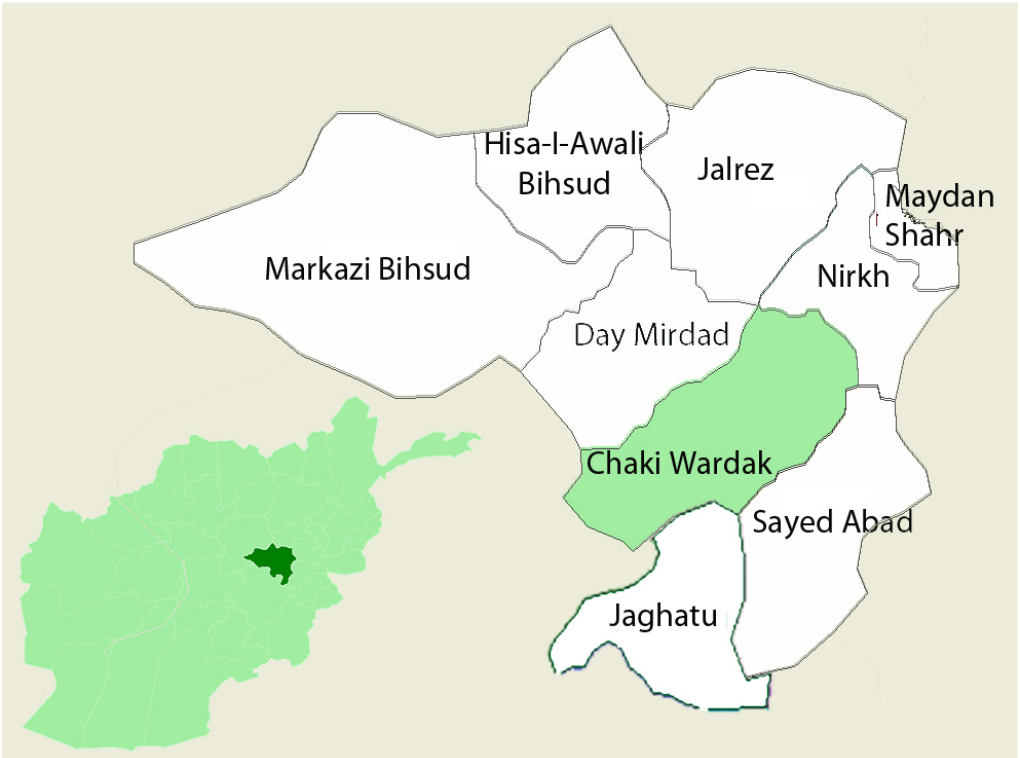
Global PARTNERSHIP for Afghanistan

Wardak Watershed and Irrigation Survey Project



Chaki Wardak District Report

March 2011

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Chaki Wardak District Water Report

1. Introduction

This report is one of a series of reports on a survey of watersheds and irrigation in the 9 districts of Wardak Province, Afghanistan. The purpose of the survey was to provide data on watersheds (drainage basins) and irrigation in Wardak so that allocation of donor money for improvements to the water supply can be prioritized for maximum impact on livelihoods.

Although the survey was conducted by watershed, the data has beans extracted for each district.

2. Methodology

The survey was carried out by a team of three local surveyors, interviewed and selected by GPFA staff in July 25/2010. The team members had no previous experience of this type of work, but were trained by GPFA staff in July and the survey started on August 3rd and ended on November 7th. The survey took 15 days in August, 15 days in September, 23 days in October and 6 days in November, a total of 59 days or 177 man-days. 63 villages were surveyed, approximately one per day. The difficult security situation is the reason for low productivity of the survey team in Chak. Transport was by local taxi and on foot. Interviews were held with leaders and with 5 elders from each village. All significant water structures (karez, wells, canals etc.) were visited in each village. The teams recorded information manually in Dari/Pashto and it was later translated into English and entered into a database using MS Excel. As well as a notebook, the teams carried digital cameras with GPS facility to record location and altitude and to take representative photographs. Copies of the survey forms used are available.

There are 181 villages or settlements in Chak with government id codes. 63 villages (35%) were surveyed, but several of the villages surveyed do not have government id codes and do not appear on official maps. So the real percentage of villages surveyed is uncertain. In addition, the survey was based on watersheds (catchments) or micro-watersheds which meant that certain settlements were grouped together.

Surveyors were required to survey a percentage of villages in each sub-watershed. GPFA will also analyse carefully the approach to village selection in the light of experience and in respect to the terms of reference of the overall assignment: if necessary, GPFA will change its approach in the remaining districts.

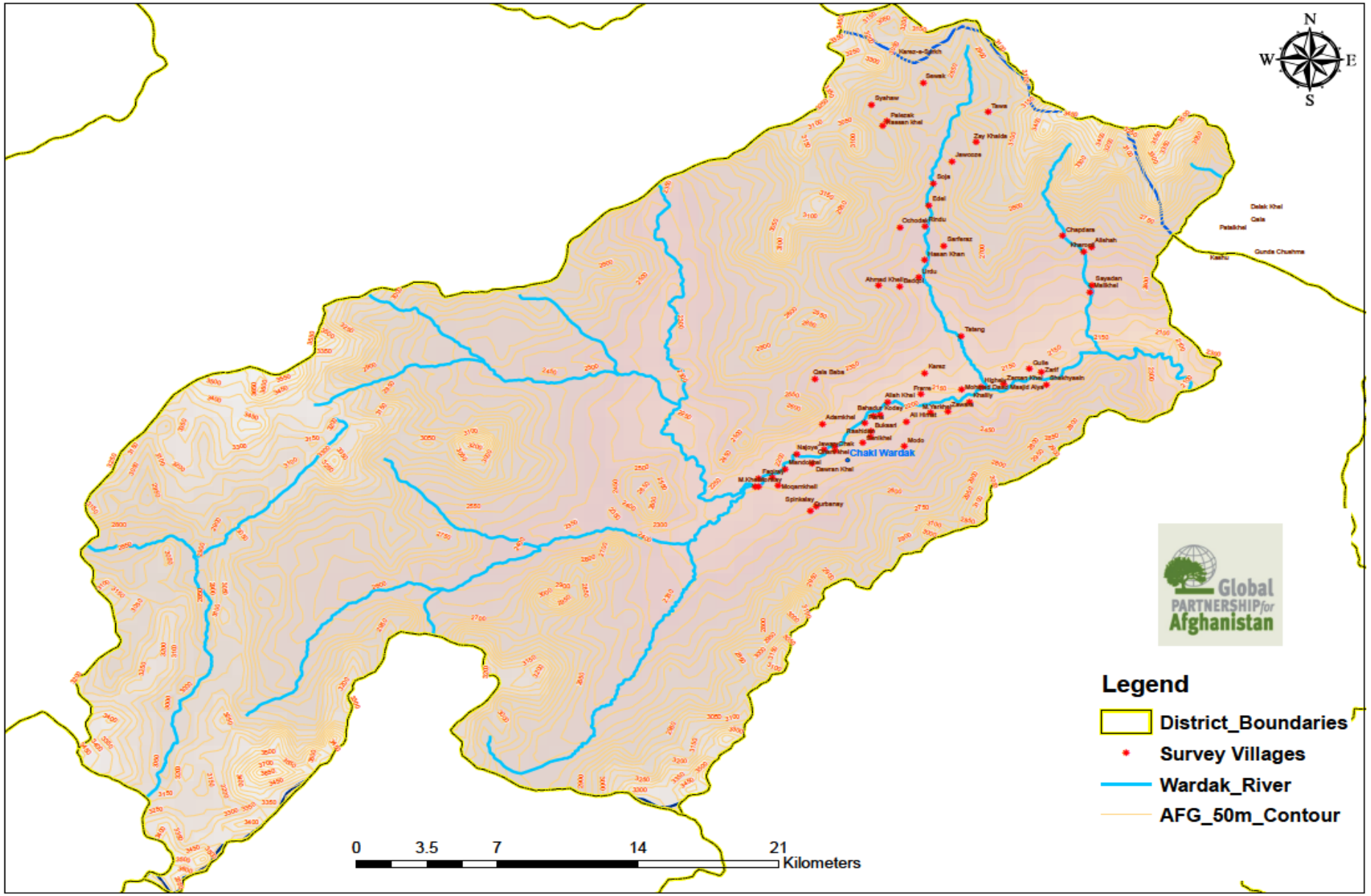
Because the survey teams are relatively inexperienced in watershed and catchment interventions, the photographs are extremely useful to experts analysing each sub-watershed. For the future, surveyors will be given better training on what to photograph. For example, a photo of the terrain above each karez mother-well would be very useful; also the off-take of each canal might be helpful. It may be possible to automatically record on each photo the GPS position of the photographer; if not, it will be done manually in future. This would give a better idea of where surveyors were photographing and a crosscheck on information recorded in the database. Nevertheless, the photographs from Chak are a valuable extra resource to aid project selection.

