the bunds of fields is difficult to quantify. The fact that in some provinces cannabis is intercropped with licit crops makes the interpretation of satellite images as well as responses from farmers difficult. The volatile situation in southern Afghanistan made the collection of ground truth information to support the satellite image analysis difficult in many and impossible in some areas. Partly, surrogate information could be obtained from overflights.

The 2009 cannabis survey was the first of its kind and was implemented under extremely difficult circumstances, which even led to the tragic loss of the life of one of the surveyors.

The cannabis survey has been implemented with the technical framework of UNODC Illicit Crop Monitoring Programme (ICMP) under AD/AFG/F98 project. The objective of ICMP of UNODC is to assist the international community in monitoring the extent and evolution of illicit crops within the context of the Political Declaration and Plan of Action on International Cooperation towards an Integrated and Balanced Strategy to Counter the World Drug Problem, adopted by Member States in 2009. [10]

[8] E.g. UNODC (2004): Concise Report on Hashish Cultivation in Afghanistan. July 2004.

[9] MCN/UNODC (2008): Information on cannabis cultivation in Afghanistan. Internal report. December 2008

[10] E/2009/28, E/CN.7/2009/12, Political Declaration and Plan of Action on International Cooperation towards an Integrated and Balanced Strategy to Counter the World Drug Problem.

Botanical information on the cannabis plant[11]:

Cannabis also known as "marijuana" or "marihuana" is a plant under the Cannabaceae family. It is a dioecious plant, which means that the male and female flowers develop on separate plants, although monoecious examples with both sexes on one plant are also found. The development of branches containing flowering organs varies greatly between male and female plants: the male flowers hang in long, loose, multi-branched, clustered limbs up to 30 centimeters (12 inches) long and shed their pollen and die several weeks prior to seed ripening on the female plant, whilst the female flowers are tightly crowded between small leaves. The female plants tend to be shorter and have more branches than the male ones. Female plants are leafy to the top with many leaves surrounding the flowers, while male plants have fewer leaves near the top with few if any leaves along the extended flowering limbs and can produce hundreds of seeds. Stems are erect, green and hollow and longitudinally grooved. It has been noted that the height of cannabis plant has gone up to 1-3 meters in different parts of Afghanistan. The maturation of Cannabis is normally annual and its timing is influenced by the age of the plant, changes in photo-period, and other environmental conditions.

Flowering:

It usually starts when darkness exceeds eleven hours per day. The flowering cycle lasts around four and twelve weeks depending on the environmental conditions.

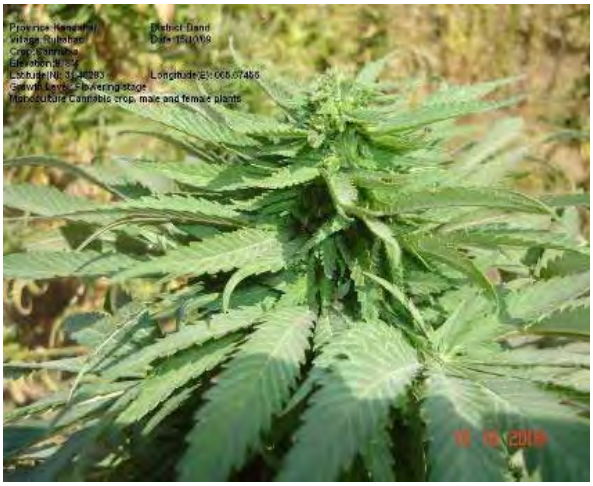
Harvesting:

Since resin secretion and associated terpenoid and cannabinoid biosynthesis are at their peak just after the pistils have begun to turn brown but before the calyx stops growing, it seems obvious that floral clusters should be harvested during this time. The floral clusters are responsible for the production of seeds, drugs, and aromatic resins.

Yield:

Yield varies depending on techniques of yield processing techniques avail in different regions in the country. The product of the yield is known as "hashish" or "charas" in local language. Depending on the technique of processing, the names are given to the product. The Mazari or Balkhi variety processing is different than the processing technique of other varieties particularly in north and east Afghanistan.

Picture 1: Morphological differences between male and female cannabis plants



Cannabis female plant in Dand district, Kandahar province

Cannabis male plant with flower buds (Kandahar)

[11]. *Information from David T. Brown (1998): Cannabis, the Genus Cannabis. Amsterdam; Robert C. Clarke (1981): Marijuana Botany. Oakland; and from UNODC internal reports on cannabis in Afghanistan.*

2 FINDINGS

The 2009 cannabis survey covered the "cannabis risk area" in Afghanistan, i.e. 20 provinces, where cannabis cultivation had been observed or reported in other surveys in the past. Field information from the other 14 provinces indicated that cannabis cultivation did either not exist or only at insignificant levels. Although the 2009 cannabis survey did not have complete national coverage, it is believed that it covered the areas where cannabis is mainly cultivated. The main components of the survey were a socio-economic survey conducted in 1,634 villages in 20 provinces of Afghanistan, which included an interview with the headman of the village plus individual interviews with 3 farmers per village, and the analysis of 128 high resolution satellite images. For the purpose of the 2009 cannabis survey, cannabis cultivation was defined as cannabis cultivated on fields. Small-scale cultivation e.g. in kitchen gardens, flower pots, along the walls of compounds or "wild cannabis" etc. was not covered by this survey.

Cannabis cultivation

Cannabis cultivation in Afghanistan in 2009 ranged from 10,000 ha to 24,000 ha. Due to the uncertainties associated with the area estimates, a mid-point estimate was not calculated. This area estimate is not comparable with previous, indicative estimates released for the years 2005 to 2007. Cannabis cultivation was found to be much lower than opium cultivation, which in 2009 amounted to 123,000 ha.

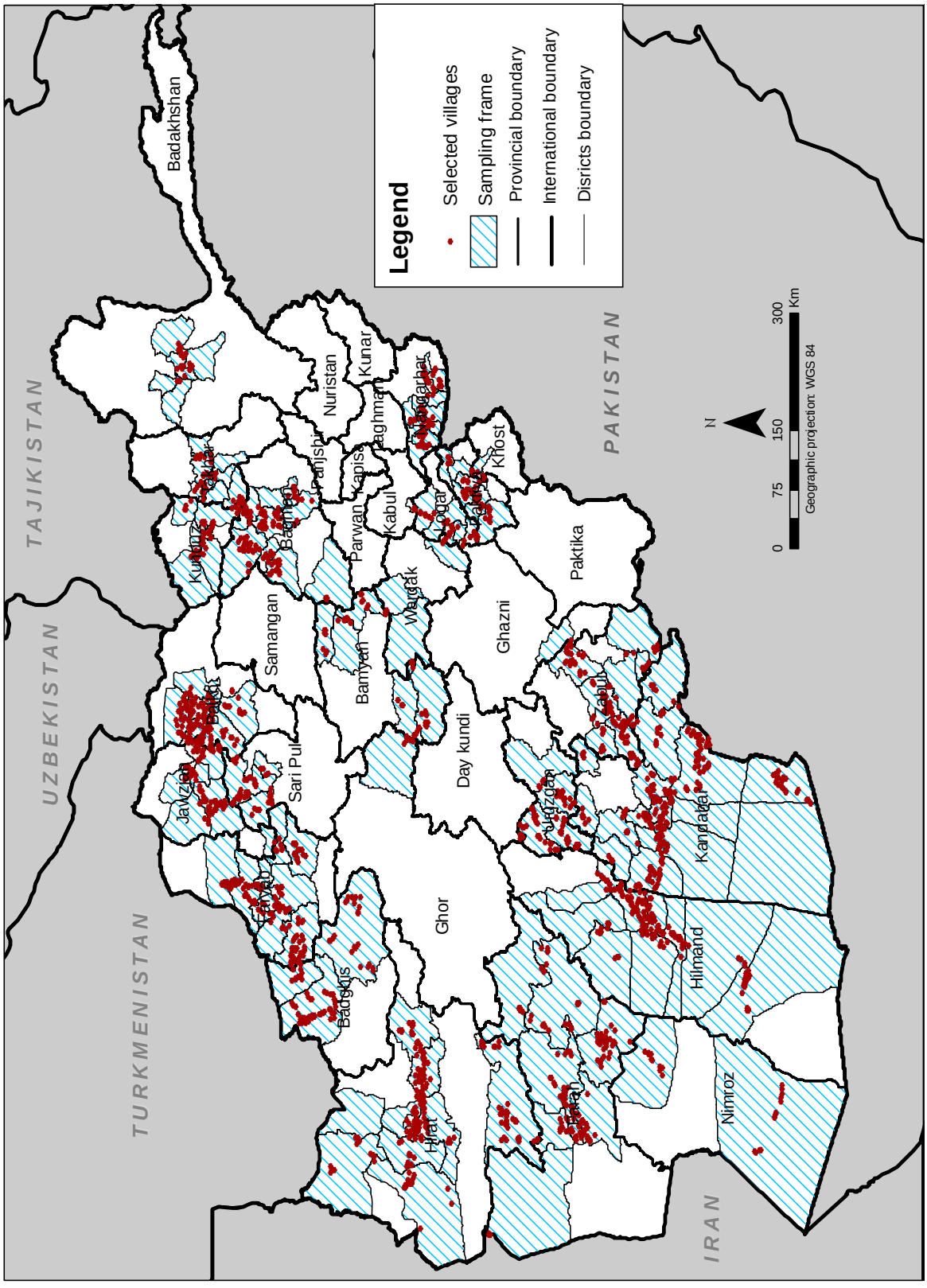
The estimation methodology did not allow to produce cannabis area estimates at province level with sufficient accuracy, although over two thirds of cannabis cultivation in 2009 was estimated to be in the Southern region. By and large this strong regional disparity with a concentration in the south reflects the current pattern of opium cultivation but cannabis was also found in poppy-free provinces.

Among the 20 provinces of the cannabis risk area, 17 had cannabis cultivation. In 3 provinces surveyed (Bamyan, Kunduz, Sari Pul), no cannabis fields were found, neither on satellite images nor during the village survey. The 14 provinces outside the cannabis risk area were considered to be without cannabis cultivation as defined for this survey as field information from survey activities in 2008 and 2009 did not indicated the existence of significant cannabis cultivation.

Table 1: Provinces cultivating cannabis, 2009

Region	Province
Central	Logar
	Paktya
Eastern	Nangarhar
North-eastern	Badakhshan
	Takhar
Northern	Balkh
	Baghlan
	Faryab
	Jawzjan
Southern	Hilmand
	Kandahar
	Uruzgan
	Zabul
Western	Badghis
	Farah
	Hirat
	Nimroz
Total	**17**

No cannabis cultivation was found in Bamyan, Kunduz and Sari Pul provinces.



Map 1: Cannabis risk area and selected villages, 2009

Cultivation trends

As the 2009 Afghanistan cannabis survey was the first of its kind, it is not possible to compare the 2009 results with previous, tentative figures. Previous attempts to estimate cannabis cultivation in Afghanistan were based on assumed seizure rates and yield information from other countries. However, the 2009

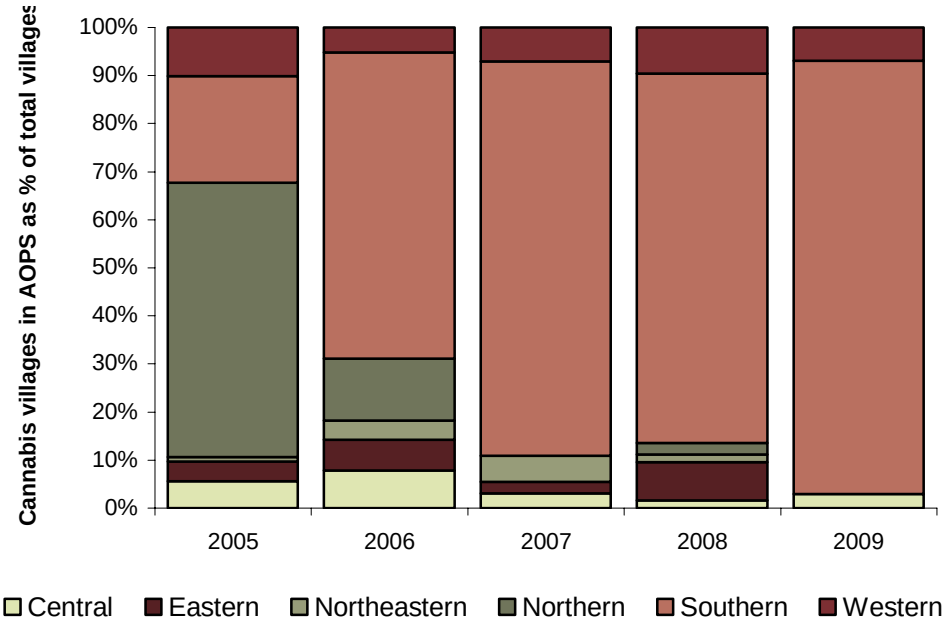
survey showed that conditions in Afghanistan allow much higher cannabis resin yields than known from other countries, namely Morocco, where UNODC and the Government of Morocco have undertaken area and yield surveys in the years 2003 to 2005. Thus, the results of the 2009 cannabis survey support previous assumptions made on the volume of cannabis resin production but presents a much lower area estimate.

During the Annual Opium Surveys 2005 to 2009, information was collected on farmers'intention to cultivate cannabis in that year. The village level interviews were conducted during the opium cultivation period (spring) and before cannabis, a summer crop, was planted. Thus, farmers could still change their decision on the cannabis cultivation. Furthermore, the existence of cannabis cultivation could not be verified by the surveyors during the opium surveys, since the crop was not yet visible on the fields. Between 2005 and 2009, only a small proportion of the surveyed villages reported cannabis cultivation and this limited the reliability of the information collected. An accurate area estimate of cannabis cultivation could not be made with this information.

Despite these limitations, some conclusions can be drawn from the cannabis trends observed during interviews done for the opium poppy survey:

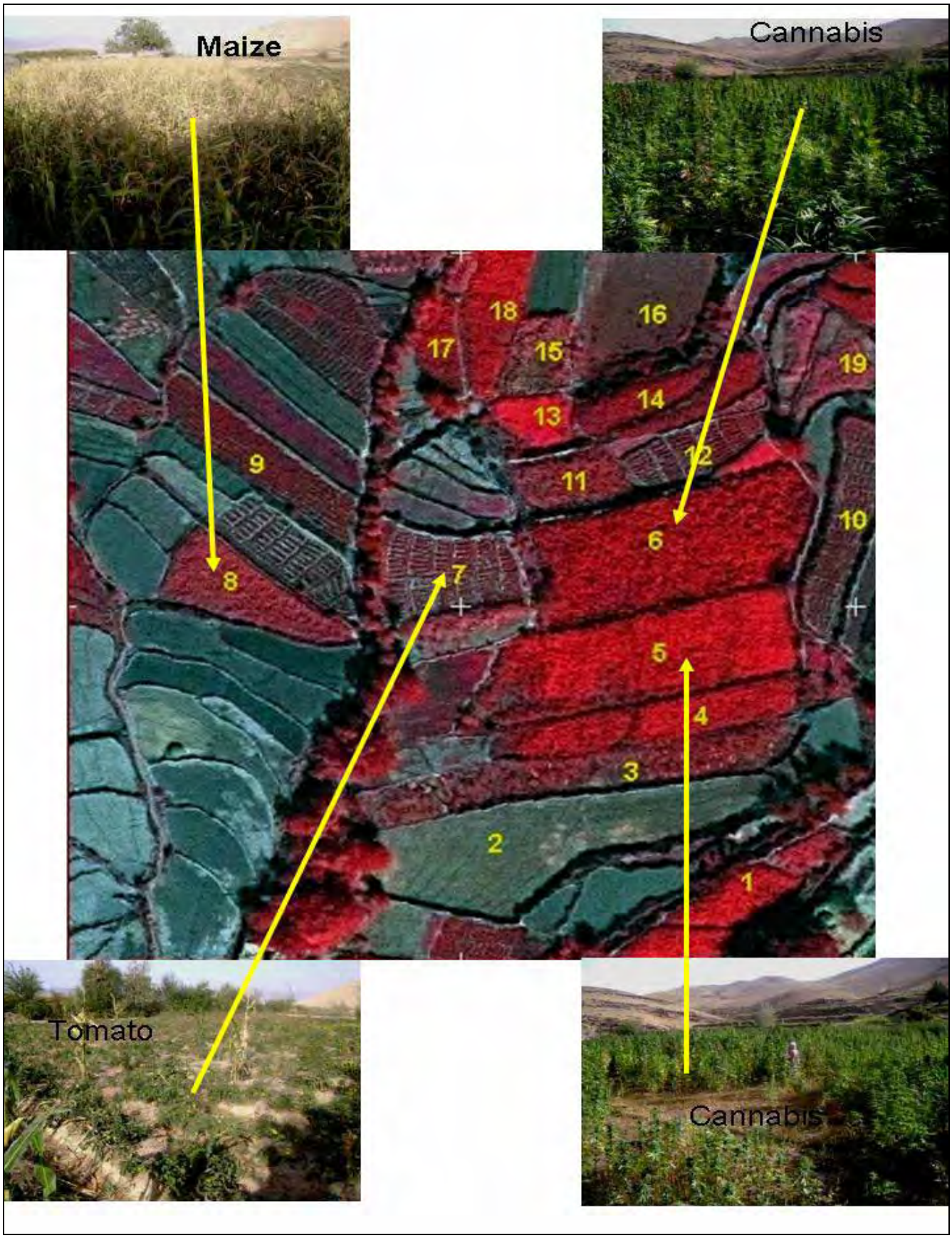
- During the period under review (2005-2009), the proportion of villages reporting cannabis cultivation was always much smaller than the proportion of opium cultivating villages. Typically, the samples showed about four times more opium cultivating than cannabis cultivating villages.
- The reported average cannabis growing area per village was between one third and half of opium cultivation area.
- The lower proportion of cannabis cultivating villages and the smaller amount of cannabis cultivated per village compared to opium cultivation, indicate that the level of cannabis cultivation in the years 2005 to 2008 was well below the level of opium cultivation in the same period.
- The proportion of villages in the sample reporting cannabis cultivation in the Southern region has dramatically increased since 2005, while the number of cannabis cultivating villages in the Northern region decreased correspondingly. This indicates a strong reduction of cannabis cultivation in the north. Due to the low number of cannabis villages found in all years, it is difficult to judge whether the increase in the south was only proportional or indicates an increase in cannabis cultivation in absolute terms.