Due to the difficult security situation at the time of the survey, only the eastern part of Chak district was covered. This included the main Chak river valley east and west of the dam and two major tributaries to the north (see map below).

In analysing the data and writing this report, consideration has been given to how to prioritise interventions. Firstly in Section 4, four villages have been chosen and described in more detail to give a flavour of the diversity found by the survey team. Then two sections of data are given: one by village and the other by water feature. Some villages supplied with water by the Chak River itself have been grouped according to the canal supplying most of their needs. In their case, any intervention would focus on repairing the whole canal. Other villages are dependent on a major tributary. In both cases, although the river and canal is important, there

may also be springs and karezes serving the higher lands. The third grouping is by micro-watershed where the stream may be dry for part of the year and the main water sources are karezes and springs. In each of these groupings, there are villages that were not surveyed and if the group were provisionally selected for a project, a short follow-up survey would be needed to establish the interdependences of water users and any formal or informal management system already in place such as the mirab or a water users' association. The fourth grouping is villages surveyed that do not have any obvious affiliation one with another. GPFA's views on managing and prioritising interventions are given in more detail in a position paper available from GPFA's Kabul office.

3. Map of Chak District Showing Villages Surveyed



4. Watersheds & sub-Watersheds in Chak District

Chak District is entirely dependent on the main Chak River and its tributaries for water. The Chak River is the source of the Logar River after flowing southeast through Sayd Abad District into Logar Province. The Chak River itself rises in Markazi Bihsud District and passes through Day Mirdad before entering Chak District at Kala in the northwest of the district. At Monkay, the Chak River is joined by a major tributary, the Araban, from the southwest. Upstream from Monkay, another tributary, the Nik Pai Kol, joins at Mirahmadkhel; downstream at Belandi, the Baksmand River joins the Chak River and below that the Alisha River joins at Langar. All four tributaries have their catchment areas inside Chak District, but the major catchment for the Chak River itself is in Markazi Bihsud district with smaller catchments in Day Mirdad District and in Ghazni Province. There is no figure for the catchment area in Chak District itself, but the total watershed upstream of the Chak Dam[1] has an area of 4,054 km^2.

Peak flow in the Chak River is from snowmelt and spring rains in April. However there are significant unpredictable flash floods in late summer too. Demand varies according to elevation and crops grown. For example, the wheat grown at high elevations will be harvested later than that at low elevation: thus its peak demand for water will also be later. Peak demand for wheat is about one month prior to harvest and falls off rapidly after grain milk stage (Zadoks 7-8). If soil conditions are good, wheat roots extend to 1m and if winter snow has fully replenished soil moisture, the plants can take about 150mm from a silt soil early in the growing season. But wheat may be using more than 7mm per day in the period Zadoks 3 to 7 and annual water demand by wheat may exceed 1,000mm: in the absence of summer rain, irrigation is essential. The peak water demand for maize will come later in the season when the water supply in some springs and streams will be dwindling. This will limit the growing of maize in certain areas. Maize roots are much shallower than wheat which means that irrigation must be much more frequent, but in Wardak, as water from snow-melt diminishes, irrigation water supply to each farmer is often less frequent in late summer. For fruit crops, apples need water most from mid-July onwards whereas stone fruit may need irrigation earlier.

Altitudes of the villages surveyed vary from Zarif at 2,114m to Karez-e-Surkh at 2,941m. There is no obvious correlation between altitude and the percentage of wheat or fruit grown. Rice, which has a very high demand for water, is not grown above 2,378m (Ahmad Khel[2]).

A major feature on the river is the Chak Dam. Much has been written about the dam elsewhere and no attempt was made to survey it. It is reported to be very silted up.

Figure 1. The Chak Dam

[1] There have been many reports on the Chak Dam, so it is not included in this survey.

[2] This may not be the correct name – there are conflicts in the data for this village.

5. Village Profile examples

These villages have been chosen to show the diversity of situations found by the survey team.

a. Tawa Village

Tawa village was selected for its remote location and high altitude (2,756 m). It is on the Tawa sub-watershed off the Baksmand River. The population is small (350) and there are 30 families. The total land area is 600 jeribs of which about half is agricultural and irrigated (300 jeribs). Thus each family has on average 10 jeribs of irrigated land. Water seems to be plentiful as distribution is hourly and each family gets water for some part of the day. There are 80 jeribs of cereal crops, but the major crop is fruit with 180 jeribs. The 2,750 m elevation is at the extreme for successful fruit growing. The number of cows is relatively low, but there are an average 10 sheep or goats per family which is typical for an upland village with access to rangeland.

According to the five elders interviewed, the population has doubled in the last 30 years. Thirty years ago, there was more agriculture and more trees in the village and there were no signs of deforestation or soil erosion. Opinions were divided on the amount of rain and snow in the past, but they were unanimous that there was more water flow from the village spring. There was no mention of conflict within or between villages.

Surveyors found moderate vegetation on surrounding hillsides and some signs of tree planting. Kuchis are not allowed access and grazing is controlled by villagers.

There is one village spring. The water is drinkable and the flow is moderate serving 6 jeribs. There is also a karez but it has been damaged by floods and the shafts are full of mud and stones. It was last cleaned twenty years ago. Nevertheless, at the time of the survey on October 12, there was a reasonable flow. The water from the karez is collected in a small reservoir or catch-pit with a capacity of 96 m^3 to accumulate sufficient for daily irrigation and livestock. It takes 3 hours to refill the reservoir. The distribution channels from the karez and the reservoir lose a lot of water en route, much of it through evaporation. If the width of the channels were restricted and the channels lined with trees of economic use, then evaporation would be reduced and any water seeping from the channels would be put to good use by the trees. It is said to service about 100 jeribs, but could be extended to a further 50 jeribs.

The mosque well also needs cleaning.

Various interventions were requested by the village elders. For water, repair to the karez and its channels damaged by flooding are a priority. Picture Tawa 3 below shows one of the channels needing definition to reduce evaporation and protection from future floods, whereas the channel in picture Tawa 2 is well defined and lined with poplars. Also the village spring needs attention – see picture Tawa 1. Surprisingly water storage in reservoirs was emphasised. The need for work on the karez and the spring was confirmed by the survey team. The potential for improving ground-water replenishment was not noted by the survey, but looking at the photographs there is obviously potential for better rangeland and catchment management and some reforestation – see picture Tawa 4.

Non-water farming interventions requested were

- orchard replanting
- improved road access to allow fruit transport
- fruit stores
- input store
- bee-keeping

Villagers also described the long distance to the hospital and school and the need for electricity.

Figure 2. Tawa Village

Tawa 1 Spring Reservoir

Tawa 3 Karez Channel

Tawa 2 Karez Channel

Tawa 4 General View

b. Urdu

At an altitude of 2,319m, Urdu is downstream from Tawa on the main Baksmand River which is a tributary of the Chak River. The soil is predominately sandy. There are 45 households and a population of 500 supported on 350 jeribs of land, most of which is irrigated. There is a further 150 jeribs of un-cropped land within the village envelope. Families have on average less land than neighbouring villages. There are 100 jeribs of cereals, but also many orchards (135 jeribs). 44 jeribs is given over to fodder to support some 40 cows and 220 sheep and goats.

The water comes from a karez and a spring. The karez originates further up (0.8km) the main Baksmand valley and is only 100m from mother well to exit. The karez was cleaned in 2008, but it seems that it was recently flooded by the main river and the shafts are damaged. No work has been undertaken above the mother well to mitigate flooding and improve infiltration into groundwater. Although the flow is said to have decreased, when the photographs were taken in October there was a good stream in the karez channel. The distribution channels are haphazard and could be improved by directing them out of the potential flood zone and stabilising with willows, Russian olives or other native species. Some 120 jeribs are irrigated from the Karez. The spring also needs some attention.

Water is distributed to each family every 18 days which is not frequent enough if the soil is all sandy. The Malik is chairman of the water shura.

All the village elders interviewed said that a village well is needed to supply clean drinking water.

There are no trees on the mountains and there has been no planting of poplar woodlots to supply villagers' timber needs, but from the photographs there are plenty of poplars and willows along the river and in other damp areas near springs and the karez channels. There may be potential for planting woodlots on land liable to flooding.

The village elders mentioned several other needs, including bridges, bees, chickens, hospital and agricultural training. However, restoring the water supply is a priority combined with flood protection measures and a clean source of drinking water.

Figure 3. Urdu karez channel showing erosion, flooding and the potential for establishing a deeper channel to prevent water loss from evaporation and protecting it from future flood damage. There is also potential for terracing and planting on the sides of the valley.

c. Nurkhel

Nurkhel has been chosen as typical of the larger villages on the main Chak River. The altitude is 2,002m.

The population has increased from about 840 thirty years ago to 1,800 with 200 households of which 170 list agriculture as their primary occupation. All 170 have irrigation and all agricultural land is irrigated. This totals some 2,000 jeribs but is only 25% of the total area of 8,000 jeribs claimed by the village. Average household landholding is some 40 jeribs, but average irrigated landholding by professional farmers is only 11 jeribs, similar to Tawa. The water distribution system is not mentioned in the survey.

Wheat and other cereals take up some 1,000 jeribs and at this elevation it is possible to cultivate rice as well: there are 100 jeribs of rice. Fruit (700 jeribs) and other horticultural crops are important, potatoes, onions, beans and vegetables. There are 110 jeribs of forage crops to support 210 cows, 450 sheep and goats and 90 donkeys. Compared to remote villages at higher altitudes, the proportion of cows to sheep and goats is much higher. In Nurkhel it is approximately 1:2, but in Tawa, it is 1:12. The area of fodder crops in the mountain villages is about 1 jerib per cow, but in Nurkhel it is only ½ jerib per cow indicating that fodder is bought in or that yields are higher at lower altitudes or through better farming with plentiful water.

According to the villagers, the irrigation system is in relatively good condition (see Figure 4 below) in spite of the recent floods, but our survey team thought that work was needed. Water is mainly by the Sayed Canal off the Chak River, but a properly constructed off-take would allow better water regulation. The canal is long and serves some 18 villages, comprising 1,200 households. General improvements to the canal system are requested to clear blockages and prevent leaks. There are several inconsistencies in the data collected for the canal and it is suggested that the team return to check their readings. For example, although the canal is supposedly 3,000 m long, the altitude of the discharge end is higher than the off-take from the main river and the GPS reading for the discharge is totally wrong. Also there is no record of how the canal is managed, how equable is the distribution and how frequently water is supplied to each farm. Improvements to the canal would be worthwhile, but better data is needed.

The elders mention the need for potable water and the surveyors failed to record any wells. This needs investigation: are there private wells for drinking water? How are the mosques supplied?

Apart from water, the villagers mentioned the need for bridges, fish farming, better seed and inputs, bees, cold stores and flood protection. The villagers protect their grazing lands from incursion by Kuchis. But the photos show sparsely covered hillsides and it seems that no effort is made at conservation of rangeland. With several moderate slopes there would seem to be potential for reforestation using river water pumped by solar or hydraulic ram.

In the survey it was noted that vegetation was sparse above the village and that there are some 4,000 jeribs uncultivated – see Figure 5 below. This is probably rangeland. In the long term, a management plan for this could be drawn up with the villagers to reduce erosion, improve water infiltration and harvesting and to generate more income from livestock, forage and firewood.