Figure 1: Change of cannabis cultivation occurrence by region, 2005 - 2009



Source: Annual Opium Poppy Surveys 2005-2009

Picture 2: Cannabis interpretation on satellite image in Sherzad district, Nangarhar province

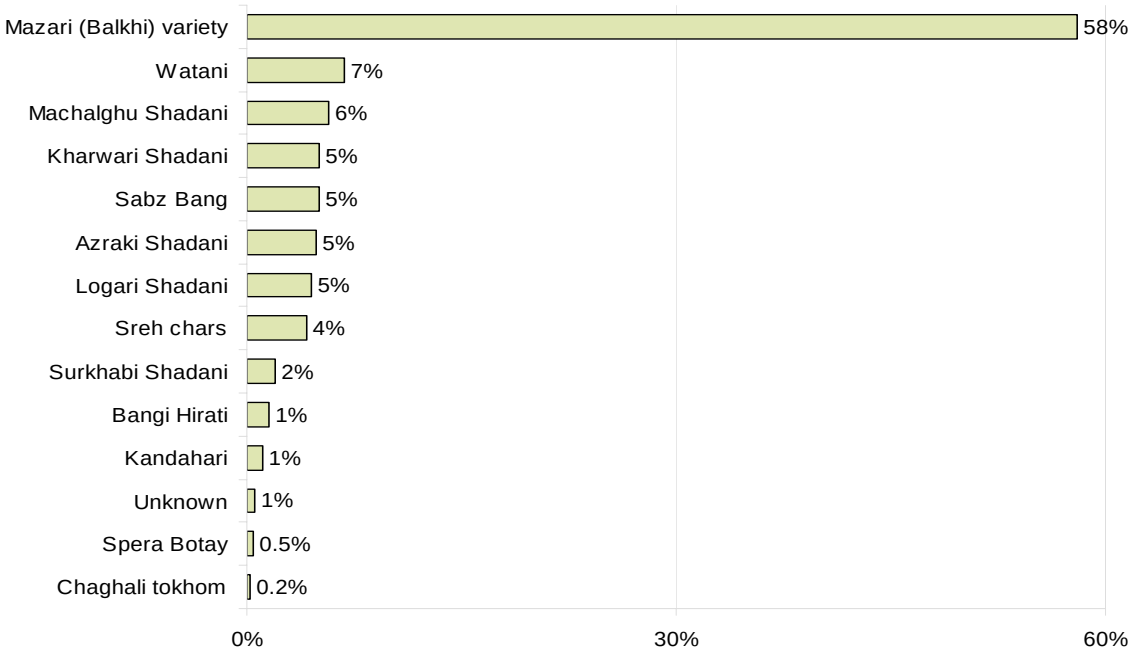


Cannabis varieties

Two distinct varieties of cannabis were reported in the 2009 cannabis survey - one with a pink red stem and the other with a green stem. The plant with pink red stalk reportedly produces higher quality resin and is in higher demand than the green stem type. There are many local names given to different varieties of cannabis in different parts of the region. Azraki Shadani, Kharwari Shadani, Logari Shadani, Machalghu Shadani, Surkhabi Shadani, Watani, Kharwari, Kandahari, Bangi Herati, Sorkhbandi Shindandi, Spera botay, Chagali and Mazari are the names reported by farmers during the survey. The most popular cannabis variety in Afghanistan reported was the Mazari variety (58%).

Watani is the most commonly cultivated cannabis variety in Nangarhar. Other varieties cultivated in the Eastern region are Azraki Shadani, Logari Shadani and Machalghu Shadani. In the Central region, most cultivated varieties are Azraki Shadani, Kharwari Shadani, Logari shadani and Macalghu Shadani. In Northern region, mostly Mazari variety is cultivated whereas in the North–eastern region the popular varieties are Kharwari shadani, Logari shadani, Machalghu shadai and Mazari. In the Southern region, Mazari, Kandahari and Spera botay (Brown Bush) varieties are cultivated. In the Western region, Azraki Shadani, Bangi Hirati, Sabz bangi, Kharwari Shadani, Sreh charas and Mazari varieties are cultivated.

Figure 2: Varieties of cannabis cultivated in different provinces

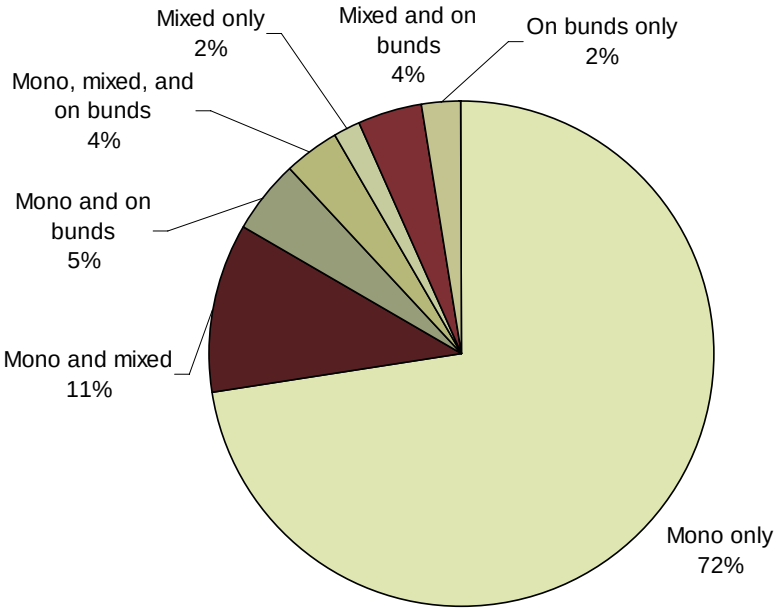


Cannabis Cultivation pattern

Cannabis is cultivated as a summer crop after for example wheat or poppy which are winter crops. It is an annual plant and has to be planted every year afresh. In Afghanistan, cannabis is mainly grown as a mono-crop, but also mixed cropping patterns exist. In addition, cannabis is grown along the field boundaries, which are often elevated in the form of small dykes called “bunds” due to the necessity to irrigate the field.

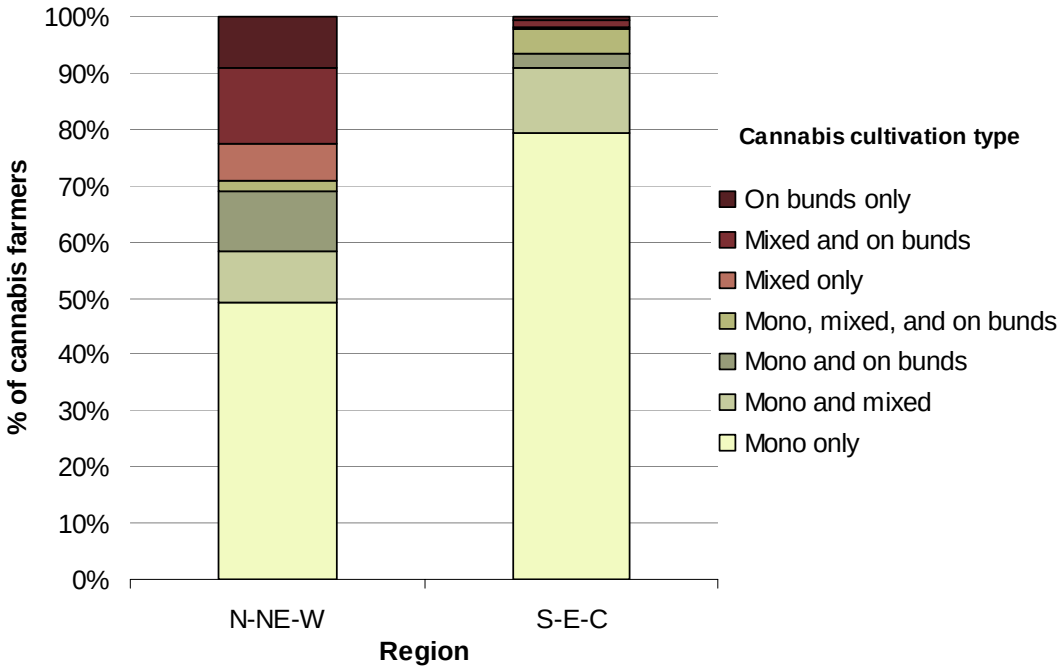
72% of the farmers who grew cannabis, cultivated it as a mono-crop. 20% cultivated cannabis as a mono-cropping in addition to mixed crop and/or on bunds. Only 8% of cannabis farmers had cannabis only as mixed cropping or on field bunds. The results indicate that mono-cropping cannabis is the predominant cultivation technique, although farmers’ interviews can not provide a precise estimate of the proportion of mono-crop cannabis within the total area under cannabis cultivation.

Figure 3: Cannabis cropping patterns reported by farmers, 2009 (n=724)



Significant regional differences in cannabis cropping patterns were observed. In the southern, eastern and central part of the country (S-E-C region), almost all farmers reported mono-cropping of cannabis, some of them in addition to other cropping patterns (mixed, on bunds). In the rest of the country, about 30% of farmers did not report mono-crop cannabis at all. Some farmers reported cultivating cannabis exclusively on the bunds of their fields.

Figure 4: Regional cannabis cropping patterns reported by farmers growing cannabis, 2009 (n=724)



Cannabis is often cultivated as mixed crop to protect other crops from insects but also to disguise the illicit cultivation. Crops mixed with cannabis include fodder, barley, maize, cotton, peanuts, sesame, tobacco, vegetables (carrot, okra, potatoes, tomatoes, cucumber, onion, eggplant). Fruits like melon and watermelon are also grown in combination with cannabis. The mixed cultivation of cannabis is most common in Balkh, Faryab, Paktya and Takhar. In Nangarhar, farmers grew cannabis mixed with maize but about one month after planting, the maize plants were cut to be used as fodder. For the purpose of the survey, this

cultivation pattern was considered to be mono-cropping. In Balkh, cannabis cultivation is often combined with cotton.

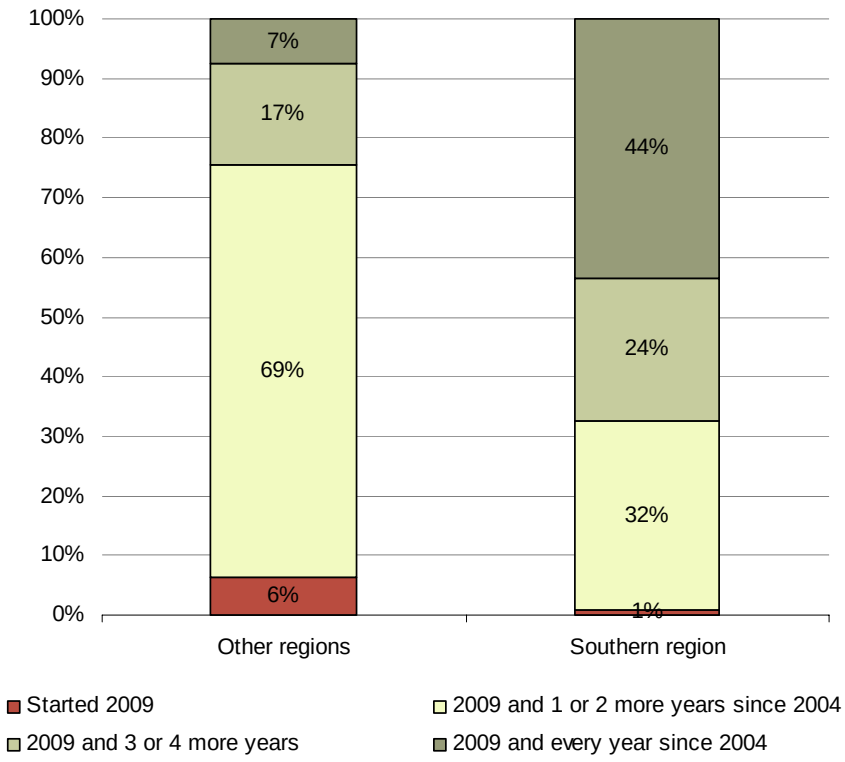
As with any seasonal crops, cultivation on bunds is often done for personal use. In such field surrounded by cannabis, farmers grow cotton, okra and other vegetables like carrot, cucumber, mung-bean etc. In Badghis and Jawzjan provinces, and to some extent in Logar cannabis was often cultivated on bunds.

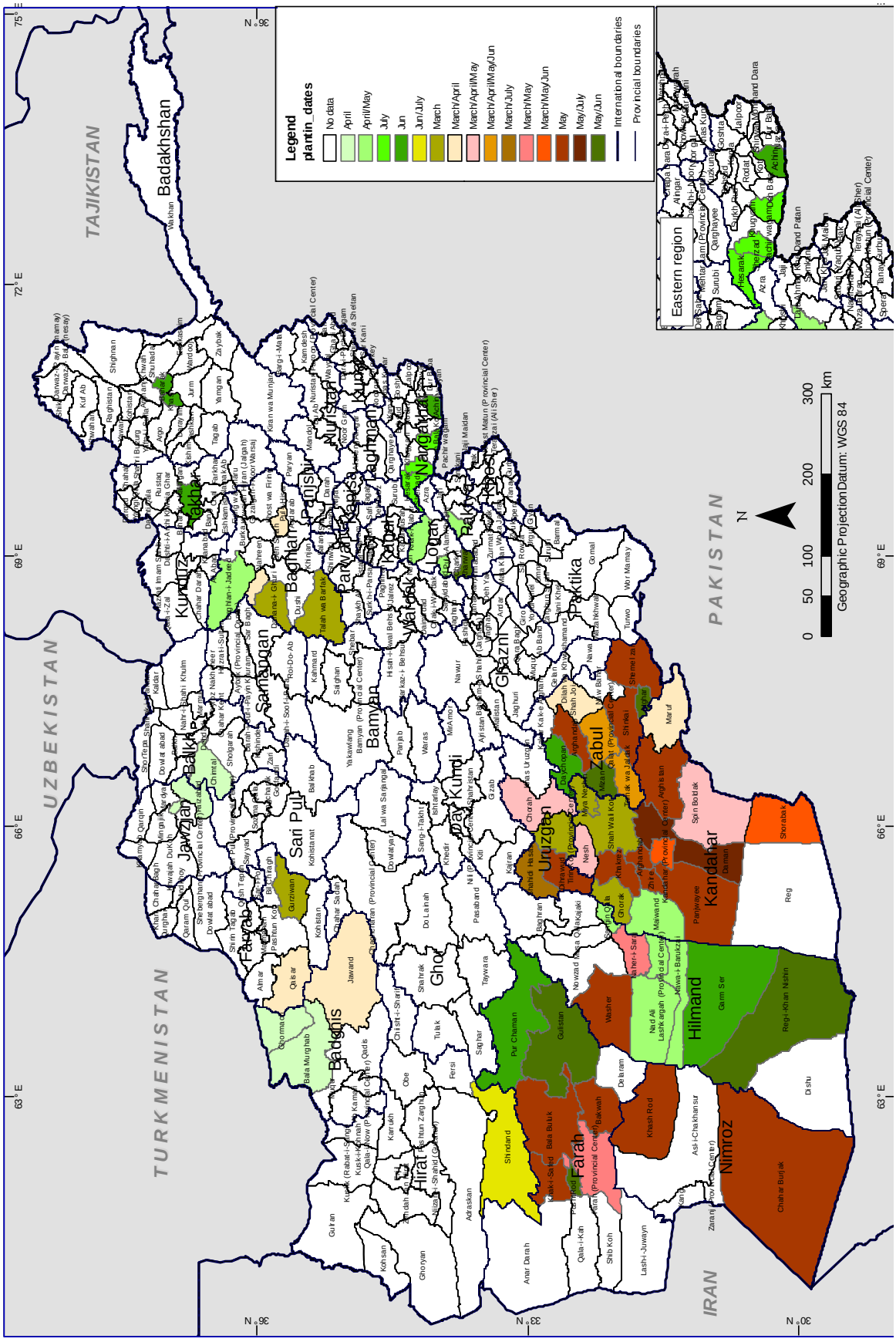
Cannabis cultivation frequency

Farmers who grew cannabis in 2009 (n=724) were asked if they had also cultivated cannabis in the previous five years (since 2004). Only a small proportion of farmers (2%) were new cannabis farmers, i.e. they had started cannabis cultivation in 2009, whereas over half of the cannabis farmers had cultivated cannabis in 3 or more years since 2004. Strong differences were found between farmers in the Southern region and other regions. In the south, 44% of cannabis farmers grew cannabis every single year since 2004, but in other regions this was true for only 7% of cannabis farmers. Two thirds of farmers in the south who cultivated cannabis in 2009 had cultivated the crop four times or more in the last 6 years. In other regions, this was true for less than a quarter of farmers. In the south, about a third of farmers cultivated cannabis sporadically (every second year or less) in the last six years, whereas in other regions, a large majority (75%) grew cannabis sporadically.

This indicates that in the Southern region, cannabis cultivation is a more permanent feature of the agricultural portfolio of households than in other regions. It also suggests that cannabis cultivation might be easier to be substituted in other regions as households choose to cultivate cannabis only once in a while and seem to have other options when they do not cultivate cannabis. It is possible that the regional shift of cannabis cultivation observed since 2005 is to some extent the result of an intensification in the south (farmers growing cannabis more often, growing cannabis in most years instead of sporadically) and a corresponding cut-back in the north (farmers growing less often, enlarging intervals between years in which they grow cannabis).