Figure 4 Sayed Canal. Neat Orchards and a well-maintained canal characterise Nurkhel

Figure 5 Hillside erosion above Nurkhel where terracing could be used to stabilise the soil

d. Sprinkalay and Qurbanay

Sprinkalay and Qurbanay are two adjacent villages in the Dersh Shalay / Darsheelay watershed which flows into the Chak River from the south near Nurkhel. Their altitude is about 2,300m. The soil is sandy and there is insufficient water to meet all irrigation needs. The watershed forms a neat unit in which to carry out projects in an accessible area close to the main river and road. Interestingly, this watershed is on the opposite side of the mountain range to the Onkay River and Watershed in Sayed Abad. As with the Onkay, there may be security difficulties in the upper reaches of the watershed.

The villages are medium size with 65 and 70 household respectively and populations of 600 and 800. As in other villages surveyed, numbers have approximately doubled in the last 30 years. The survey reveals that between the two villages they have 6,000 jeribs of land in total, of which 2,200 is agricultural, but only 600 is cultivated and 450 is irrigated. Qurbanay lists 1,000 jeribs as rainfed, although from the previous figures it is obviously not used. Sprinkalay has 150 jeribs of rainfed land which is used.

Water is available on a different basis for each village. Sprinkalay receives water every 10-12 days. Qurbanay shares water with two other villages and its turn lasts 3 days in 12.

Cropping places greater emphasis on arable than horticulture crops. There is some discrepancy in the figures for Qurbanay which lists only 200 jeribs of cultivated land, but has 1,000 jeribs of rainfed land and 1,000 jeribs of wheat, presumably the same. A major difference is in the numbers of sheep and goats: Sprinkalay has 350, but Qurbanay has 800. Because of this, Qurbanay restricts Kuchi access to its pastures but grazing round Sprinkalay is less rigorously controlled. In other respects the villages are similar with about 85 jeribs of fruit each, 35 jeribs of fodder, 60 jeribs of beans and potatoes, few other vegetables and 55 cows. No woodlots have been planted, but with the shortage of water, they should not be recommended.

Water is sourced from karezes which are said to be in poor condition and needing repair. There are four karezes in Qurbanay, of which two are private, and one in Sprinkalay. Small unlined reservoirs accumulate water on a daily basis. The older (20 years) reservoir at Sprinkalay holds 3,375 m^3 and the newer one at Qurbanay (8 years) holds 6,000 m^3. It takes 6 hours to fill the former and 13 hours to fill the latter. Sprinkalay reservoir is in better condition, but Qurbanay needs cleaning. Lining the reservoirs would reduce leaks. From photos of Qurbanay, some channels and the karez sources are subject to erosion and flooding, but some canals are in good condition and lined with trees. Unfortunately there are no photos of Sprinkalay. Little attempt has been made to improve groundwater infiltration above the mother wells and the potential for this needs further investigation.

The village elders from Sprinkalay say that the karez needs cleaning and they would like a tubewell and a larger reservoir. At Qurbanay, the reservoir and canal system are also mentioned as needing attention. Our survey team agreed that all karezes need attention, but the karez at Sprinkalay was cleaned quite recently. However, any sustainable long-term intervention here should focus on the Dersh Shalay watershed as a whole and include the other villages: Nurkhel, Moqamkhell, Mahekam Khell, and Dersh Shalay / Darsheelay itself. The Google Map (Figure 6) shows large areas where water harvesting with terracing, check dams etc. and where flood prevention works could be carried out. Moqamkhell, Qurbanay and Sprinkalay all spoke of flooding being a problem. Work would benefit the karezes and springs lower down. Control of grazing would be a prerequisite to any afforestation and this would involve active cooperation between all villages in the watershed.

The elders in Qurbanay and Sprinkalay also listed the following village improvements: veterinary clinic, electricity, flood protection, agricultural machinery and technology and bees.

Figure 6 The Karez Channel at Qurbanay

Figure 7 Dersh Shalay / Darsheelay Watershed

6. Village Irrigation in Chak District

There are many villages in the alluvial plain along both sides of the Chak River. In the main they are irrigated by a series of canals fed further upstream by the river. Below villages have been grouped separately by five major canals and one section to cover the other canals. In some cases more than 20 villages are dependent on one canal, and some villages have two or more canals at different levels. The survey was based on villages, not canals, but it would make sense when planning interventions to take each canal as a unit. In the tables below, the information was supplied by the villagers and the information given for the same canal varies from village to village. In planning work, a quick survey of the whole canal should be conducted and sections running through villages not in the GPFA survey should be included.

Many of the villages back onto the sides of the valley or actually have land extending back up small sub-watersheds. Thus some of the villages also have karezes and springs which need attention. The canal water is not deemed potable, and if there is no karez, the village is often dependent on a single well. Provision of potable water was outside the scope of the survey but needs were noted. It is likely that work on karezes, springs and wells would be carried out separately from canals, and the data should be revisited to make sure these items are not missed.

a. Villages surveyed principally dependent on Sayed Canal

Name: **Village**	**Population** **Jeribs**	**GPS** **N** **E** **Altitude (m)**	**Village description**	**Water supply**	**Cost estimate USD**	**Cost per beneficiary USD**	**Cost per jerib irrigated USD**
Chak چک WD-CH-063	Pop. 750 Total.3500j Irrig. 800j	N 34.10475 E 68.57787 Alt. 2184 m	Out of 70 households 60 households are benefiting from irrigated agriculture, the soil type is silt and sandy, the population has doubled in last 30 years, the hillside vegetation is moderate. From 3500 jeribs total land of village 800 jeribs are irrigated agriculture and 800 jeribs are cultivated, the incomes of 60 families are growing Cash crops. There are 270 jeribs cereals, 300 jeribs fruits, 80 jeribs animal feed, 70 jeribs beans and potatoes, 50 jeribs Rice. In addition	This village has one Canal and one surface well. The source of the Canal is khawat River and it's shared between 8 villages, 600 households are benefiting from this Canal and its irrigated 5600 jeribs land, it badly damaged by recent flood. And from surface well 50 households are benefiting and it's full of mud and stones. Cleaning and Repairing of the Canal and surface well is recommended.	Canal 30000 Surface well 500		