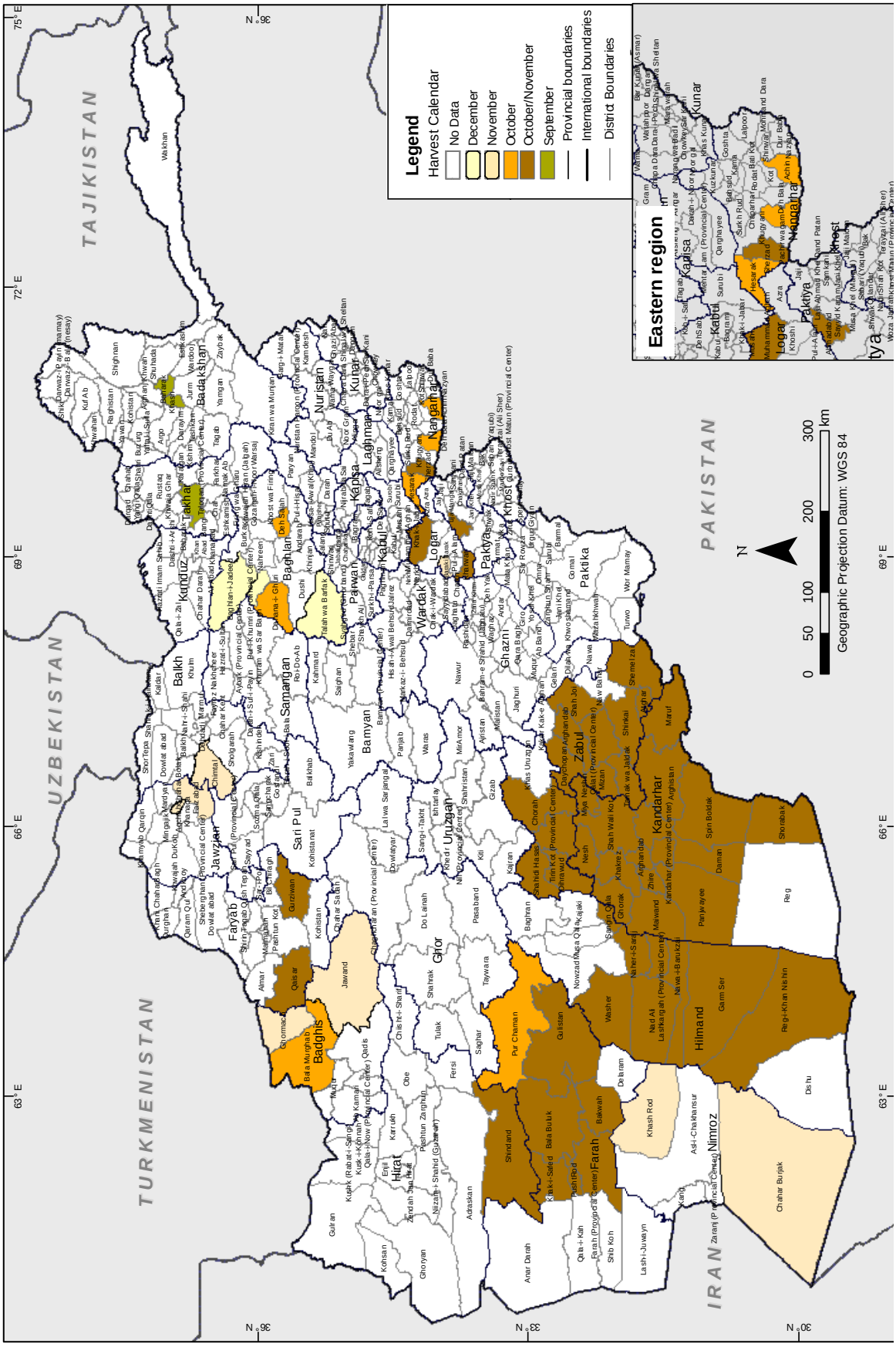
Figure 5: Years of cannabis cultivation between 2004-2009 reported by cannabis growing farmers in 2009 (n=724)





Map 2: Planting dates of cannabis, 2009

Map 3: Harvesting dates of cannabis, 2009



Cannabis crop calendar

Typically, the planting season of cannabis is between March and May. The stem elongation stage of cannabis is in July and August and the crop is in full bloom between September and October. In 2009, in most areas, cannabis plants were fully matured and harvested from the field by the end of November. The resin was extracted between late December 2009 and January 2010.

Results of the village survey and focus group interviews show that the cannabis crop cultivation cycle differs between across the country due to the variation in climatic conditions:

- Cultivation in Central region starts between early April and June and harvesting is in November.
- Cultivation in Northern and Southern regions starts between mid-April and June.
- Farmers in the eastern part of Nangarhar province plant cannabis in June; however farmers in Hisarak district of Nangarhar start early in March.
- Farmers in the Western region cultivate cannabis during the last week of May and early June. However, in some districts of Hirat province, cultivation starts already in mid-March.
- In the North-eastern region, cannabis is planted in April and harvested between late October and end of November. However, in some areas such as Baharak district of Badakhshan province, the farmers plant cannabis as late as in June.

Cannabis and opium cultivation

Most of the cannabis cultivation was estimated to take place in the Southern region, where most of the opium cultivation (84%) also took place in 2009. All four Southern provinces surveyed in the cannabis survey (Hilmand, Kandahar, Uruzgan, Zabul) had sizable amounts of cannabis cultivation. Day Kundi was not included in the cannabis risk area. There is a clear geographic association between opium and cannabis cultivation at the provincial level, which was confirmed by interviewed farmers.

Out of the total number of interviewed farmers, 15% cultivated cannabis in 2009. About 53% had never grown cannabis and 32% had stopped cannabis cultivation.

Over two thirds of interviewed cannabis farmers reported to have grown opium in the same year (67%). However, this relationship is not exclusive: 11% of farmers who never grew cannabis grew opium in 2009.

The link between cannabis and opium cultivation seems to exist on the trading level as well. Information gathered during surveyor debriefings in 2009 indicated that a large proportion of cannabis traders also trade opium.

Cannabis yield

The production of cannabis resin in Afghanistan involves several steps. First, farmers dry the harvested (cut) cannabis plants in the field and usually later dry them further inside the farm. The dried cannabis plants are threshed and sieved to produce a powdery substance locally called “garda”. Garda consists of cannabis resin proper but also other plant material. The objective is to extract as much cannabis resin as possible. Through repeated sieving, farmers produce a graded quality which contains different proportions of cannabis resin. Cannabis farmers interviewed during the survey did not report production or sale of cannabis herb which is the upper part of the cannabis plant containing the floral cluster, often called outside Afghanistan as marihuana. However, this does not preclude the existence of small-scale production of cannabis herb.

Table 2: Cannabis and opium cultivation by province, 2009

PROVINCE	Opium cultivation 2009	Cannabis cultivation 2009
Kabul	132	No cultivation reported*
Khost	Poppy free	No cultivation reported*
Logar	Poppy free	yes
Paktya	Poppy free	yes
Panjshir	Poppy free	No cultivation reported*
Parwan	Poppy free	No cultivation reported*
Wardak	Poppy free	No cultivation reported*
Ghazni	Poppy free	No cultivation reported*
Paktika	Poppy free	No cultivation reported*
Central Region	**132**	**yes**
Kapisa	Poppy free	No cultivation reported*
Kunar	164	No cultivation reported*
Laghman	135	No cultivation reported*
Nangarhar	294	yes
Nuristan	Poppy free	No cultivation reported*
Eastern Region	**593**	**yes**
Badakhshan	557	yes
Takhar	Poppy free	yes
Kunduz	Poppy free	no
North-eastern Region	**557**	**yes**
Baghlan	Poppy free	yes
Balkh	Poppy free	yes
Bamyan	Poppy free	no
Faryab	Poppy free	Insignificant
Jawzjan	Poppy free	yes
Samangan	Poppy free	No cultivation reported*
Sari Pul	Poppy free	no
Northern Region	**Poppy free**	**yes**
Hilmand	69,833	yes
Kandahar	19,811	yes
Uruzgan	9,224	yes
Zabul	1,144	yes
Day Kundi	3,002	No cultivation reported*
Southern Region	**103,014**	**yes**
Badghis	5411	yes
Farah	12,405	yes
Ghor	Poppy free	No cultivation reported*
Hirat	556	yes
Nimroz	428	yes
Western Region	**18,800**	**yes**
Total (rounded)	**123,000**	**10,000-24,000**

** These provinces were outside the cannabis risk area defined for the 2009 cannabis survey. The 14 provinces outside the cannabis risk area were considered to be without cannabis cultivation as defined for this survey as field information from survey activities in 2008 and 2009 did not indicated the existence of significant cannabis cultivation.*

Based on the quantity and quality of resin, garda is categorized as first garda, second garda and third garda. Fourth gara was only reported in a few instance in the south. The first garda is considered to be the best quality since it contains the highest proportion of resin. It is also more expensive than the second and third garda qualities. Laboratory test to determine the actual resin or THC content of different garda qualities were not part of this survey. Several garda extraction processes were observed and documented during the survey. Based on this observation, it seems very likely that lower garda qualities contain significant proportions of plant matter other than resin. It is not yet known how exactly farmers and traders determine the garda grade outside the counting of the number of sieving processes performed to extract the resin. The first, gentle shaking of the plant and sieving of plant material usually produces first garda, although the first garda may also contain products from further sieving.

Many cannabis farmers sell garda (resin) to traders but some also further process it into hashish, which is locally called "charas". Hashish is the final product used for trafficking and consumption.

Picture 3: Mature female cannabis plant with resin glands

Mature female Cannabis plant with buds cultivated in North Afghanistan

Information from focus group interviews indicated that regional differences exist in processing cannabis into garda. For the purpose of estimating yield and production, provinces were grouped into two regions, North-Northeast-West (N-NE-W) and South-East-Central (S-E). In the North, Northeast and West of the country, the processing methods resulted with a higher quality but less quantity of first garda, whereas in the South and East, a larger production of first garda was obtain, but with a lower quality (less resin and more plant material).

The garda from the Northern region (Balkhi garda) contains more resin without the mixture of cannabis leaves, in contrast to the Central and Eastern regions, where during processing of the first garda, the farmers mix the cannabis leaves. In the Southern, Eastern and Central regions, the first and second yield collected are combined and considered as first garda. The third and fourth sieving were combined and considered as second garda and similarly for the fifth and sixth yield, which were considered as third garda. Hence the quantity of garda yield is higher in these regions.

Table 3: Average cannabis garda yield by region (kg/ha), 2009

Region	1st garda (kg/ha)	2nd garda (kg/ha)	3rd garda (kg/ha)	4th garda (kg/ha)	Total yield (kg/ha)
N-NE-W (n=15)	51.3	53.9	31.4	na	136.7
S-E (n=20)	71.8	44.9	27.7	2.3	146.7
Weighted average*	**68.3**	**46.5**	**28.3**	**1.9**	**145.0**

** Weighted by cultivation area. N refers to number of fields.*

Cannabis yield studies conducted by the Government of Morocco in 2004 and 2005 in cooperation with UNODC found much lower yields per hectare.[12] The methodology to determine cannabis yield in Morocco

[12] Royaume du Maroc/UNODC (2005): Maroc. Enquête sur le cannabis 2005. Janvier 2007.

Stambouli H., A. El Bouri, M. A. Bellimam, T. Bouayoun and N. El Karni (2005):Cultivation of Cannabis sativa L. in northern Morocco. Bulletin on Narcotics, LVII, No. 1 and 2, 2005, p. 79-117.

consisted in harvesting cannabis plants and further processing them under controlled conditions in the traditional way used in the country, which also involved sieving. The yield was established as the extraction rate of cannabis powder from the harvested plant material, which was 2.82% in 2004 and 2.0% in 2005. One hectare of irrigated cannabis field in Morocco produced about 35.8 kg of cannabis resin in 2004 and 36.4 kg in 2005. According to the study, this includes cannabis powder of three different qualities, each representing about one third of the total production.

The comparability of the cannabis yield results from Morocco and Afghanistan is affected by methodological differences (field observations in Afghanistan vs. controlled off-farm measurement in Morocco) However, different processing and cultivation techniques, plant varieties and climatic conditions can explain part of the different yield results obtained in Afghanistan and Morocco which suggests that the two countries actually produce different cannabis products. The second and third garda produced in Afghanistan for example may be a product with very different properties of the cannabis powder produced in Morocco. Further investigations are needed to better identify what are the factors that can explain the large differences between the two countries.

Potential cannabis production

Total cannabis garda production, including all garda qualities, was estimated in 2009 between 1,500 and 3,500 mt. The estimation range reflects the range reported for the cannabis cultivation area. Most of the produced garda was of first quality. There are no standards across regions for garda qualities and garda of one quality type may not be homogenous. The survey did not investigate THC content or other chemical properties of the garda produced in Afghanistan and therefore its potency level is unknown.

Table 4: Potential cannabis resin garda production, 2009

Region	1st garda (mt)	2nd garda (mt)	3rd garda (mt)	4th garda (mt)	Rounded total (mt)
Lower limit	693	471	287	19	**1,500**
Upper limit	1,648	1,120	683	45	**3,500**
As % of total garda	47%	32%	20%	1%	**100%**

Garda processing

At least two farmers are involved when producing the garda. At the beginning, they hit the dried cannabis plants on a barrel (drum) to separate the buds from the main branches. Then, they collect the cannabis powder (product) onto a heap inside a room. After separating the dried buds and leaves, they use the remaining plant branches as cooking fuel. They also separate the seeds, after which they sieve (filter) the product through a wooden frame (cot) kept in an inclined position. Two persons sieve the garda: one collects the product by the shovel and spreads it over the cloth on the cot, assisted by the second person who helps to spread the dust evenly, using the hands. After sieving, they put the product in a bag made of cloth. The two persons hold the bag at the ends and shake the bag for about 5 minutes. Most of the dust is filtered out during this process. The sieving takes place three times. The remaining powder is split and put into smaller bags. A small quantity of powder is put in a cloth pouch and beaten by hand to remove the remaining dust. Thus, the final garda contains mostly resin called first garda. The first garda in the Northern region processed in this traditional way is considered to be the best quality and to contain a high proportion of cannabis resin. It is also known as Jooshi or Balkhi garda. It was reported that 25 kg of "normal" first garda produces only about 14 kg of Jooshi garda.

Most farmers usually sell the garda (resin) in its powdery form. The garda (resin) powder is not yet ready for consumption, and another transformation is needed to convert garda powder into hashish. This transformation is usually done by traders.

Picture 4: Stages of cannabis garda production

1.Cannabis dried plant ready for processing

2. Farmer crushing cannabis plants before sieving

3. Cannabis plant crushed ready for sieving

4. Farmer removing cannabis sticks

5. Cannabis garda sieving through muslin cloth

6. Cannabis garda powder collected after sieving

Hashish production

The information collected during the survey, suggests that the amount of hashish produced from 1 kg of cannabis garda vary across regions probably due to the different hashish production methods utilized. . Traditional methods of hashish production from high quality garda powder typically generate a 1:1 ratio, with no weight loss in the transformation process from garda to hashish. Weight loss, which was reported occasionally, does probably occur due to a final “dusting” of the garda to get rid of unwanted plant material and other matter, and is not a result of the conversion of garda in to hashish as such. Weight gain could also occur, when water is added to facilitate the consolidation of cannabis garda powder into a paste or mass that can be heated. Further research is needed to better understand if and to what extent such weight gain occurs, how widespread it is, and if the added water evaporates (partly) later in the process.

With the current knowledge of the different hashish production methods used in Afghanistan, some of which are explained in more detail below, it is reasonable to assume a 1:1 conversion rate of cannabis garda into hashish.

Traditional hashish (charas) production

To make hashish from Jooshi garda, a farmer puts a handful of powder on his palm and lights a match. Another farmer slowly sprinkles some powder on the top of the flame. During this process, the powder gets heated The process is repeated a couple of times, until the product becomes soft, sticky and solid. The resin is pressed and rolled by hand until the product becomes soft. Then, the solid mass turns into a greenish brown product. This product is called Jooshi hashish (charas). This traditional process is time consuming, but because of its quality, demand for this product is reportedly high, and it can be sold at high price. Jooshi hashish is also known as Balkhi hashish or Sherak-i-Mazar (milk of Mazar).

Picture 5: Hashish production by machine

1.Cannabis powder (Garda)

2. Electric motor to run machine for hashish preparation

3. Cannabis powder input to machine for hashish processing

4. Out put of hashish from the machine

5. Reprocessing hashish in the machine

6.Hashish spread in the block-frame

7. Hashish rolled in the block-frame for sizing

8. Hashish blocks ready for storing and trading

Hashish production by machine

The mechanized preparation of larger quantities of hashish seems to be a more recent development. This machinery observed during the survey comes from Pakistan and can, reportedly, process the product (garda) from one jerib land (0.2 ha) in 4-5 hours. It consists of a main part (funnel) where the garda is fed into from the top. A rotating/kneading spiral shaft is connected to an electric motor. The garda powder is

continuously fed from the top and churned inside. The kneading and churning action heats the garda and converts it into a thick, dark brown paste. This paste is reprocessed by feeding it for a second time into the machine to achieve a homogenous hashish paste. The hashish paste is then put into a wooden mould and spread uniformly using a roller, while covering it with a plastic sheet. According to anecdotal information, this kind of machinery is currently only used by traders, not by farmers.

Manual hashish production in the Southern region

A small amount of garda powder is pressed with the palms of the hand. Good quality garda (first garda), which is rich in resin and has "oily" components, gets sticky and consolidates when pressure is applied by rubbing it between the hands. No other ingredients are needed in this case. However, some water is added to garda powder of lower quality with a lower proportion of resin and oily components, to increase cohesion and facilitate its consolidation. Then, the garda mass is heated over a low flame, sometimes referred to as 'cooking", which converts it into hashish. There can be several rounds of rubbing, heating, and rubbing again until a piece of garda mass is "cooked". The addition of water in the process of hashish-making from low quality garda adds weight but some of the water may evaporate later on through the repeated heating and rubbing. This type of hashish preparation is done on a small scale and mostly used by local traders and sporadically by local drug users.

Picture 6: Stages of manual hashish preparation from garda powder

1. Garda powder taken in hand for pressing

2. Garda pressed with palms

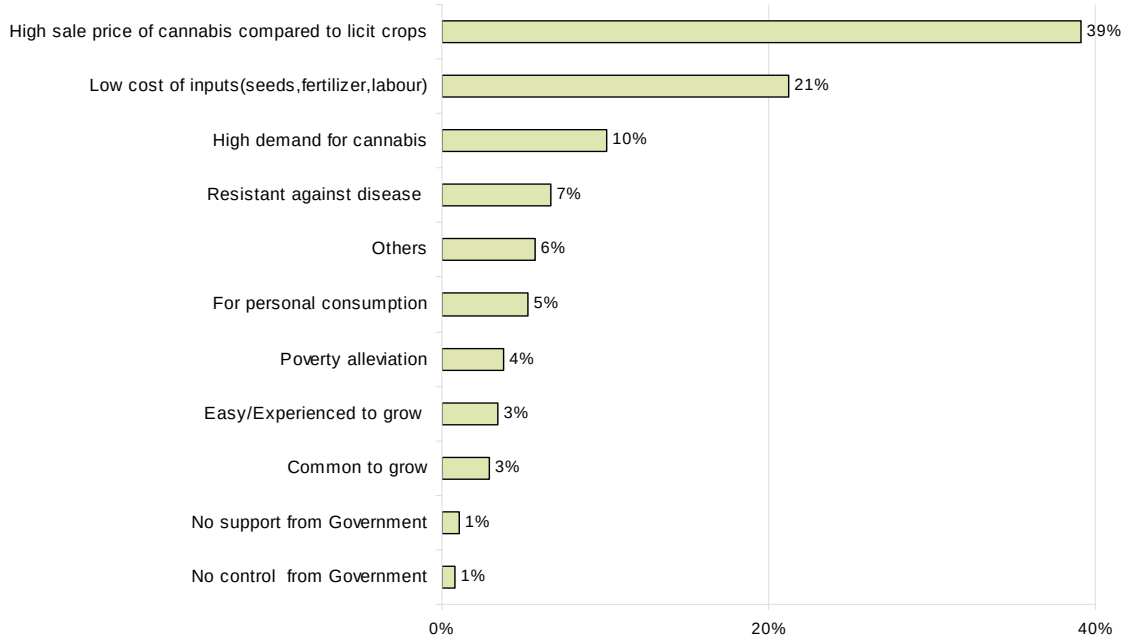
3. Pressed garda being removed from the palm

4. Sticky garda mass heated over low flame heater to become hashish

Reasons for cultivating cannabis

Cannabis farmers were asked for the most important reasons for doing so. The most frequent reason for cannabis cultivation was the high sales price of cannabis compared to licit crops (39%) and low cultivation costs (21%). Furthermore, cannabis was cultivated because of high demand (10%) and resistance against diseases (7%). Few farmers reported that cultivation was for personal consumption (5%) and alleviating poverty (4%). Other reasons included that cannabis was easy to grow (3%) or common to grow (3%). A very small percentage of farmers mentioned that they are growing cannabis because of lack of government support for alternative development opportunities, as well as lack of control by the government.