Name: Village	Population Jeribs	GPS N E Altitude (m)	Village description	Water supply	Cost estimate USD	Cost per beneficiary USD	Cost per jerib irrigated USD
			there are 70 cows, 300 sheep's and goats, 6 donkeys.				
Nurkhel نورخیل WD-CH-030	Pop. 1800 Total.8000j Irrig. 2000j	N 34.09172 E 68.54981 Alt. 2202 m	Out of 200 households 170 are benefiting from irrigated agriculture, the soil type is clay and sandy, out of 8000jeribs village land, 2000jeribs are irrigated agriculture, 2000jeribs are cultivated. The population has doubles in last 30 years, the hillside vegetation is sparse, The income of 150 families are from growing Cash crops, there are 1000jeribs cereals, 700jeribs fruits, 120jeribs animal feed, 60jeribs beans and potatoes, 100jerisbs Rice. In addition there are 210 cows, 450 sheeps, goats, and 90donkeys.	Totally this village dependent on the Sayed canal, 18 villages shared the water of this village and 1200 households benefiting from this canal, it's irrigated 14000 jeribs. Enlarging the canal and Repairing the cannel of this canal is recommended.	Canal 100,000		
Modo مدو WD-CH-001	Pop 1,500 Total 2,500 j Irrig.200 j	N 34.10925 E 68.60428 Alt 2,265 m	Out of 300 families, 250 are dependent on irrigated agriculture. The soil is sandy. Out of 400 jeribs, 200 are irrigated. The hillside vegetation is moderate and erosion is a problem A wide range of crops and livestock are grown including 80 jeribs of fruit and 220 jeribs of wheat.	Modo is in a sub-watershed from high mountain springs. There are three Karezes, two springs and a canal shared with 9 other villages. Water from one karez is shared between 2 villages. Modo gets water every 5 days. The main canal needs cleaning and lining. Water flow in springs and karezes has decreased. The 3 karezes have been badly damaged by floods and water distribution systems need repair.	Canal 120,000 Karez 100,000 Spring 1,111		

Name: Village	Population Jeribs	GPS N E Altitude (m)	Village description	Water supply	Cost estimate USD	Cost per beneficiary USD	Cost per jerib irrigated USD
Senikhel سنی خیل WD-CH-028	Pop. 725 Total. 2500j Irrig. 1000j	N 34.10844 E 68.59030 Alt. 2162 m	Out of 65 households 60 households are benefiting from irrigated agriculture, the soil type is silt and sandy. The hillside vegetation is sparse, Out of 2500jeribs total land of village,1000jeribs are irrigated agriculture,1000jeribs are cultivated land and the income of 50 families are from growing Cash crops, there are 370jeribs cereals,400jeribs fruits,70jerbs animal feed,75jeribs beans and potatoes,80jeribs Rice. In addition there are 70cow, 300sheeps, goats, and 32donkeys.	Totally the irrigation of this village is dependent on sayed canal, the source of this canal is noorkhel,15 village shared the water of this canal and 1300 households benefiting from this canal, its irrigated 17000 jeribs land its has leaks and blockages. Cleaning and Repairing the Canal is recommended.	Canal 80,000		
Rashidan رشیدان WD-CH-031	Pop. 650 Total.2000j Irrig. 900j	N 34.11130 E 68.59371 Alt. 2168 m	Out of 55 households 50 are benefiting from irrigated agriculture, the soil type is silt and sandy. The hillside vegetation is full, Out of 2000 jeribs village land,900jeribs are irrigated agriculture,900 are cultivated, the income of 45 families are from growing Cash crops, there are 280jeribs cereals,400jeribs fruits,40jeribs animal feed,60jeribs beans and potatoes,100jeribs Rice. In addition there are 60 cows, 220 sheeps, goats, 20 donkeys.	The water of this village is dependent on sayed Canal and one surface well. The source of the sayed canal is nurkhel, the water of this canal is shared between 15 villages, 1300 benefiting from this canal, its irrigated 17000jeribs, and the water of well are served by 30 households. Digging of well and make a hand pump above the well and Cleaning, Concreting the intakes of the canal is recommended.	Canal 130,000 Surface well 1,100		

Name: Village	Population Jeribs	GPS N E Altitude (m)	Village description	Water supply	Cost estimate USD	Cost per beneficiary USD	Cost per jerib irrigated USD
Dawrankhel دورانخیل WD-CH-002	Pop. 780 Total 1,500 j Irrig. 500 j	N 34.09845 E 68.56762 Alt 2,192 m position uncertain – AIMS place this village on the other side of the Chak River	Out of 70 families, 65 are dependent on irrigated agriculture. The elders give the population 30 years ago as 300 – a 5x increase! There are 150 jeribs of cereals and 220 jeribs of fruit. In addition there are 30 jeribs of rice. From the photos, training in pruning would be beneficial. 40 jeribs of fodder support 60 cows. 280 sheep graze the 1,000 jeribs of rangeland.	Dawrankhel is completely dependent on the Sayed Canal which was badly damaged by the floods. Parts are blocked or leaking and vegetation has encroached. Cleaning and repairs to the whole canal are recommended... No data on the water management	Canal 130,000		

b. Villages surveyed principally dependent on Malik Yaar Canal

Name: Village	Population Jeribs	GPS N E Altitude (m)	Village description	Water supply	Cost estimate USD	Cost per beneficiary USD	Cost per jerib irrigated USD
Ali Himat علی همت WD-CH-010	Pop .1500 Total. 1200j Irrig. 800j	N 34.11878 E 68.60972 Alt. 2171m	Out of 135 household, 100 households are benefiting from irrigated agriculture. The population has increased in last 30 years. All 800 jeribs are irrigated. The vegetation on the hillside is moderate. There are 340 jeribs cereals, 280 jeribs fruits, 80 jeribs animal feed, 30 jeribs beans and potatoes. In addition there is 60 jeribs Rice. And there are 140 cows, 180 sheep and goats.	The water source of this village is from Malikyar Canal and tube well. The in-take of this canal is on the main Chak River. 20 villages are sharing this canal, number of household benefiting this canal 1500, and 15,000 jeribs are irrigated. Cleaning of canal and building the walls of this canal is recommended. The water of tube well is used by 30 households for drinking and livestock. Cleaning, and make water pump for this well is recommended.	Canal 160,000 Tube well 20,000		
M.yarkhel محمد یارخیل WD-CH-027	Pop. 550 Total.1000j Irrig. 700j	N 34.12301 E 68.62047 Alt. 2157 m	There are 50 households benefiting from irrigated agriculture, the soil type is sandy and clay, out of 1000jeribs village land,700jeribs are irrigated agriculture,700jeribs are cultivated, the income of 45 families are from growing Cash crops. The population has doubled in last 30 years. There are 120jeribs cereals, 400jeribs	This water irrigation of this village is dependent on malik yar canal, the source of this canal is sarband chak, and it's shared between 20 villages and 1700 households benefiting from this canal, its irrigated 20000jeribs land. And there is a surface well it's full of mud and stones need to be clean. Cleaning and Repairing of canal is	Canal 130,000 Surface well 1333.33333		

			fruits, 60jeribs animal feed, 70jeribs beans, potatoes, 40jeribs Rice. In addition there are 75 cows, 400 sheeps, goats, and 48 donkeys.	recommended.			
Zawara ژوره WD-CH-20	Pop. 550 Total. 300j Irrig.180j	N 34.12381 E 68.62832 Alt. 2160m	There are 55 households benefiting from irrigated agriculture, the soil type is clay and sandy, out of 200jeribs agriculture land, 180jeribs are cultivated, 180jeribs are irrigated. The population has doubled in last 30 years. The income of 50 families are from growing Cash crops crops, there are 60jeribs cereals, 100jeribs fruits, 30jeribs animal feed, 10jeribs beans, potatoes. In addition there are 58 cows, 230 sheep's, goats, 30 donkeys.	The water source of this village is from one spring and tree canals. 20 villages shared this canal, 1500 households benefiting from this canal; its irrigated 12000jeribs land .these canals are badly damaged by recent flood. Cleaning and concreting of canals is recommended.	Canal 200,000 Spring 11,000		