Figure 6: Reasons for cultivating cannabis in 2009 (n = 724 farmers)

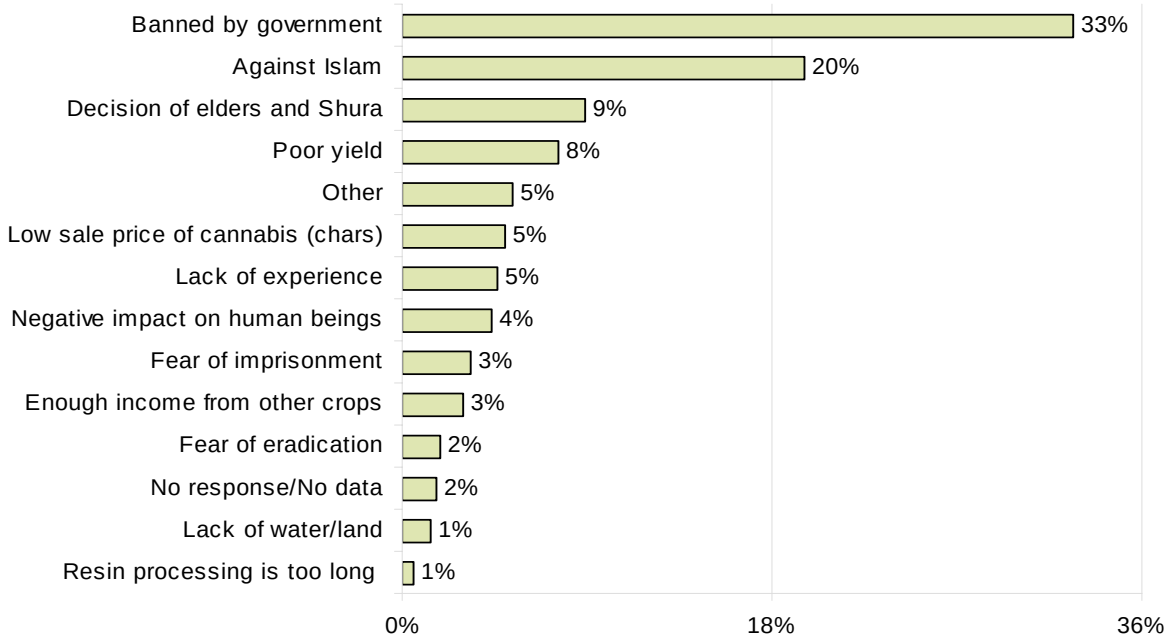


Reason for stopping cannabis cultivation

Similar to opium poppy, cannabis is an illicit crop in Afghanistan and the possession of cannabis products is a legal offence. A high number of farmers reported that they stopped cannabis cultivation because of the ban by the government. The other dominant reasons were because cultivation is against Islam, decision of the elders and Shura, as well as poor yield. Other reasons included lack of experience, negative impact on human beings, fear of imprisonment, enough income from other crops and fear of eradication. Quite a few also mentioned that cannabis resin processing is too time consuming or that they lack water and land to cultivate cannabis.

Approximately 25% of the farmers who stopped cannabis cultivation, compensated the loss of cash income by taking a loan, other employment, labor work, help from abroad, or selling household goods.

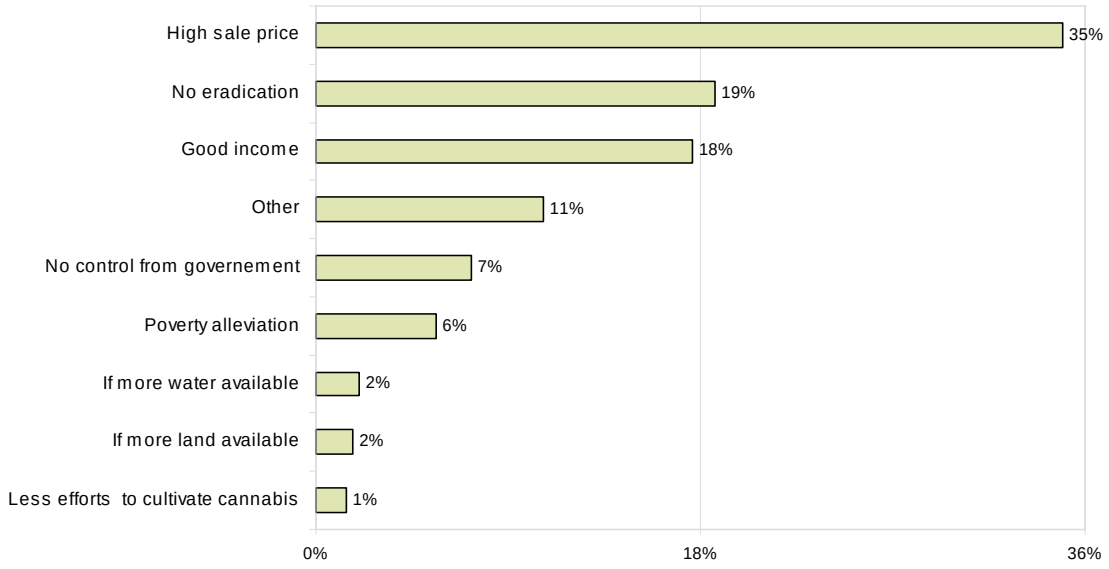
Figure 7: Reasons for stopping cannabis cultivation (n = 1,553 farmers)



Conditions for resuming cannabis cultivation in future

The farmers who stopped cannabis cultivation were asked under what condition they would restart growing it. A number of farmers responded that they would grow cannabis because its high sale price (35%), lack of eradication (19%), good income (18%), no control from the government (7%) and to alleviate poverty (6%).

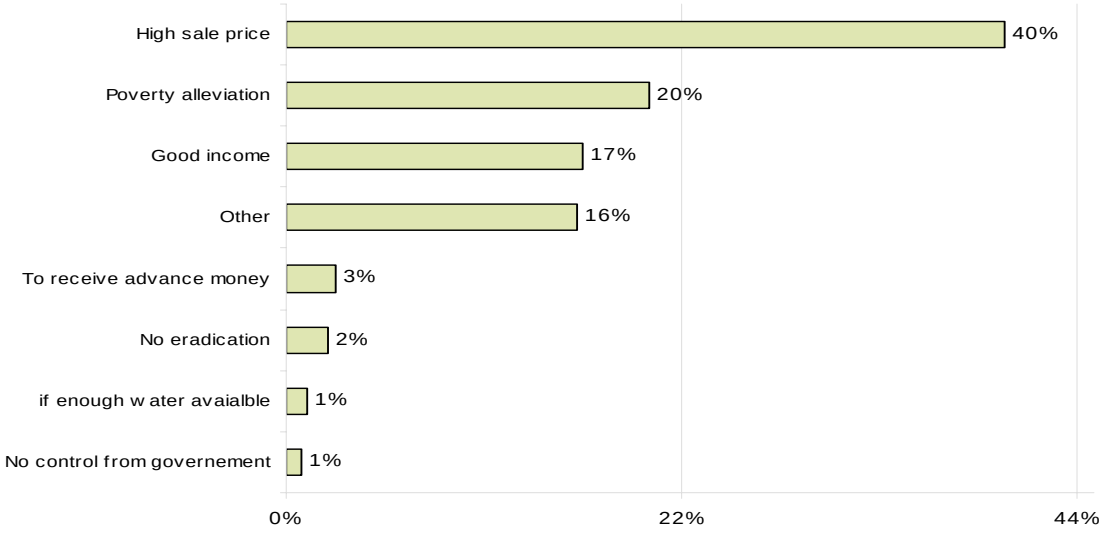
Figure 8: Conditions for resuming cannabis cultivation in future, reported by farmers who stopped cultivation (n=1,553 farmers)



Conditions which would lead farmers who had never grown cannabis to start cultivating it

Farmers who had never grown cannabis, were asked under what conditions they would start cultivating it. The conditions included: high sale cannabis price (40%), poverty alleviation (20%) and good income from cannabis (17%). Few farmers reported that they would start if they would receive advance money (3%), there was no cannabis eradication (2%), there was more water available (1%) or if there was no control from the government (1%).

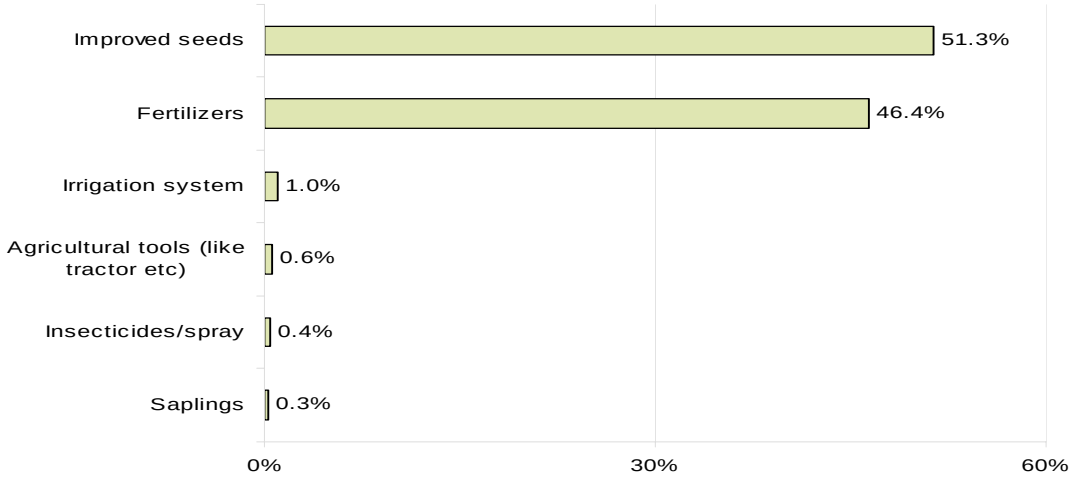
Figure 9: Reason for potentially cultivating cannabis in future as reported by farmers who have never grown cannabis (n = 2,625 farmers)



Agricultural assistance received

Village headmen were interviewed in the survey to understand farmers' access to agricultural assistance services. More than half of villages surveyed (51%) reported having received agriculture assistance. The assistance was provided in the form of seeds, fertilizer and provision of irrigation. The types of assistance varied and included improved seeds (51%), fertilizers (46%), irrigation system improvement (for example karez) and stream cleaning (1%). Support in the form of agricultural tools, insecticides and saplings was minimal (less than 1% each).

Figure 10: Type of agricultural assistance received reported by headmen (n =1,634 villages)



There was a statistical association between cannabis cultivation and not having received agricultural assistance but the size of the effect was not very big. Villages that had not received agricultural assistance were slightly more likely to have cannabis cultivation. This association may also be due to the fact that most cannabis growing villages were located in the Southern region, where the security situation is volatile and the delivery of agricultural assistance difficult.

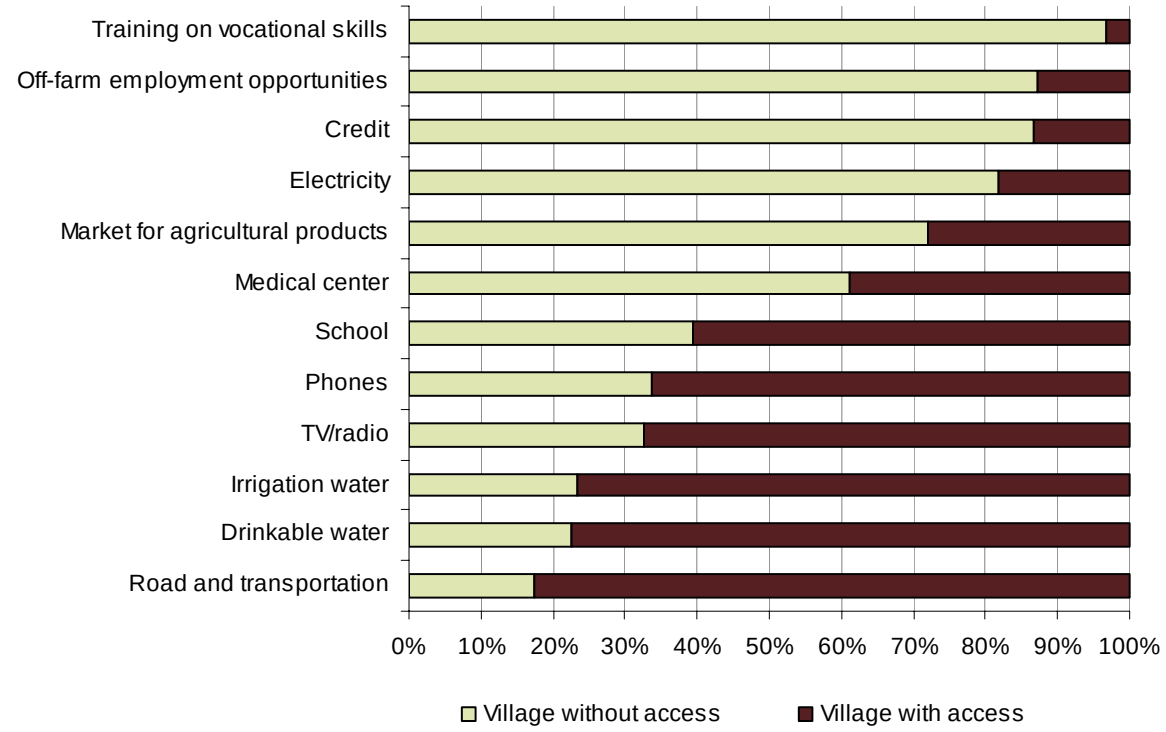
Table 5: Agricultural assistance and cannabis cultivation, 2009 (n=1,634)

No. of villages	No cannabis cultivation	Cannabis cultivating village	Total
No agricultural assistance received	417	380	**797**
Agricultural assistance	498	339	**837**
Total	**915**	**719**	**1,634**

Access to development facilities in the surveyed villages

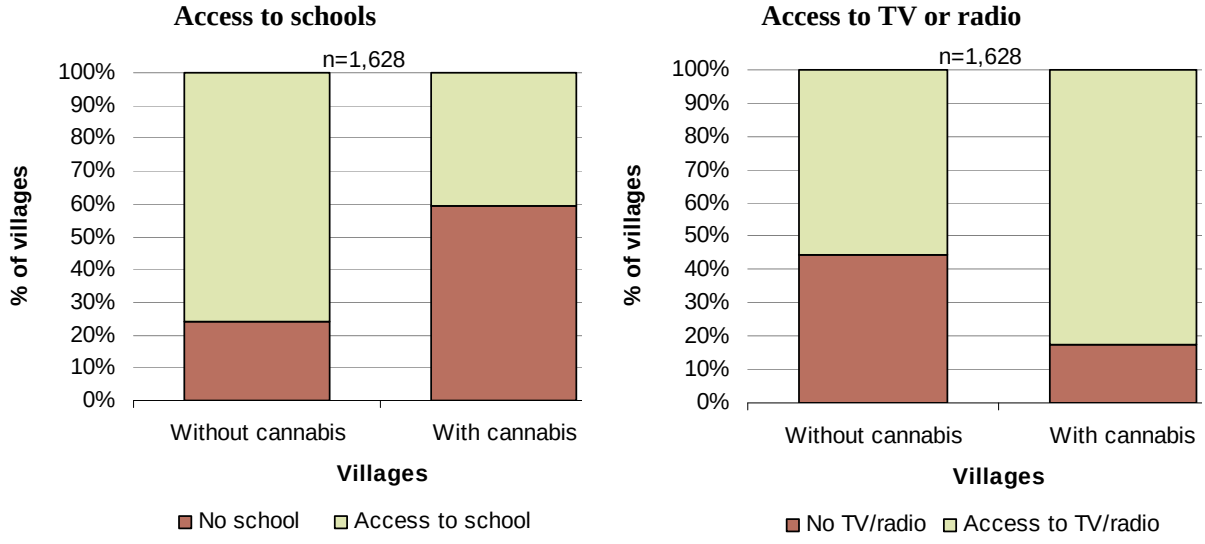
All village headmen were interviewed on the status and availability of basic development facilities in their villages. Basic facilities on which information was collected covered credit, electricity, irrigation, markets for agricultural products, medical facilities, off-farm employment opportunities, telephones, drinking water, road and transport, schools, training on vocational skills and access to TV/radios.

Figure 11: Access to services in the cannabis risk area, 2009 (n = 1,628 villages)



According to the information provided by headmen, over three quarters of the villages surveyed had no access to vocational training, off-farm employment, credit facilities and electricity. Over half of the villages had no access to market for their agricultural products and no local medical facility.

Figure 12: Access to schools and media in the cannabis risk area, by cannabis growing status, 2009



Little difference was found between cannabis growing and non-growing villages with regard to access to roads, off-farm employment, credit and electricity. More cannabis growing villages reported to have access to market facilities than non-cannabis growing villages. This may be due to the fact that most cannabis growing villages were located in the Southern region with mainly flat terrain were transport in general is easier than in mountainous regions.

Significant differences were found in access to schools. The proportion of villages with no access to schools was much higher among cannabis growing villages. On the other hand, the proportion of villages were the population reportedly had access to TV and radio was much higher in cannabis growing villages.

It was not possible to verify the information provided by headmen. However, it can be concluded that basic conditions for agricultural development were absent in large parts of the cannabis risk area. Lack of access to educational facilities is worrying especially in cannabis growing villages, while there seems to be a wider access to TV and radio.

Income sources of the farmers and cannabis cultivation

The income level of the cannabis cultivating farmers was compared with the income of farmers who stopped cultivating cannabis in 2008 and of farmers who had never grown cannabis. The average reported income of cannabis cultivating farmers was higher than the income of farmers who stopped cultivation (-7%) and farmers who have never cultivated cannabis (-28%). Moreover, farmers who stopped cannabis cultivation, had less income from wheat (30%) than farmers who never cultivated cannabis (35%). Wheat was the major income source of the farmers who did not grow cannabis and those who had stopped growing cannabis. Their other sources of income included daily wages, remittances, other licit crops and livestock.

Figure 13: Sources of 2008 cash income of farmers cultivating cannabis in 2009

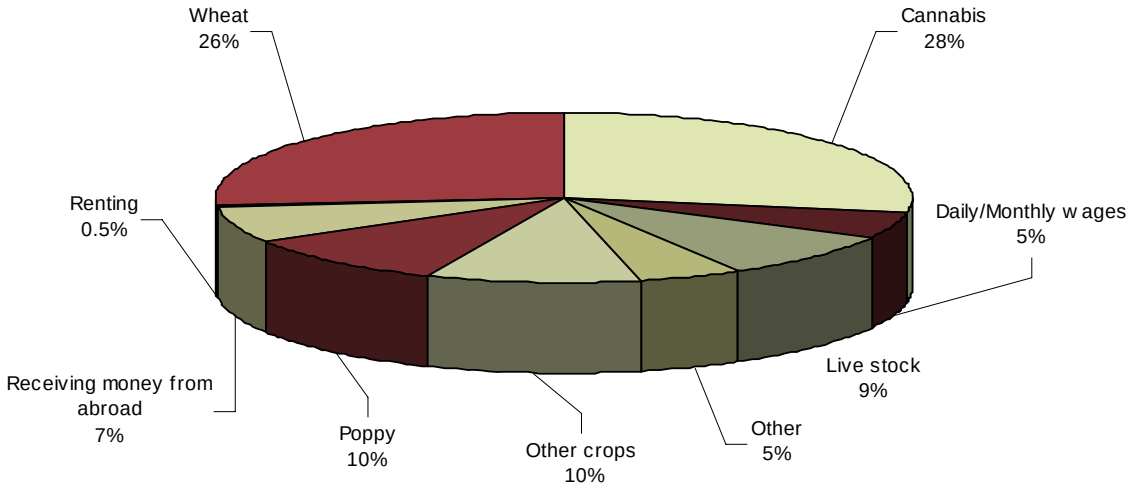


Figure 14: Sources of 2008 cash income of farmers who stopped cannabis cultivation in 2009 or before

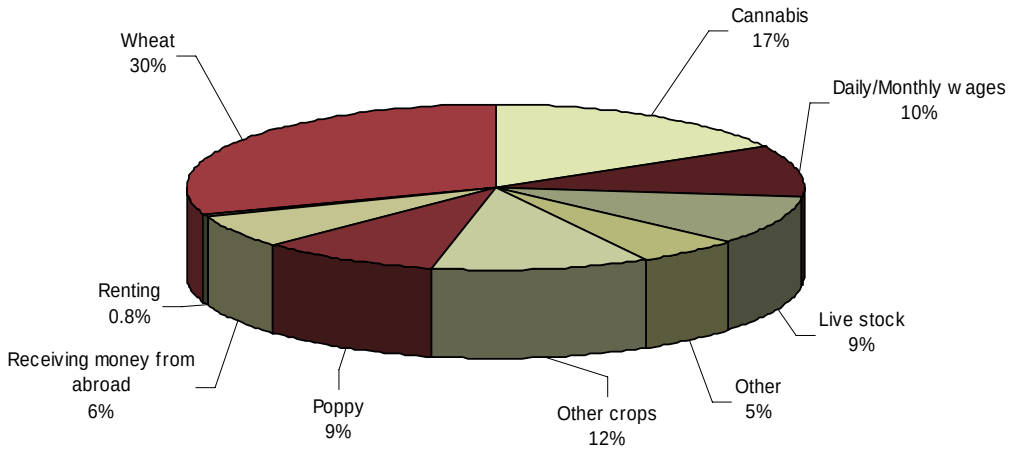
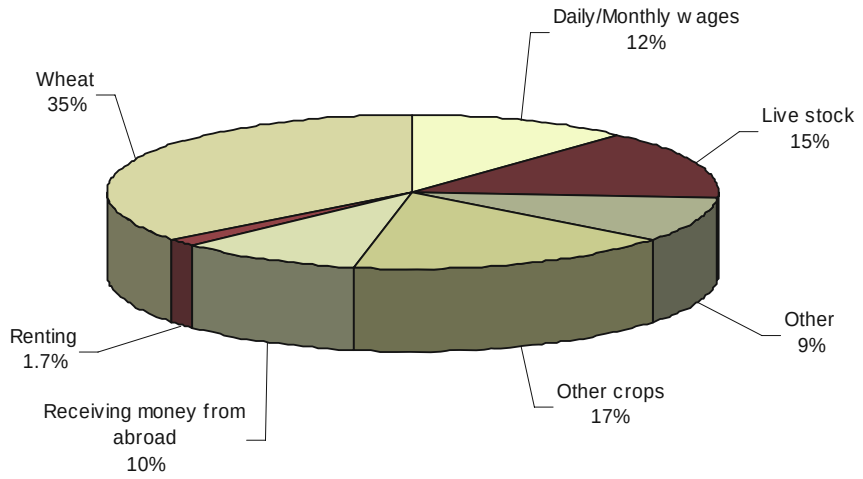


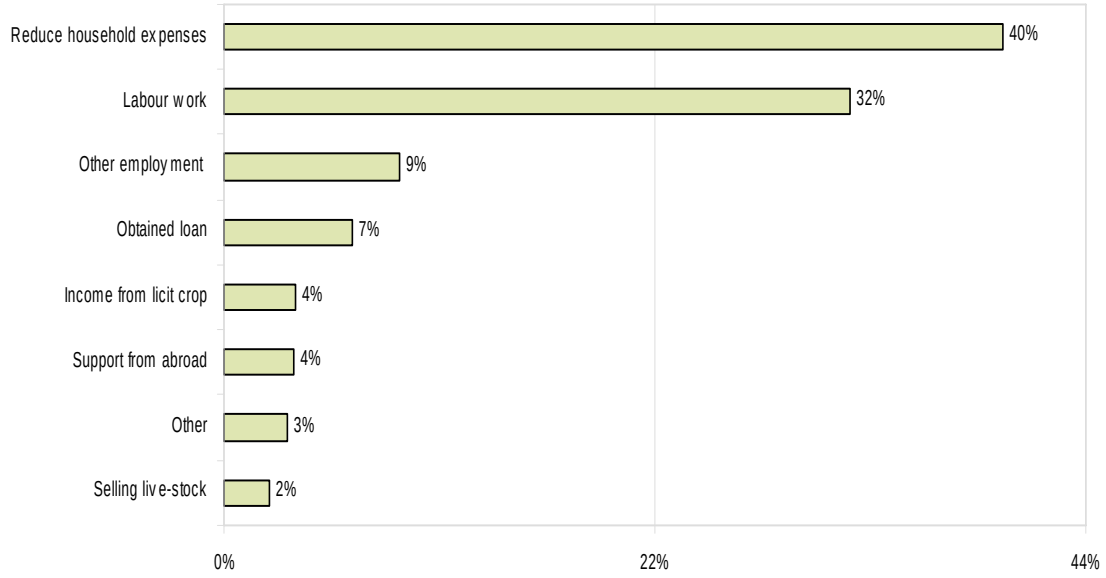
Figure 15: Sources of 2008 cash income of farmers who never cultivated cannabis as reported in 2009



Coping strategy for the reduced income of farmers who stopped cultivating cannabis

The farmers who stopped cannabis cultivation were asked if their income had decreased or increased or whether there was no change. About 25% reported that their income had decreased and they had difficulties to cope with the situation. Many had to reduce household expenses (40%), others reported that they had to engage in wage labour (32%). Other strategies used by farmers were: alternative employment 9%), obtaining loans (7%), cultivation of licit crops (4%), remittances (4%) and selling of livestock (2%).

Figure 16: Coping strategies for the reduced income by stopping cannabis cultivation



Cannabis cultivating households

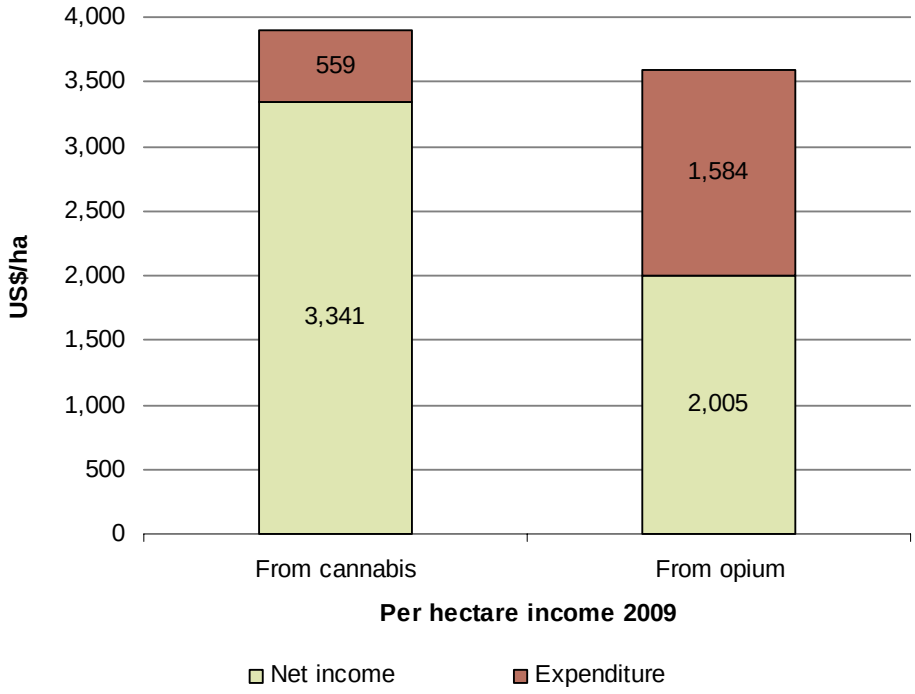
Based on the villages survey, the number of cannabis growing households in 2009 was estimated at 40,000 households. The 40,000 households estimated to be involved in cannabis cultivation was calculated on the basis of the interviews carried out during the village survey. This number fits well with the range that can be calculated for the number of households on the basis of the area under cannabis cultivation (10,000 ha to 24,000 ha) and the estimated average area of area under cannabis cultivation per household (0.4 ha). Based on this calculation the number of households involved in cannabis cultivation ranges between 25,000 and 60,000.

Income from cannabis

Based on prices at the time of resin extraction (January 2010) and the average resin yield of 2009, farmers could achieve a gross cash income per hectare of US$ 3,890/ha (rounded US$ 3,900/ha) from cannabis resin. This is slightly more than the gross income from opium was in 2009 (US$ 3,600/ha). The gross income from cannabis resin does not take into account the potential value of cannabis by-products such as cannabis seeds or stalks.[13]

[13] In the yield observation survey, farmers reported on average of 665 kg cannabis seed per hectare on cannabis mono-crop fields, ranging from a minimum of 175 kg/ha to 1,400 kg/ha. Considerably higher seed yields were reported in the S-E region (average 943 kg/ha) than in the N-NE-W region (average 294 kg/ha). One farmer reported obtaining a price of 20 Afghanis (approx. US$ 0.41) per kg for cannabis seeds. The average seed yield of 665 kg/ha would add US$ 273 to the gross income per hectare.

Figure 17: Average annual per hectare income from cannabis and opium (US$), 2009



With an average of 0.4 ha per household, the average gross income from cannabis per household amounted to US$ 1,553. This is slightly less than the gross income per household from opium in 2009 (US$ 1,786).

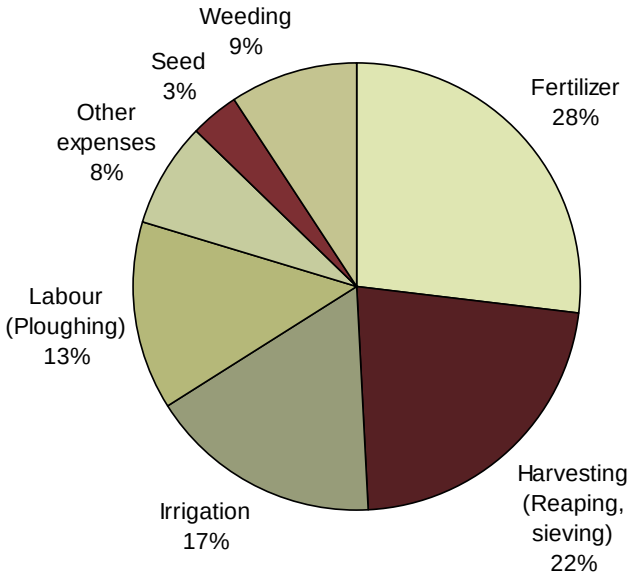
The expenditure per hectare of cannabis cultivation was estimated at US$ 559/ha or 14% of gross income. This is much lower than costs of opium cultivation, which was estimated at US$ 1,584/ha or 44% of gross income from opium per hectare. Cannabis farmers have lower costs especially for harvesting, which in the case of opium is done by skilled lancers who often come from other provinces. For opium cultivation, lancing cost constituted almost half of all expenditure whereas for cannabis cultivation, costs for fertilizer were a more important expenditure item, and harvesting and cannabis extraction (sieving) accounted for only 22% of total per-hectare expenditure. The focus group interviews and yield observation surveys revealed that cannabis harvest, i.e. cutting the plants, and resin extraction are two separate activities which can be spread over several weeks. Thus, farmers manage to conduct many of these necessary activities with ("free") family labour without having to hire outside labourers.

Expenditures for cannabis cultivation are closer to those needed for wheat cultivation which are estimated at 20% of gross income. In combination with the relatively high per hectare gross income, this makes cannabis a more profitable crop than opium poppy. Notwithstanding this, the survey showed that a much smaller number of households was involved in cannabis cultivation and that the average area cultivated with cannabis per household was smaller than the average area households use for opium poppy cultivation. In addition, mixed cropping of cannabis is common in some regions, a pattern which is not know from opium cultivation.

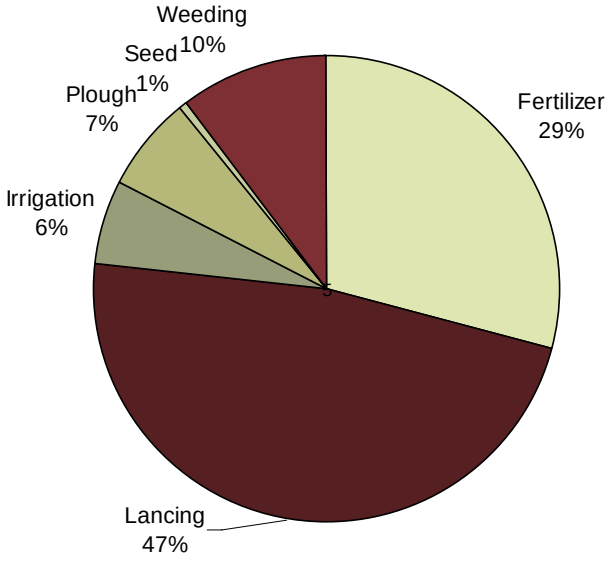
Why would households not grow more cannabis and exclusively as a mono-crop? One hypothesis is that less land for cultivation is available in summer, the second agricultural season in the year, when cannabis is grown. Other reasons may include less water available for irrigation. In a subsistence agriculture, food crops and fodder are to a certain point indispensable, and compete with cash crops like cannabis for scarce land.