Figure 8 Google Earth Map showing villages served by the Malik Yaar Canal on the south of the Chak River and the Taaka Canal on the north of the Chak River

c. Villages surveyed principally dependent on Taaka Canal

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Bahadur Koday بها در کودی WD-CH-009	Pop .680 Total. 1500j Irrig .1000j	N 34.12220 E 68.59806 Alt. 2155m	This is village is on the main Chak River below the dam. Out of 65 families 60 families benefiting from irrigated agriculture. The soil type is silt; the population has doubled in last 30 years. All 1000 jeribs are irrigated. There are 360 jeribs cereals, 500 jeribs fruit, 30 jeribs animal fodder, 20 jeribs potatoes, in addition there are 80 jeribs rice. There are 80 cows and 100 sheep & goats.	The water source of this village is canal. This Canal is shared between 12 villages, 1,000 household benefiting from this canal and 12,000 jeribs are irrigated by this canal. This canal has cracks and blockages. There is one surface well now dry, need to be digging and cleaning. Cleaning and repairing of this canal is recommended.	Canal 130,000		
Kodi Ali Mohmad کودی علی محمد WD-CH-034	Pop. 300 Total. 900j Irrig. 270j	N 34.12137 E 68.59509 Alt. 2209 m	Out of 30 households 25 households are benefiting from irrigated agriculture, the soil type is silt, clay and sandy. The hillside vegetation is spars, and the population has doubled in last 30 years. Out of 900 jeribs total land of village 350jeribs are agriculture, 270jeribs are irrigated and 270jeribs are cultivated, the income 20 families are from growing Cash crops. There are 110jeribs cereals, 50jeribsfruits, 30jeribs animal feed, 35jeribs beans, potatoes, 40jeribs Rice. In	This village has two canal and one surface well. The source of white canal is sarband; the water is shared between 14 villages and 600 households benefiting from this canal, its irrigated 800jeribs land. It's full of mud and stones and has grasses. There is a surface well and is full of mud and sands, 10 households benefiting from this well. Enlarging, Cleaning and Repairing the Canal is recommended.	Canal 50,000 Surface well 1333.3333 3		

			addition there are 22 cows, 40 sheeps, goats, 5 donkeys.				
Pana پنه WD-CH-029	Pop. 600 Total.1700j Irrig.1000j	N 34.11803 E 68.59106 Alt. 2163m	Out of 55 households in village,48 households are benefiting from irrigated agriculture, the soil type is silt and sandy and the irrigated agriculture land is 1000jeribs, cultivated land 1000jeribs.the income of 45 families are from growing Cash crops. There are 230jeribs cereals, 400jeribs fruits, 170jeribs animal feed, 90jeribs beans and potatoes, 100jeribs Rice. In addition there are 60 cows, 120 sheeps, goats, and 9 donkeys.	This village has two canals and one spring. The source of canal is sarband, 16 villages shared the water of this canal and 1500 households benefiting from this canal, its irrigated 18000jeribs land, the vegetation seems in and around the canal, it has leaks and blockages. This spring is served by 15 households and it's irrigated 8 jeribs of land, it's full of mud and sand. Cleaning and Repairing of the canal and spring is recommended.	Canal 100,000 Spring 20,000		
Ahmad Khel احمد خیل WD-CH-007	Pop .500 Total. 200j Irrig.150j	N E [3] Alt.	Out of 40 families 40 are dependent on irrigated agriculture. The population has doubled in last 30 years. The soil is silt, and 150 jeribs are irrigated land. There are 35 jeribs cereals, 80 jeribs fruits, 10 jeribs animal feed, 15 jeribs potatoes in addition there are 50 jeribs Rice. There are 29 cows and 70 sheep & goats.	The water source of this village is from canal and surface well. This Canal is full of mud and stones; the source of this Canal is from the Sarband. This surface well is full of mud and stones. Cleaning and repairing the surface and canals are recommended.	Canal 10,000 Surface well 1,111		
Frarre فرار WD-CH-021	Pop. 750 Total. 280j Irrig. 160j	N 34.13193 E 68.61624 Alt. 158.5m	Out of 75 households 50 are benefiting from irrigated agriculture, the soil type is clay, silt, sandy. The population has doubled in last 30 years. There is 160jeribs irrigated agriculture, 160jeribs cultivated. The income of 50 families are from growing Cash crops	This village is dependent one two Canals. This canal is shared between 20 villages,980 households benefiting from this canal and its irrigated 600jeribs.there are 600jeribs cultivated.	Canal 125,000		

[3] Coordinates wrong in database – need to re-survey

			crops, there are 70jeribs cereals,40jeribs fruits,17jeribs animal,30jeribs beans, potatoes, in addition there are 30 cows,150 sheeps,goats,45 donkey.	Cleaning and Repairing of the Canal is recommended.			
Mohmad Daad Masjid Alya محمد داد مسجد علیا WD-CH-022	Pop. 350 Total. 165j Irrig. 100j	N 34.13447 E 68.63429 Alt. 2146.5m	Out of 30 households 30 are benefiting from irrigated agriculture. The soil type is silt, sandy and clay, out of 120jeribs agriculture land, 100jeribs are cultivated, 100jeribs are irrigated and 20jeribs are rain fed land. The income of 25 families are from growing Cash crops crops, there are 30jeribs cereals, 63jeribs fruits, 20jeribs animal feed. In addition there are 32cows, 125sheeps, and 20donkey.	This village has one spring, two canal and one well. This canal is shared between 20 village,this canal is served by 1500 households and its irrigated 8250jeribs land. There is a well also 20 households benefiting from this well. Cleaning and Repairing of canal and well is recommended.	Spring Canal 150,000 Well 1,111		