Figure 18: Comparison of expenditure distribution per hectare of opium and cannabis cultivation, 2009

Expenditure distribution for cannabis cultivation



Expenditure distribution for opium cultivation

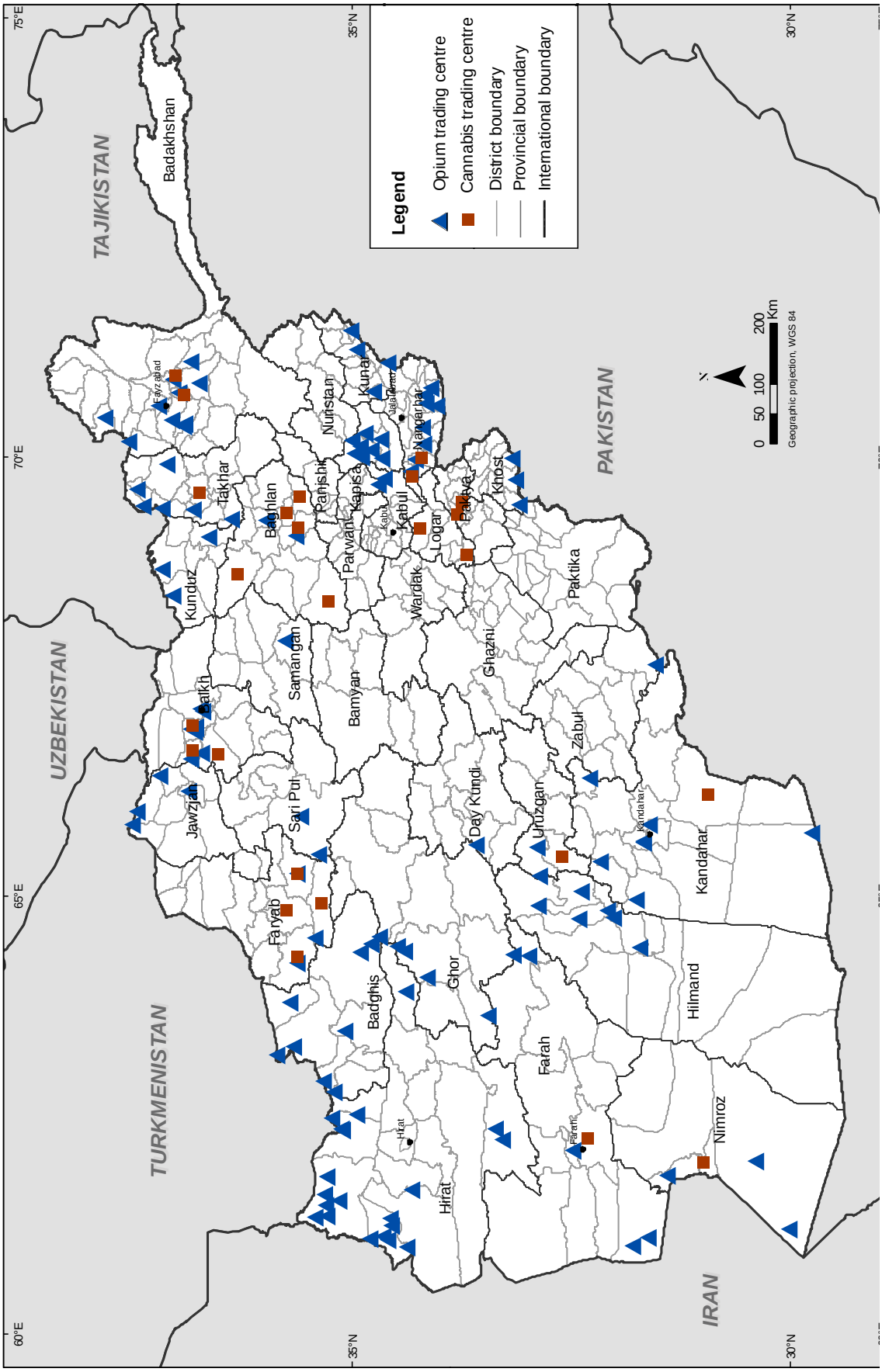


Cannabis trading

According to anecdotal information received during the survey, many illegal cannabis trading centres exist in different parts of the country. In the Northern region, it is reported that there are cannabis trading centres in Baghlan-i-Jadad, Talwa Barfak, Andarab, Puli-Hisar and Deh-Salah in Baghlan province; Chimtal, Balkh, Chaharbolak and Gurziwan in Balkh province and Qaysar, Kohistant and Pashtonkot in Faryab province. In the Eastern region, Hesarak and Sherzad in Nanagarhar province are famous for such illegal trading centres. In the Central region the centres are located in Ahmad Abad, Sayd Karam in Paktya province and Kharwar and Mohammad Agha districts in Logar province. In the North–eastern region, Khash and Baharak districts in Badakhshan province and Taloqan in Takhar province are known for illegal cannabis trading centres. In the Southern region, Dehnaw in Uruzgan province and Spin Boldak in Kandahar province are the most famous centres inside Afghanistan. Spin Boldak is also well known as a centre for preparing hashish from garda. In the Western region, Farah and Nimroz cities are known for the cannabis trading. The survey revealed that traders have introduced the technique of converting garda to hashish using machines. Most recently, this has been found in main cannabis trading centres in Kandahar, Balkh and Uruzgan. These centres are at clandestine locations such as in the areas of Chimtal in Balkh, Dehnaw in Uruzgan and Spin Boldak in Kandahar province.

Unlike opium, garda can reportedly be stored only for 3 to 10 months depending upon the moisture content. If the garda is not properly stored, it can get spoiled and its quality reduced. Most of the farmers reported that they prefered to sell the garda immediately after harvesting. However, few farmers, who can afford to wait till the price of garda rises, store garda 3 to 10 months in leather or goat skin bags, called “gharak”.

Map 4: Drug trading centres in Afghanistan, 2009



Cannabis prices

Farm-gate prices of cannabis garda

Differences in the farm-gate price of cannabis resin reflect different garda qualities and regional distribution. Prices reported by farmers during the survey referred to first, second and third garda. Fourth garda prices were not reported although some farmers reported fourth garda yield figures.

Prices reported from the S-E region (Southern, Eastern, Central regions) were lower for all garda qualities. This is consistent with reports that the processing of garda in this regions results in higher garda yields per hectare but lower quality garda. The price difference between first and second, and first and third garda were also slightly larger in the S-E region.

Figure 19: Farm-gate prices of garda reported by headmen at the time of the survey (US$/kg), 2009

Region	1st garda (US$/kg)	2nd garda (US$/kg)	3rd garda (US$/kg)	2nd garda price as % of 1st garda price	3rd garda price as % of 1st garda price
N-NE-W	57.3	38.6	21.6	0.7	0.4
S-E	41.9	24.9	11.7	0.6	0.3
Average*	**51.0**	**33.0**	**17.5**	**0.7**	**0.3**

** Simple average of provincial averages.*

The prices reported by headmen referred to the current prices at the time of the survey. Focus group interviews revealed, however, that most farmers sell their cannabis garda soon after harvest, i.e. in January. Therefore, the January prices reported through the monthly price monitoring system were used to calculate farmers' income and farm-gate value of cannabis production. The January prices were higher than the prices reported during the survey, as some regions experienced a price increase in the course of 2009, namely Nangarhar and Balkh, while others were at about the same level.

Table 6: Farm-gate prices of cannabis garda by region from the monthly price monitoring system (US$/kg), January 2010

	1st garda (US$/kg)	2nd garda (US$/kg)	3rd garda (US$/kg)
Average*	**58**	**38**	**20**

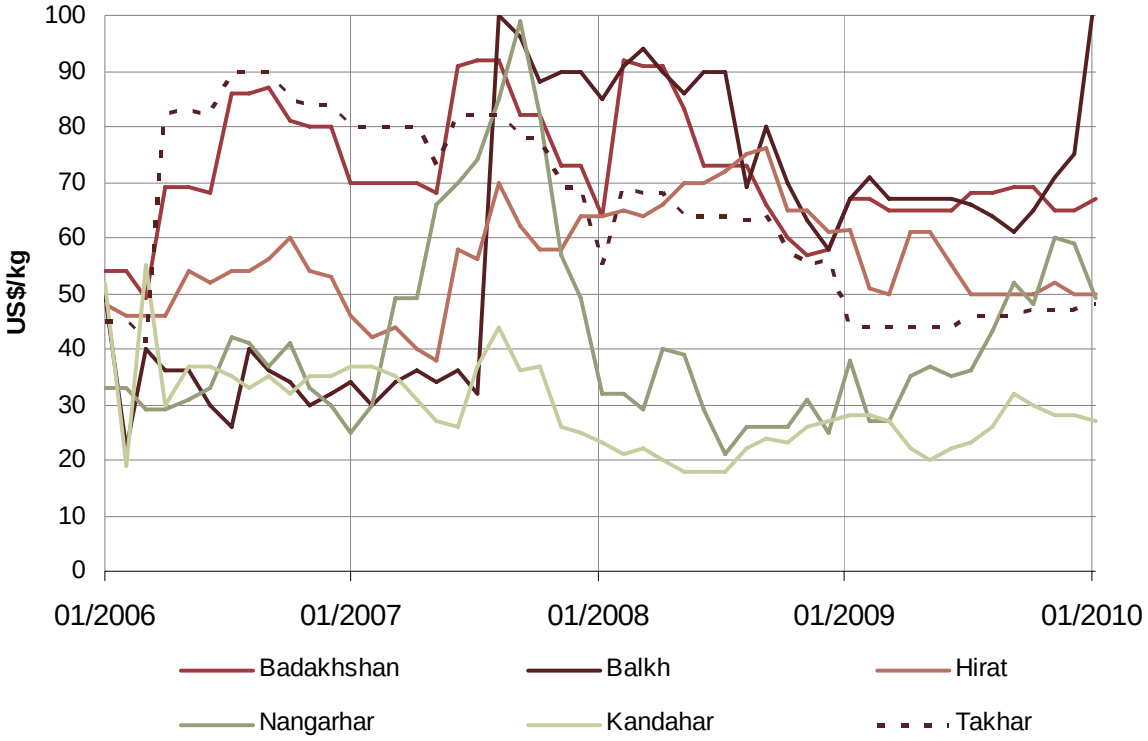
** Simple average of provincial averages.*

Source: 1st garda prices: MCN/UNODC monthly price monitoring report, January 2010. 2nd and 3rd garda prices: own calculations.

Regional differences in cannabis garda prices

Between January 2006, when regular price monitoring started, and January 2010, monthly farm-gate prices of cannabis garda showed large changes both within and across regions. Compared to other regions, prices in the south were relatively stable since 2006. Since the beginning of 2008, the north shows higher prices than in the South and East. However, in the second half of 2009, prices in Balkh and Nangarhar sharply increased whereas other provinces showed little changes. As there is no standard garda quality, it is not possible to determine to what extend cannabis garda prices reflect changes in the garda quality of changes in the market.

Figure 20: Monthly farm-gate prices of cannabis garda (best quality) by region, Jan. 2006 – Jan. 2010



Source: MCN/UNODC monthly price monitoring system.

As it can be noted in the graph above, in January 2006, there was a narrow difference between provinces (around US$ 20/kg). This difference was much higher (around US$ 64/kg) in October 2007, it reduced again December 2009 (reaching about US$ 46/kg). During the period January 2006 to January 2010, the highest price (around US$ 100/kg) was found in Badakhshan in July 2007, whereas the lowest price (around US$ 19/kg) was found in Kandahar in July 2008. The national average price for cannabis was relatively low (around US$ 39/kg) in February-March, 2006 and it jumped to its highest (around US$ 78/kg) in August-September 2007. At the end of 2009 it return to the 2006 levels reaching US$ 52/kg.

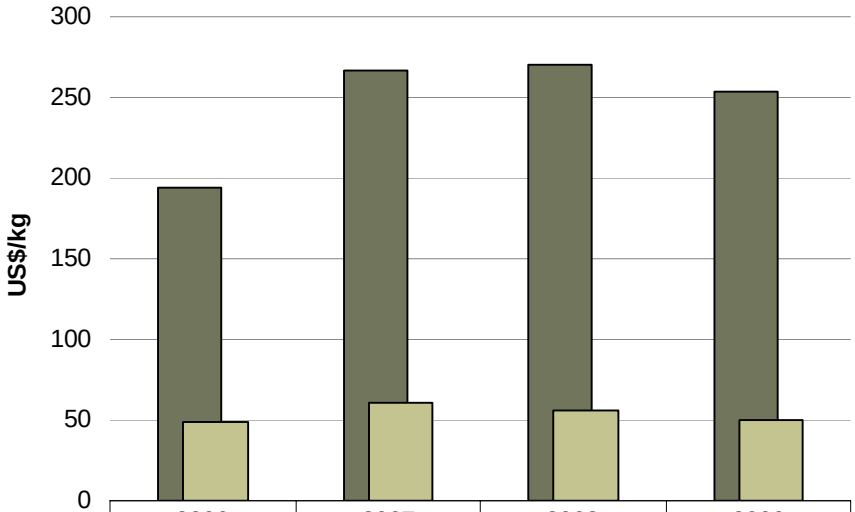
The general annual trend shows that prices had moved up during 2007-2008 (US$ 60/kg and US$ 56/kg respectively) in comparison to 2006 (US$ 49), and decreased in 2009 (US$ 50/kg). The same trend was reflected by wholesale prices for hashish on the Peshawar market in Pakistan.

Farm-gate prices of hashish

Farm-gate prices for hashish were reported by headmen in practically all cannabis cultivating villages. This indicates that some farmers process cannabis garda into hashish, locally also called *charas*. However, interviews with farmers during the yield observation survey revealed that most farmers do not produce hashish but sell cannabis garda. Out of 46 farmers interviewed during the yield observation survey, only 9 produced hashish.[14] The conversion from garda to hashish requires a considerable labour input or the availability of machines, which require access to electricity and are not easily available in the rural area. These machines are reportedly used by traders rather than by farmers. This may be one of the reasons why most farmers do not process cannabis garda into hashish, despite the considerable increase in value.

[14] The exact proportion of farmers engaged in converting cannabis garda into hashish or the quantity of garda being processed by farmers could not be quantified as this was not part of the main survey questionnaire.

Figure 21: Average annual prices of cannabis products in Pakistan and Afghanistan, 2006-2009



	2006	2007	2008	2009
Peshawer, Pakistan (hashish, best quality, wholesale)	194	267	270	253
Afghanistan (cannabis 1st garda, farm-gate)	49	60	56	50

Table 7: Farm-gate hashish prices as reported by headmen at the time of the survey (US$/kg), 2009

	1st garda hashish (US$/kg)	2nd garda hashish (US$/kg)	3rd garda hashish (US$/kg)	2nd garda hashish price as % of 1st garda hashish price	3rd garda hashish price as % of 1st garda hashish price
N-NE-W	82	56	35	0.7	0.4
S-E	63	48	33	0.8	0.5
Average*	**74**	**53**	**34**	**0.7**	**0.5**

** Simple average of provincial average prices.*

The hashish grading and prices reported seem to reflect the cannabis garda qualities (1st, 2nd and 3rd garda). Hashish prices were 1.5 to almost three times more the price of cannabis garda (powder), depending on the region and garda quality. While the value added for 1st garda hashish was similar in the N-NE-W and S-E region, 3rd garda hashish prices were almost 3 times the prices of 3rd garda powder.

Table 8: Farm-gate hashish price as proportion of cannabis garda powder price (US$/kg), 2009

	1st garda (US$/kg)	2nd garda (US$/kg)	3rd garda (US$/kg)
N-NE-W	1.4	1.5	1.6
S-E	1.5	1.9	2.9
Average	**1.5**	**1.6**	**1.9**

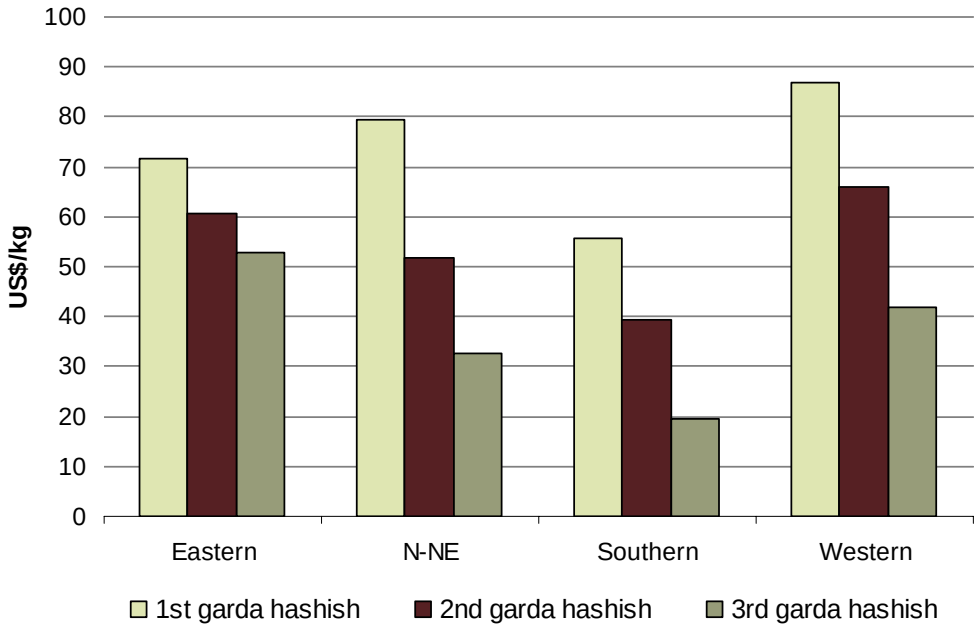
Note: Calculated from headmen's responses at the time of the survey.

It is not clear if 3rd garda hashish is exclusively made from 3rd garda powder as information from focus group interviews indicate that mixing of garda from different sieving processes is common, especially in the South. This may also be true for hashish. A further disaggregation of hashish prices reveals that in the Eastern region, prices for hashish of different qualities differ relatively little, whereas in all other regions, larger price differences were observed. As for the different garda qualities, it should be noted that there is no standard hashish quality, and the composition and drug content of the product sold as hashish was not investigated in this survey. The fact that prices for 2nd garda hashish in the Eastern and Western regions

were higher than the 1st garda hashish price in the Southern region can be a result of differences in demand and/or different garda quality but it could also be a consequence of (actual or perceived) differences in product quality.

The average wholesale price of best quality hashish in Peshawar (US$ 253/kg) in 2009 was over three times the farm-gate price of hashish reported by headmen. This price difference is higher than for opium, which was traded at US$ 145/kg in Peshawar while the farm-gate prices of dry opium at harvest time was US$ 63/kg at harvest time.

Figure 22: Farm-gate prices of hashish by region as reported by headmen (US$/kg), 2009



N-NE: The Northern and North-eastern regions were joined due a low number of observations in the North-eastern region.

Cannabis seizures

Drug seizures to not necessarily take place close to the place and time of production. They do not necessarily reflect cultivation patterns or production levels but can also indicate possible trafficking routes, markets and consumption centres.

Many cannabis cultivating provinces appear on the list of provincial hashish seizure amounts reported by CNPA between 2007 and 2009. In 2007, the highest quantity of hashish was seized in Paktya (11,693 kg), followed by Kandahar (9,266 kg) and Khost (8,329 kg). In 2008, Kandahar topped the list with an exceptionally high seizure of 244,638 kg, most of which was seized in one single operation, followed by Paktya (13,975 kg) and Balkh (3,803 kg). In 2009, none of the northern and north-eastern provinces had large seizure amounts and the bulk of seizures was reported for the Central, Eastern and Southern region.

In the regions of Central Asia, Middle East and South Asia, most cannabis resin seizures are reported from Afghanistan, Iran and Pakistan. Reports from Iran and Pakistan indicate that most of the cannabis resin (hashish) seized there originates from Afghanistan. Data from Pakistan shows a generally upward trend of cannabis resin seizures since 2005 whereas seizures in Iran have declined recently. The large cannabis resin seizure in Kandahar in 2008 was exceptional within Afghanistan but also in comparison to its neighbours. A similarly large seizure did not occur in Afghanistan in 2009.