d. Villages surveyed principally dependent on the Monkay Canal

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Mohmad Khel[4] محمد خیل WD-CH-038	Pop. 500 Total.1300j Irrig. 600j	N 34.08751 E 68.54370 Alt. 2182.5 m	Out of 56 households 50 are benefiting from irrigated agriculture, the soil type is silt and sandy. Out of 1300jeribs total land of village, 600jeribs are irrigated agriculture, 600jeribs are cultivated. The hillside vegetation is full, The income of 30 families are from growing Cash crops, there 110jeibs cereals, 270jeribs fruits, 70jeribs animal feed, 120jeribs beans and potatoes, 20jeribs Rice. In addition there are50 cows, 300 sheep's, 40 donkeys.	This village has one spring, one canal and one surface well. 20 households served by this spring, it's badly damaged by recent flood. The source of canal is alishing and 10 villages shared the water of this canal, 900 households benefiting from this canal, its irrigated 12000jeribs land and it has leaks, blockages. The surface well is served by 30 households. Cleaning and Repairing the canal, spring and surface well is recommended.	Spring 13,500 Canal 40,000 Surface well 1333.33333		
Monkay ما نکی WD-CH-040	Pop. 680 Total.1000j Irrig. 500j	N 34.08766 E 68.54218 Alt. 2181.5 m	Out of 60 households 50 are benefiting from irrigated agriculture, the soil is clay and sandy. Out of 1000jeribs total land of village 500jeribs are irrigated agriculture, 500jeribs are cultivated, the income of 32 families are from growing Cash crops. The population has doubled in last 30 years, the hillside vegetation is moderate. There	This village has one canal and one surface well. The source of this canal is khawat river; the water is shared between 6 villages and 800 households served by this canal. Its irrigated 1600jeribs land and the surface well are served by 28	Canal 90,000 Surface well		

[4] There are several variations in spelling this name.

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			140jeribs cereals, 200jeribs fruits, 60jeribs animal feed, 50jeribs beans and potatoes, 40jeribs Rice. In addition there are 50 cows, 180 sheep's and goats, 25 donkeys.	households. Cleaning and Repairing of canal and surface well is recommended.	1111.11111		
Faqiray فقیری WD-CH-036	Pop. 720 Total.1800j Irrig. 700j	N 34.09167 E 68.54370[5] Alt. 2204.5 m	Out of 65 households 60 are benefiting from irrigated agriculture, the soil type is clay and sandy. The hillside vegetation is moderate, Out of 1800jeribs land of village 180jeribs are agriculture land,700jeribs are cultivated and 700jeribs are irrigated, the income of 45 families are from growing Cash crops, there are 230jeribs cereals,350jeribs fruits,100jeribs animal feed,65jeribs beans,potatoes,20jeribs Rice. In addition there are 55 cows, 280 sheep's, goats, 35 donkeys.	This village has one canal and one surface well. The source of the canal is River, the water of this canal is shared between 5 villages and 300 households are benefiting from this canal, its irrigated 2500jeribs land, it's full of mud and stones. The surface well is full of mud and sands. Cleaning and Repairing of canal and well is recommended.	Canal 50,000 Surface well 666.666667		
Adamkhel آدم خیل WD-CH-039	Pop. 740 Total.1500j Irrig. 700j	N [6] E Alt. 2265m	Out of 65 households 60 are benefiting from irrigated agriculture, the soil type is sandy, the population has doubled in last 30 years. Out of 1500 jeribs total lands of village 700jeibs are irrigated agriculture and 700jeribs are cultivated, the incomes of 40 families	This village has one canal, the source of this canal is from khawat river, and this canal is served by 8 villages. 700 households benefiting from this canal and its irrigated 1900jeribs, it's full of mud and stones.	Canal 60,000		

[5] GPS readings may be wrong as Monkay Canal is on south side of the Chak River and these readings put it on the north

[6] GPS readings for Adamkhel are wrong, but from cross-referencing fairly certain it is on the Monkay Canal

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			are from growing Cash crops. The hillside vegetation is moderate. There are 220jeribs cereals, 330jeribs fruits, 40jeribs animal feed, 50 beans and potatoes, 50jeribs Rice. In addition there are 50 cow, 280 sheep and goats, 30 donkeys.	Cleaning and Repairing of canal is recommended.			

e. Villages surveyed principally dependent on the Bakheband Canal

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Khalily[7] خلیلی WD-CH-19	Pop.1100 Total.2500j Irrig.1500j	N E Alt. 2159 m	There are 150 households, 150 households benefiting from irrigated agriculture, the soil type is clay and sandy, out of 1500jeribs, 1500jeribs are irrigated, 500jeribs are cultivated. The population has doubled in last 30 years. The income of 120 families from growing Cash crops, there are 600jeribs cereals,600jeribs fruits,120jeribs animal feed,170jeribs beans, potatoes, in addition there are 160 cows,600 sheeps,40 donkey.	This village is located in a sub watershed. It has two canals and one karez. The Bakhband canal shared between 19 villages its irrigated 12000 jeribs land. From the karez 100 households are benefiting its irrigated 5jeribs. Cleaning and Repairing of springs, canal and karez is our Recommendation.	Canal 200,000 Karez 120,000		
Allah khel الله خیل WD-CH-014	Pop.600 Total.500j Irrig.400j	N 34.12810 E 68.60129 Alt. 2144m	60 households are benefiting from irrigated agriculture the soil type is clay. The population has doubled in last 30 years, Out of 500jeribs, 400jeribs are irrigated agriculture land and there is 400jeribs cultivated land. Here are 120jeribs cereals, 200jeribs fruits, 40jeribs animal feed. And there are 50 cows, 150 sheep's.	The main water source of this village is bakhband Canal 15 villages share this canal 15000 household benefiting from this canal the source of this canal is sarband ,and there is one surface well for mosque. Cleaning and Repairing of canal is recommended.	Canal 135,000 Surface well 666		

[7] Khalili needs resurveying – several GPS readings wrong.