Table 9: Hashish seizures in Afghanistan by province (kg), 2007 - 2009[15]

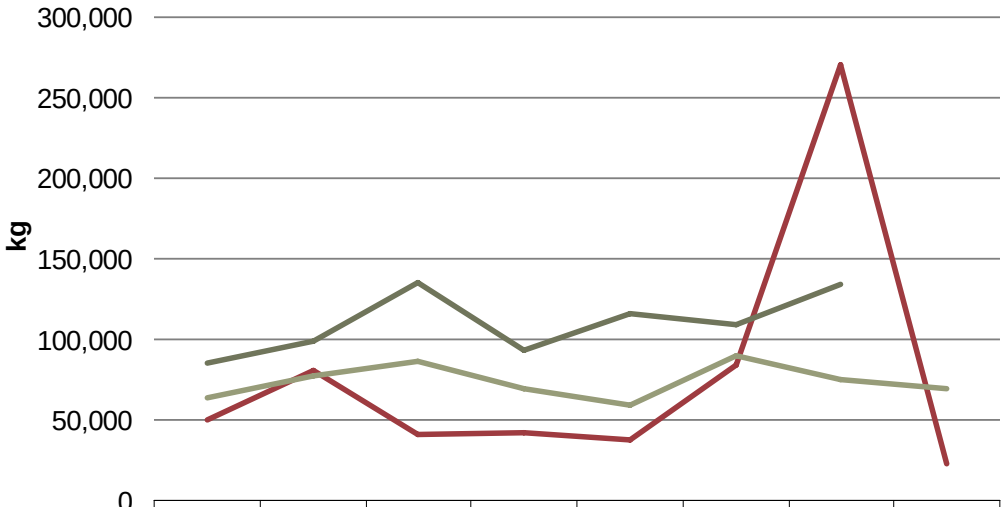
Province	2007	2008	2009
Badakhshan	74	362	153
Badghis	30	0	1
Baghlan	38	1,124	27
Balkh	4,042	3,803	37
Bamyan	0	0	1
Daykundi	0	0	0
Farah	0	0	0.1
Faryab	71	0	0.1
Ghazni	0	0	3
Ghor	19	0	0
Hilmand	1,112	1,466	558
Hirat	1,880	2,786	40
Jawzjan	24	45	51
Kabul	5,067	531	11,319
Kandahar	9,266	244,638	6,765
Kapisa	1	0	1
Khost	8,329	0	13
Kunar	0	173	104
Kunduz	319	236	23
Laghman	0	0	8
Logar	5,455	0	14
Nangarhar	5,663	1,200	3,184
Nimroz	6,182	285	44
Nuristan	0	0	0
Paktika	0	0	0
Paktya	11,693	13,975	594
Panjshir	0	0	6
Parwan	0	25	17
Samangan	0	0	0
Sari Pul	0	0	0
Takhar	23	89	4
Uruzgan	0	0	5
Wardak	0	0	0
Zabul	399	302	0.3
D-333 *			72
Total	**59,686**	**271,040**	**23,041**

** Operations throughout the country*

Source: Counter Narcotics Police of Afghanistan (CNPA)

[15] Note: Figures presented here can differ from aggregate seizure amounts at the national level published in the World Drug Report 2010, which may include seizures from several agencies.

Figure 23: Seizures of cannabis resin (hashish) in Afghanistan, Iran and Pakistan (kg), 2002 - 2009



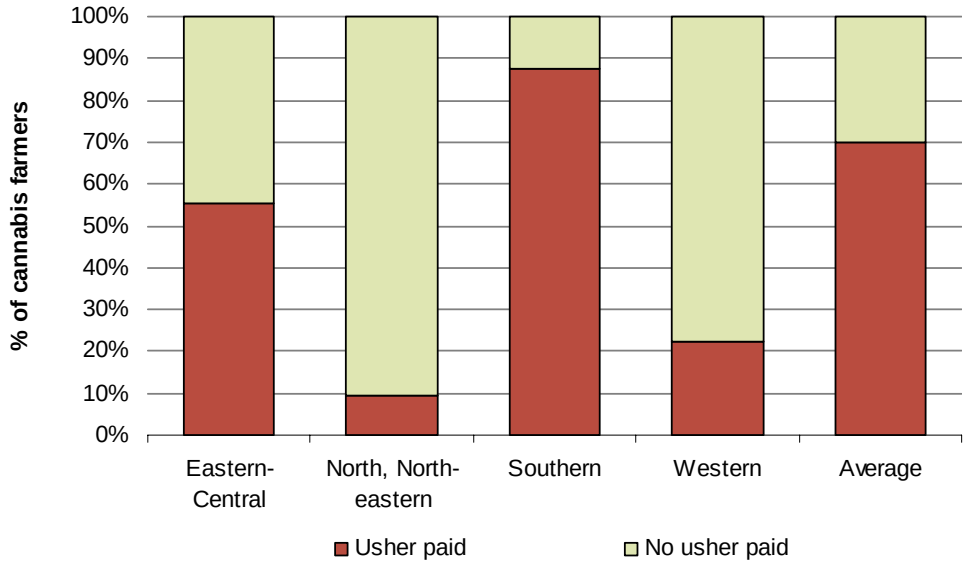
	2002	2003	2004	2005	2006	2007	2008	2009
Afghanistan	50,314	81,176	41,146	42,389	36,972	83,844	271,021	23,041
Iran, Islamic Republic of	64,166	76,991	86,500	68,836	59,189	89,718	75,092	69,222
Pakistan	85,126	99,123	135,639	93,539	115,444	109,531	134,622	

Source: Annual Reports Questionnaires 2002-2008. 2009 figures: Government reports. Pakistan seizure figures for 2009 were not yet available at the time of printing of this report.

Payment of tax on cannabis (usher)

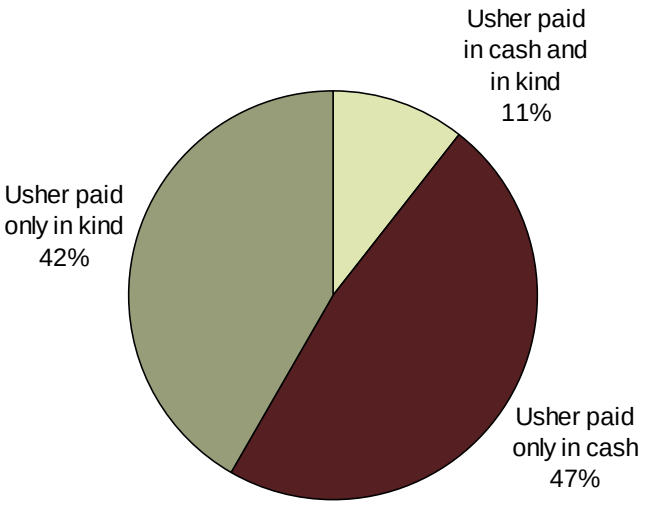
Usher is an informal tax of about 10% of the value on agricultural products paid by farmers to groups which control the territory in rural Afghanistan. Over two thirds of cannabis farmers (70%) reported the payment of usher on their 2008 cannabis production, whereas 30% did not pay usher. There were strong regional differences: An overwhelming majority of cannabis farmers in the Southern region paid usher, while few farmers in the Northern, North-eastern and Western regions did so. This regional pattern is similar to the usher payment pattern reported in the Annual Opium Survey 2009, when mostly farmers in the Southern region reported having paid usher on opium, compared to only a small proportion of farmers in other regions. In the Eastern and Central region, usher payment on cannabis was reported from Logar and Paktya provinces but not from Nangarhar.

Figure 24: Payment of usher in 2008 by region, reported by cannabis farmers in 2009 (n=724)



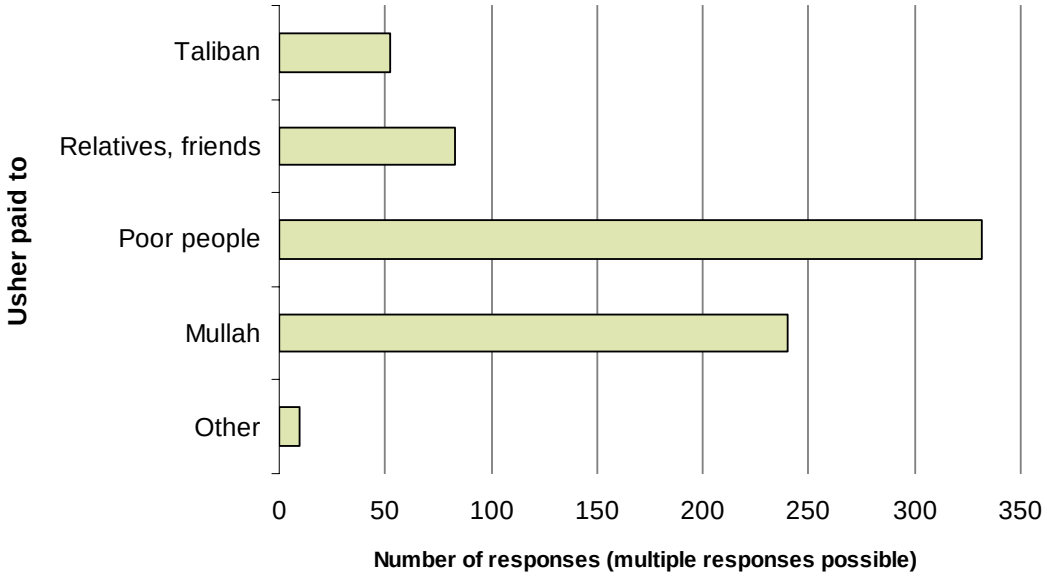
Almost an equal proportion of farmers reported paying usher only in cash or only in kind. Only a small proportion paid usher partly in cash and partly in kind.

Figure 25: Type of usher payment made by cannabis farmers in 2008, (n=508)



The responses on to whom usher was paid were not easy to interpret. Many cannabis farmers (35%) reported having paid to several recipients, e.g to the Mullah and the poor. These two recipients were often mentioned together, sometimes in combination with the Taliban. It is not easy to differentiate to whom the usher was paid, by whom it was collected and for which purpose. The responses given should therefore be interpreted with caution.

Figure 26: Recipients of usher payment in 2008, reported by cannabis farmers in 2009 (n=508)



Farm-gate value of cannabis production

The farm-gate value of cannabis garda production in 2009 was estimated to range between US$ 39 million and US$ 94 million. This is equivalent to 9% to 21% of the farm-gate value of opium production in 2009.

The farm-gate value of cannabis production correspond to 0.4% to 0.9% of the 2009 GDP of Afghanistan.

3 METHODOLOGY

The survey had two main components:

- A questionnaire survey with interviews of village headmen and three farmers per village in a sample of villages, randomly selected under an area frame sampling approach.
- A remote sensing survey using a sample of satellite images.

In addition, several other survey instruments were used to investigate specific aspects of cannabis cultivation and production:

- Focus group discussion: cannabis yield, harvesting, processing
- Yield observation: cannabis yield per field, timing of harvest, processing of plants, work inputs for processing, involvement of other household members

The information from the different survey instruments was complemented by information from the monthly price monitoring system, which also covers cannabis resin, and from the Annual Opium Surveys where appropriate.

The sampling was followed on the guidelines of an area frame sampling design. An area frame sampling design is a widely used methodology in agricultural statistics. 464 grids were selected by using probability proportional to size (PPS, where size is defined by the amount of agricultural land). Four villages (when there were only three villages in the segment, three villages were selected) within each grid were randomly selected using GIS tools (Hawth tools build-in in ARC view software). This resulted in a total sample size of 1,758 villages. This method has contributed sampling approach by weight on cannabis cultivated districts of Afghanistan based on past years with reference to the information collected during opium poppy survey conducted by UNODC survey section.

Given the lack of accurate and reliable statistics on the extent and distribution of area under cannabis cultivation in Afghanistan it has been proposed to carry out a survey which combines remote sensing techniques and village survey data. The aim of this survey is to provide the framework and procedures for obtaining reliable statistics on the cannabis situation in the entire territory of Afghanistan.

Survey components

Village survey

The sampling follows the guidelines of an area frame sampling design. An area frame sampling design is a widely used methodology in agricultural statistics. For the aims of this survey the following steps were carried out.

Construction of the sampling frame: The purpose of stratification in any survey is to reduce the variance of the variables under study in each stratum. The village frame is a list of villages compiled by The Central Statistical Office in Afghanistan and AIMS. It contains the village name, district name, province name, location, number of households, and average household size. It has 43,556 villages in total. This frame was overlaid with the most recent map of agricultural land in Afghanistan and divided in a series of 10 km by 10 km grids. The resulting frame is a collection of 4,231 grids (each of them with an area of 100 squared km); each grid in the frame contains one or more villages and a determined amount of agricultural land.

By consultations with survey coordinators in Afghanistan, it was concluded that several districts in some provinces in Afghanistan have little or almost null cannabis cultivation. In order to optimize resources, it was decided to exclude all this districts from the sampling frame. Therefore, only 105 districts in 20 provinces in Afghanistan were targeted as potential areas with cannabis cultivation.

Considering only the potential areas translates into a sampling frame of 13,713 villages enclosed within 1,569 grids holding approximately 30 million squared kilometres of irrigated land.

Auxiliary information collected during the cannabis rapid assessment in December 2008 also allowed survey coordinators to provide in some extent the degree of cultivation (low, medium, high) for each of the potential districts in Afghanistan. Due to non significant differences between low, medium and high cultivation levels, it was decided not to stratify the sampling frame under this scheme.

Sample size. More than one item or characteristic is usually measured in surveys and often times the number is large. If a desired degree of precision is prescribed for each item, the sample size calculations lead to series of conflicting values for n (see Cochran, Wiley 1977 for formulae). To determine the sample size for the cannabis survey in Afghanistan, two constraints were considered. Firstly, it was assumed that not much about the amount of cannabis cultivation was known, although some survey coordinators could provide in some extent orders of magnitude but the variability was too high to be able to be included as means of stratification. Secondly, there is a budget constraint due to field and operations costs, limiting the village survey to carry out up to 1,700 interviews.

In order to collect as much variability as possible in terms of area under cannabis cultivation among villages and taken into account the constraints described above it was determined to select a sample of clusters as primary sampling units (PSU). Each cluster corresponds to a grid which geographically groups a set of villages.

With an unknown value of the probability of finding cannabis cultivation in a village, a desired level of precision of +/- 5% and willingness of taking 1 in 20 chance of getting an unlucky sample, Cochran (1977) states that the minimum sample size may be calculated as below under a simple random sampling approach.

Equation 4.1

$$n = \frac{\frac{t^2 PQ}{d^2}}{1 + \frac{1}{N}\left(\frac{t^2 PQ}{d^2} - 1\right)}$$

Or for practical use, an advance estimate p of P is substituted in this formula. If N is large enough, a first approximation is

Equation 4.2

$$n_0 = \frac{t^2 pq}{d^2}$$

With a d=0.05 (precision), p=0.50 (unknown presence of cannabis), alpha=0.05 (error willing to take), t=1.96 (from normal distribution tables)

Thus equation 4.2 is

$$n_0 = \frac{(1.96)*(0.5)*(0.5)}{(0.0025)} = 400$$

Collecting data in the ground in Afghanistan involves costs which significantly restricts the size of the sample. Overhead cost of managing the survey and the cost per village interview limited the sample as expressed in the following formula.

Equation 4.3 and 4.4

$$n0*m < \text{Sample size} < 1{,}500$$

and

$$C(n) = co + c1*n$$

Where m is the number of villages to be interviewed in each grid, C is the cost function, Co is the overhead cost and C1 is the cost of interviewing each village headman.

With a view of absorb as much variability as possible within the grids, it has been opt to select up to 4 villages in each grid as secondary sampling units. Therefore, in order to maximize 4.4 subject to 4.3, the solution for n yields 400 grids.

It is a common practice in surveys to increase the sample size by an amount equal to the anticipated non-response rate. Increasing the sample ensures that the actual number of interviews completed in the survey will closely approximate the target sample size. Therefore, the resulting sample size is 464 grids.

Sample selection. Due to the fact that the agricultural land in each segment varies considerably, it was opt to use probability proportionate to size (PPS) sampling. The use of PPS sampling permits the sampler to have better control over the ultimate sample size in cluster surveys. Within each cluster, it was opt to use a fixed cluster size. This sampling plan, probability proportionate to size with a fixed cluster size has the following advantages:

- Maximum control of total sample size and costs
- Control of interviewer work loads

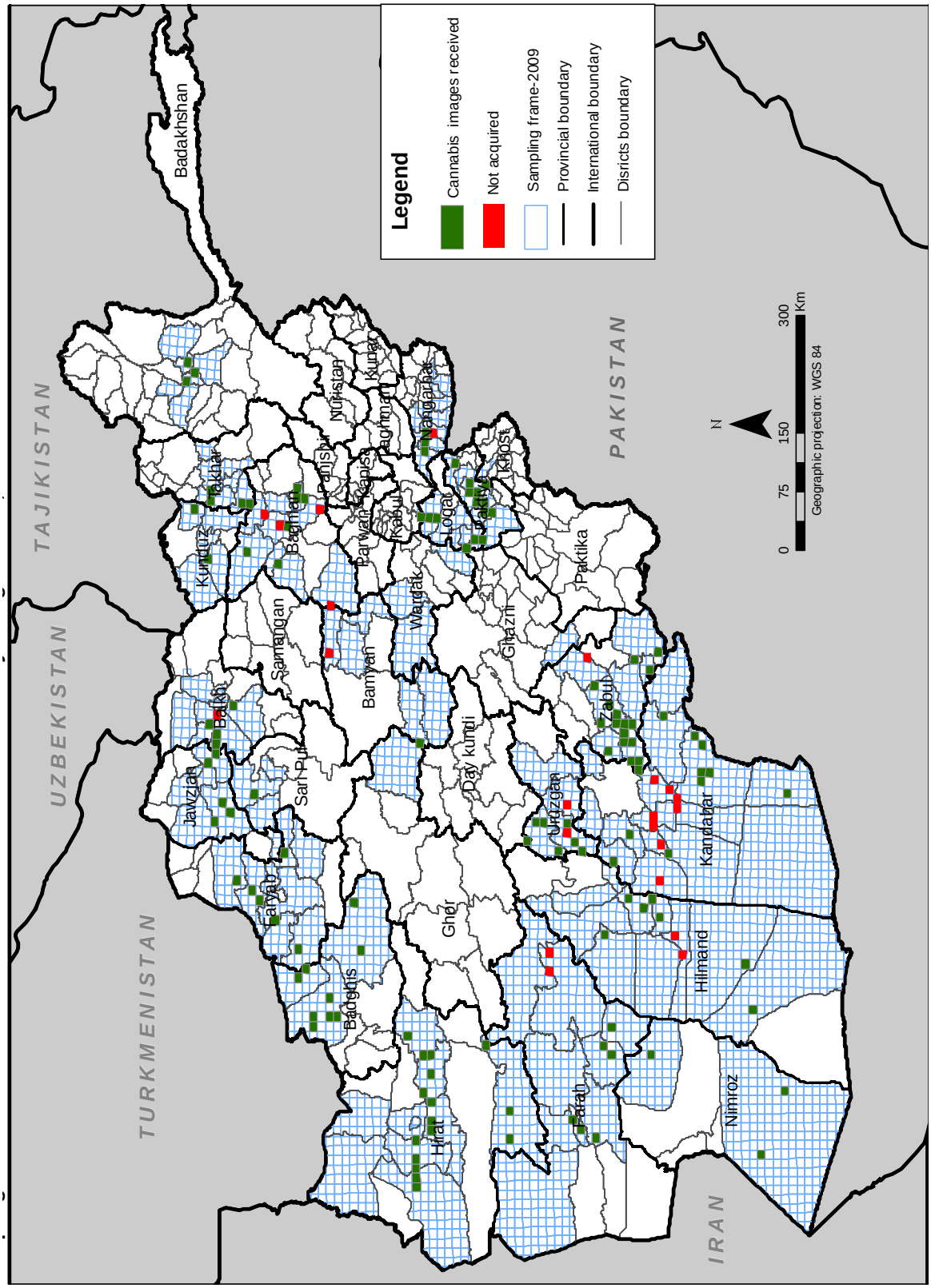
464 grids were selected by using probability proportional to size (PPS, where size is defined by the amount of agricultural land). Four villages (when there were only three villages in the segment, three villages were selected) within each grid were randomly selected using GIS tools (Hawth tools build-in in ARC view software). This resulted in a total sample size of 1,758 villages.

Data collection and data entry

The village survey was carried out by experienced surveyors of UNODC/MCN Afghanistan under the close supervision of UNODC/MCN Survey Coordinators, who were also involved in the opium poppy survey for many years. The methodology of the cannabis survey 2009 covered various tools, such as village survey through questionnaire to different types of farmers like “cannabis growing”, “stopped cannabis growing” and “cannabis never grown”. The village survey also included interviews of 1634 village headmen to understand the extent of cannabis crop cultivation and socio-economic factors behind it. In addition to the village survey, other important methods such as focus group discussions (FGD) with the targeted farmers, ground truth collection for the imagery interpretation, area estimation of cannabis field as well as the growth calendar of the crop and yield survey. In fact the survey methodology was based on a sampling approach and was combined with the use of satellite imagery and extensive field visits. For the images, high resolution satellite images were acquired.

For this task, 148 surveyors visited 1,634 responded villages out of a total of 1,758 sampled villages spread over 26 Provinces. The Villages were stratified according to the area frame sampling method. An area frame sampling design is a widely used methodology in agricultural statistics. A total of 464 grids were selected by using probability proportional to size (PPS, where size is defined by the amount of agricultural land). Four villages (when there were only three villages in the segment, three villages were selected) within each grid were randomly selected using GIS tools (Hawth tools build-in in ARC view software). This resulted in a total sample size of 1,634 villages. This method has contributed to determine the sampling approach by weight on cannabis cultivated districts of Afghanistan based on past years estimates with reference to the information collected during opium poppy survey conducted by UNODC survey section. Altogether, 148 surveyors interviewed 4,902 farmers in the village survey. The Survey Coordinators conducted targeted focus group discussions and also ensured quality and timeliness of the field work by conducting monitoring visits in all the regions.

The data were collected by the trained surveyors through the questionnaire prepared for interviewing the farmers cultivating cannabis, stopped cultivating cannabis, never grown cannabis and head man of the village to know his perception regarding the cannabis cultivation. The questionnaire also covered to know socioeconomic aspects of the farmers, reasons for growing, accessibility of loan for the crop and other licit crops, access to other financial institutions and other aid organizations in the area. All the questionnaires were reviewed by the regional Survey Coordinators and sent to UNODC or MCN central survey section. The data were entered by the data clerks based in Ministry of Counter Narcotics (MCN) under the supervision of Data Management Programmer of UNODC, survey section.



Map 5: Sampling frame and selected blocks for the cannabis satellite survey, 2009

Selection of grids for remote sensing survey

From the 464 grids, 147 were selected with a random sampling procedure for the remote sensing survey. In total, 128 very high resolution images (Geoeye and Quickbird) could be acquired and were interpreted with visual interpretation technique.

Ground truth information with field visits was collected in accessible locations. The ample images were taken from the cannabis field in different stages with latitude and longitudinal directions during the village survey and monitoring visits of the field. These images were used for verification of the satellite images in order to interpret and estimate the cannabis area cultivation.

However, the ground truths for the provinces of high security areas like Hilmand, Uruzgan, and Zabul were not possible to collect by the surveyors. For this air assets were sought with the special help of INL. In line with this, an air mission was undertaken for selected areas of Uruzgan, Kandahar, Zabul and Hilmand in a DC3 air-craft fitted with high resolution camera on 14th December 09. Although the timing of the flight was delayed due to maintenance of the air-craft and most of the cannabis fields were harvested in this time. In fact the air mission was successful for identifying the signature of cannabis in the satellite image. Further more the image interpretation and land estimation for cannabis was done by the remote sensing experts of the survey unit in close coordination with Vienna ICMP unit.

Picture 7: A surveyor using GPS

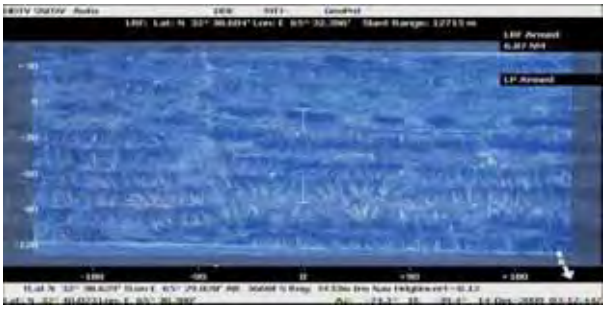
Location of cannabis field recorded using GPS

Ground truth collection

Ground truth information was collected in Badakhshan and Nangarhar through a segment survey (GPS points and field mapping). The collection of ground truth in most of the Southern region was difficult for the surveyors and survey Coordinators. Aerial observation was used to complement ground truth in high risk areas.

Picture 8: Cannabis field interpreted from the satellite images

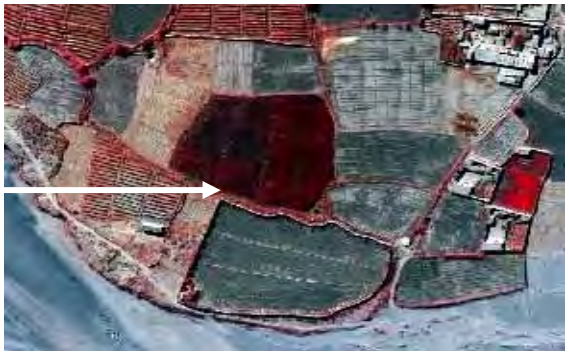
Picture 9: Aerial ground truth collection



Cannabis plants reaped and left for drying - Uruzgan - Oblique aerial photo

Dried cannabis with tent for 'garda' extraction on field

Cannabis field in Kandahar province- Oblique aerial photo



Cannabis field in Kandahar province- Satellite image

Cannabis field in Hilmand province- Oblique aerial photo

Cannabis field in Hilmand province- Satellite image

Foucs Group Discussions

A focus group (FG) is a form of discussion in which a group of people are asked about their attitude towards the objective they have been asked to answer. Questions are asked by the facilitator (Survey Coordinators) in an interactive group setting where participants are free to talk with other group members regarding the cannabis cultivation and its economic diversification. Focus group was conducted with farmers who cultivated cannabis in 2009. The main themes were to get information on cannabis planting, harvesting methods and yield. For the focus group discussions, 8 to 10 villages per region were sampled at random, in total 57 villages.

Cannabis Yield Observation Survey

The focus group discussions revealed considerable difference in cannabis processing methodologies, yield and grading/quality of products. Therefore, practical observations on yield processing were carried out during the cannabis harvest and cannabis garda processing with selected farmers from the focus groups. 44 fields were identified, 35 of them with mono-crop cannabis, the others with cannabis in mixed cultivation.

Farmers were interviewed on the yield obtained from a previously identified field, including all yield qualities, as well as on the cannabis extraction method used, cannabis seed yield, timing and duration of harvesting, drying, and garda extraction, people involved and hashish production.

Capacity Building

UNODC and MCN Survey Coordinators and Assistant Coordinators were trained through following training workshops:

- Training of trainers to the Survey Coordinators (SC) and assistant survey coordinators of UNODC and MCN
- Training to the surveyors hired by the SCs
- Training to data clerks on data cleaning procedure by the UNODC data programmer

Estimations

Area estimation

The estimated cannabis area in Afghanistan in 2009 is presented as a range, from 10,000 ha to 24,000 ha. The range expresses the uncertainty associated with the estimation.

The lower limit of the range is the best-estimate of the remote sensing survey (10,226 ha, rounded to 10,000 ha). The confidence interval at 95% is 5,000 ha to 17,000 ha.

The remote sensing survey was conducted for the first time with limited ground reference information available. Certain types of cannabis cultivation such as cultivation in kitchen gardens, mixed crops, and cannabis along field bunds are difficult or impossible to detect with the methodology applied. The amount of cannabis cultivation of these types could not be estimated. It is assumed that the best estimate of the remote sensing survey represents a minimum estimate. It was therefore used to establish the lower limit of the area estimation range.

Information on the cannabis area per village and the proportion of cannabis of the arable land of the villages was collected through the village survey. In Kandahar province, cross-checks with the agricultural area existing in the survey area revealed that the cannabis area and overall arable land from the village survey were grossly over-estimated. Thus, the area data from villages in Kandahar provinces was not used. The data from all other provinces did not have this problem and was used to calculate a cannabis area estimate at the national level. For Kandahar, the result from the remote sensing survey was used. The total area estimated based on this information was 24,111 ha (village survey-based estimate). As in most provinces, the village survey area estimate was higher than the remote sensing estimate, the village survey-based estimate was used to establish the upper limit of the range.

Yield and production

Cannabis yield was estimated based on the results of the cannabis yield observation survey. This survey was conducted in January 2010, when farmers actually processed the harvested and dried cannabis plants to obtain cannabis resin. During focus group interviews in November 2009, farmers and specific fields were identified for the yield observation. In January 2010, surveyors went to selected farmers and witnessed the cannabis resin (garda) production from these fields. The garda yield of different qualities was measured. Additional information e.g. on cannabis seed production, timing of processing, people involved was collected.

Yield information from 35 mono-crop cannabis fields and 9 fields with mixed crops was collected. The information from the mono-crop fields was used to calculate the average yield for all garda qualities. Information from focus group interviews indicated that regional differences exist in processing cannabis to obtain garda. In the North, Northeast and West of the country, the processing methods employed result in first garda of higher quality but less quantity, whereas in the South and East, a larger proportion of first garda is obtain, which however is of lower quantity (less resin and more plant material). Therefore, for purposes of yield and production estimation, provinces were grouped into two regions.

Table 10: Regional grouping

Region: north, northeast, west (N-NE-W)	Region: south, east, central (S-E)
BADAKHSHAN	HILMAND
BADGHIS	KANDAHAR
BAGHLAN	LOGAR
BALKH	NANGARHAR
FARAH	PAKTYA
FARYAB	URUZGAN
HIRAT	ZABUL
JAWZJAN	
TAKHAR	
NIMROZ	

Table 11: Cannabis resin (garda) yield by region, 2009

Region	Average of 1st garda (kg/ha)	Average of 2nd garda (kg/ha)	Average of 3rd garda (kg/ha)	Average of 4th garda (kg/ha)	Average of total yield (kg/ha)
N-NE-W (n=15)	51.3	53.9	31.4	na	136.7
S-E (n=20)	71.8	44.9	27.7	2.3	146.7
Weighted total average*	**68.3**	**46.5**	**28.3**	**1.9**	**145.0**
Weighted total average*	**68.3**	**46.5**	**30.2**	**-**	**145.0**

** Weighted by cultivation. N refers to number of fields. As fourth garda was only reported in some regions, it was subsumed under third garda in the fact sheet.*

Cannabis production for all garda qualities was estimated by multiplying the average regional yield with the lower and upper value of the cannabis cultivation range, respectively. For this purpose, it was assumed that 17% of cultivation took place in the N-NE-W region and 83% in the S-E region. These proportions correspond to the cannabis cultivation areas in these regions based on the results of the remote sensing survey.

Table 12: Cannabis garda production, 2009

Region	Area proportion	1st garda (kg)	2nd garda (kg)	3rd garda (kg)	4th garda (kg)	Total (kg)
N-NE-W	0.17	87,806	92,289	53,819	-	233,914
S-E	0.83	605,190	378,779	233,646	18,967	1,236,582
Total lower limit		**692,996**	**471,068**	**287,465**	**18,967**	**1,470,496**
					Rounded:	**1,500 mt**
N-NE-W	0.17	208,761	219,419	127,957	-	556,136
S-E	0.83	1,438,852	900,556	555,499	45,095	2,940,002
Total upper limit		**1,647,613**	**1,119,975**	**683,455**	**45,095**	**3,496,138**
					Rounded:	**3,500 mt**

Thus, total cannabis production including all garda qualities was estimated to range from 1,500 mt to 3,500 mt (rounded).

Cannabis growing households

The number of cannabis cultivating households was estimated from information provided by headmen in the sample villages on the number of households involved in cannabis cultivation compared to the total

number of households in the village. This number includes any kind of cannabis cultivation, i.e. it may include households which have only small-scale cannabis cultivation, e.g. in a kitchen garden.

The proportion of cannabis cultivating households was calculated by region as the sum of all cannabis cultivation households reported by headmen divided by the sum of all households reported by headmen. The regional totals of households reported by headmen did not reflect the actual regional distribution of the population in the sampling frame. Thus, the regional proportions of cannabis cultivating households were weighted by population based on recent population estimates provided by the Central Statistical Office of Afghanistan.

Farm-gate value of cannabis production

The farm-gate value is a function of average per hectare yield, area cultivated and average prices. Monthly monitoring of the farm-gate price of cannabis resin (garda) shows that prices in the South are significantly different from prices in the north. In 2009, garda prices in the south were less than half the price in the N-NE-W region. While garda yield and production methods did not differ much between farmers in the south and east, prices do. Thus, for the purpose of farm-gate value and income from cannabis per hectare, it was assumed that 83% of cannabis production took place in the southern and 17% in the eastern region. These proportions correspond to the cannabis cultivation areas in these regions based on the results of the remote sensing survey, and are by chance nominally the same used above to calculate the proportion of cultivation in the N-NE-W and S-E regions.

Similar to the methodology used in the Annual Opium Survey, the farm-gate value of cannabis was calculated based on the prices observed in the monthly price monitoring in the month of harvesting/garda production, which was January 2010. As the monthly price monitoring only collects prices of first garda, second and third garda prices were calculated from the average price difference between first and second and first and third garda reported by farmers in the village survey.

Table 13: Farm-gate prices of cannabis resin by region (US$/kg), January 2009

	1st garda (US$/kg)	2nd garda (US$/kg)	3rd garda (US$/kg)
N-NE-W	68	46	27
S only	27	17	8
E only	49	27	13
Average*	**58**	**38**	**20**

** Simple average of provincial average prices.*

Source: MCN/UNODC monthly price monitoring report, January 2010, own calculations.

Table 14: Prices of 2nd and 3rd garda reported by farmers as proportion of 1st garda, 2009

	Garda2/garda1	Garda3/garda1
N-NE-W	69%	39%
South	64%	30%
East	56%	26%
Average	65%	35%

Table 15: Farm-gate value of garda (lower limit, US$)

Region	1st garda	2nd garda	3rd garda	Total
N-NE-W	5,926,913	4,280,475	1,433,024	11,640,411
South	13,629,869	5,433,204	1,581,337	20,644,410
East	4,918,611	1,722,533	489,392	7,130,536
Total				**39,415,357**

Table 16: Farm-gate value of garda (upper limit, US$)

Region	1st garda	2nd garda	3rd garda	Total
N-NE-W	14,091,366	10,176,924	3,407,045	27,675,335
South	32,405,316	12,917,561	3,759,665	49,082,542
East	11,694,106	4,095,360	1,163,540	16,953,006
Total				**93,710,883**

The total farm-gate value of cannabis resin (garda) in 2009 was estimated to range between US$ 39 million and US$ 94 million (rounded).

Income from cannabis

The potential gross income per hectare from cannabis resin was calculated based on regional prices and regional yields, using the regional divisions described above. The gross income does not take into account expenditure, and is the potential cash income a farmer would get if he sold the total resin produced in January 2010. The weighted average was calculated using the proportions of regional cannabis cultivation from the remote sensing survey as weights.

Table 17: Gross income from cannabis resin per hectare (US$/ha), 2009

	1st garda (US$/ha)	2nd garda (US$/ha)	3rd garda (US$/ha)	Total (US$/ha)	US$/hh (rounded)
N-NE-W	3,463	2,501	837	6,801	2,106
South	1,938	773	225	2,936	1,283
East	3,518	1,232	350	5,100	1,348
Average*				**3,890**	**1,553**
Rounded				**3,900**	**1,600**

** Weighted by proportion of cannabis cultivation per region.*

Farmers reported in the village survey an average of 0.4 ha of cannabis cultivation per household. On average, cannabis farming households had a cash income of US$ 1,553 in 2009. Cannabis area cultivated per household was highest in the south with 0.44 ha, and much lower in other regions. Due to this, household income from cannabis shows much less regional differences than regional per hectare income.

4 ANNEX: PICTURES OF CANNABIS FIELDS AT DIFFERENT STAGES, 2009

Cannabis field in Dand district, Kandahar province (stem elongation)

Cannabis field in Mohammad Agha district, Logar province (stem elongation)

Cannabis field in Sherzad district, Nagarhar province (mixed with maize, stem elongation)

Cannabis field in Ahmad Abad, Paktya province (growing stage)

Cannabis cultivation in Zhari district, Kandahar province (stem elongation period)

Cannabis cultivation in Arghandab, Kandahar province (stem elongation)

Cannabis field in Zhari district, Kandahar province (Flowering stage)

Cannabis plant flowering stage, Dand district, Kandahar province (flowering stage)

Cannabis mono crop field in Baharak district, Badakhshan province (maturing stage)

Cannabis mix crop with watermelon in Baharak, Badakhshan province (maturing stage)

Cannabis field in Pul-i-Hisar district, Baghlan province (fully grown stage)

Cannabis field in Sherzad district, Nangarhar (fully grown stage)

Cannabis field in Mizana district, Zabul province (fully grown)

Cannabis field in Maywand, Kandahar province (fully grown)

Cannabis field in Mohammad Agha district, Logar province (flowering stage)

Cannabis field in Bakwa district, Farah province