f. Miscellaneous Villages on other canals off the Chak River

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Buksari بوکسری WD-CH-033	Pop. 350 Total. 800j Irrig. 600j	N 34.11417 E 68.59394 Alt. 2155 m	Out of 35 households 30 are benefiting from irrigated agriculture, the soil type is silt and sandy. The population has doubled in last 30 years, Out 800jeribs of total lands of village 600jeribs are irrigated agriculture, 600jerubs are cultivated and the income of 25 families are from growing Cash crops. The hillside vegetation is sparse, There are 220jeribs cereals, 300jeribs fruits, 30jeribs animal feed, 25jeribs beans and potatoes, 20jeribs Rice. In addition there are 30 cows, 180 sheep's, goats, 18 donkeys.	This village dependent on yatimack canal. The source of yatimack canal is sarband, the water of this canal is shared between 12 villages, 900 households benefiting from this canal and its irrigated 15000 jeribs.the canal is full of mud and stones and has leaks and blockages. Cleaning and Repairing Canal is recommended.	Canal 80,000		
Shekhyasin شیخ یاسین WD-CH-035	Pop. 800 Total.2500j irrig.1600j	N 34.13655 E 68.67228 Alt. 2136 m	Out of 80 households 45 households are benefiting from irrigated agriculture, the soil is clay and sandy. Out of 2500 jeribs total land of village 2000 jeribs are agriculture, 1600jeribs are cultivated and 1600jeribs are irrigated. The income of 40 families are from growing Cash crops, there are 520jeribs cereals, 480jeribs fruits, 120jeribs animal feed, 380jeribs beans and potatoes, 180jeribs Rice. In addition there are100 cows, 450	This village has one canal and one Surface well. The water of this canal is shared between 10 villages and 900 households benefiting from this canal, its irrigated 10000jeibs land, it has leaks and blockages. Cleaning and Repairing of this Canal is recommended, the water of the well is served by 15 households, Digging of well and make a hand pump above the well is	Canal 90,000 Surface well 1,110		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			sheep's, 60 donkeys.	recommended.			
Zaman khel زما نخیل WD-CH-024	Pop. 800 Total.1500j Irrig. 500j	N 34.13695 E 68.65306 Alt. 2120 m	Out of 75 households, 70 households are benefiting from irrigated agriculture; the soil type is clay and sandy. Out of 800jeribs agriculture land, 500jeribs are cultivated, 500jeribs are irrigated, and 300jeribs are rainfed. The income of 60 families are from growing Cash crops, there are 440jeribs cereals,240jeribs are fruits,40jeribs are animal feed,50jeribs are beans and potatoes, in addition there are 20jeribs Rice. And also there 80 cows, 200 sheep's, goats, 15 donkey.	This village has one spring two Canal and one well. Three villages shared this canal, 300 households benefiting from this canal, its irrigated 900jeribs land. The spring is served by 45 households this spring is full of mud and stones. This has badly damaged by flood, Cleaning and Repairing of this canal is recommended.	Spring 1,000 Canal 100,000 Well 1666.66667		
Zarif ظریف WD-CH-025	Pop. 400 Total.1600j Irrig. 600j	N 34.14285 E 68.67010 Alt. 2114 m	Out of 40 households, 30 households are benefiting from irrigated agriculture; the soil type is clay and sandy. Out of 1600jeribs total lands of village, 600jeribs are irrigated agriculture land, the income of 20 families are from growing Cash crops. There are 250jeribs cereals, 200jeribs fruits, 60jeribs animal feed, 80jeribs beans and potatoes, in addition there are 30 cows, 300 sheep's, 36 donkey.	The water source of this village is from one canal and one Surface well. And the canal is shared between 6 villages including Gulie, 450households benefiting from this canal and its irrigated 8000jeribs land, 18 households benefiting from mosque well. Cleaning canal and making water pump for well is recommended.	Canal 120,000 Surface well 1,111		
Gulie	Pop. 600	N 34.14412	Out of 55 households 50 are benefiting from irrigated agriculture, the soil type	This village has one canal is has			

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
گلی WD-CH-032	Total.1000j Irrig. 400j	E 68.66455 Alt. 2126 m	is silt, sandy and clay. Out of 1000jeribs village land 400jeribs are irrigated agriculture, 400 cultivated, the income of 40 families are from growing Cash crops. The population has doubled in last 30 years, There are 140jeribs cereals, 170jeribs fruits, 30jeribs animal feed, 30jeribs beans and potatoes, 20jeribs Rice. In addition there are 45 cows, 280 sheep's, goats, 30 donkeys.	badly damaged by recent flood. The water of his canal is shared between 6 villages and 450 households benefiting from this canal and its irrigated 8000jeribs. And it's natural and full of mud and stones. Cleaning and Enlarging of this canal is our Recommendation.	Canal 80,000		
Mandokhel مندوخیل WD-CH-037	Pop. 820 Total.1200j Irrig. 600j	N 34.09597 E 68.55560 Alt. 2177.5 m	Out of 70 households 65 are benefiting from irrigated agriculture, the soil type is clay, sandy. The population has doubled in last 30 years, Out of 1200 jeribs total land of village 650jeribs are agriculture land,600jeribs are cultivated land and 600jeribs are irrigated land, the income of 35 families are from growing Cash crops. There are 150jeribs cereals, 270jeribs fruits, 50jeribs animal feed, 45jeribs beans and potatoes, 80jeribs Rice. In addition there are 60 cows, 200 sheep's, goats, 28 donkeys.	This village has one canal and one surface well and this village gets water every 4 days. The source of this canal is from khawat River the water is shared between three villages, 280 households served by this canal and its irrigated 1500jeribs, it's full of mud and stones. And there is a surface well that is served by 25 households. Cleaning and Repairing of canal also Digging and making of hand pump above the well is recommended.	Canal 30,000 Surface well 1000		
Jawary جواری	Pop. 450 Total. 600j	N 34.10508 E 68.57301	Out of 40 households 40 are benefiting from irrigated agriculture, the soil type is sandy, the hillside vegetation is	This village has one Canal and one surface well. Total length of this canal is 1200 m,	Canal		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
WD-CH-057	Irrig. 350j	Alt. 2177.5 m	sparse and out of 400 jeribs agriculture land 350 jeribs are irrigated, 350 jeribs are cultivated, the income of 35 families are from growing Cash crops, there are 80 jeribs cereals, 180 jeribs fruits, 50 jeribs animal feed, 70 jeribs beans and potatoes, in addition there are 35 cows, 180 sheep's and goats, 10 donkeys.	the source of this canal is khawat River, 3 villages shared the water of this canal and it served 250 households, its 1500 jeribs land. From surface well 25 households are benefiting. Cleaning and Repairing of canal and surface well is recommended.	80000 Surface well 1000		
Najoye ناجوی WD-CH-047	Pop. 550 Total. 110j Irrig. 600j	N 34.10329 E 68.56078 Alt. 2173,5 m	Out of 50 households 45 are benefiting from irrigated agriculture, the soil type is clay and sandy, the hillside vegetation is moderate. Out of 110 jeribs total land of village 600 jeribs are irrigated agriculture and 600 jeribs are cultivated, the incomes of 35 families are from growing Cash crops. There 180 jeribs cereals, 260 jeribs fruits, 70 jeribs animal feed, 45 jeribs beans and potatoes, 40 jeribs Rice. In addition there are 40 cows, 170 sheep's and goats, 10 donkeys.	This village has just one canal , the source of this canal is khawat river the length of canal is 1800m , 3 villages shared this canal and 200 households benefiting from this canal, its irrigated 2000 jeribs and it has leaks and blockages also full of mud and stones. Cleaning and Repairing of this canal is recommended.	Canal 50000		
Qhani khel غنی خیل WD-CH-046	Pop. 800 Total. 900j Irrig. 450j	N 34.10723 E 68.57773 Alt. 2149,5 m	Out of 70 households 65 are benefiting from irrigated agriculture, the soil type is silt and sandy, the hillside vegetation is moderate and the population has doubled in last 30 years. Out of 900jerib total land of village 450jerigbs are irrigated agriculture, 450jeribs are cultivated, the income of 50 families	This village has one Canal and the water of this canal is shared between 80 villages and 560 households benefiting from this canal, its irrigated 2600jeribs, Its full of mud and stones. Cleaning and Repairing of this canal	Canal 80000		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			are from growing Cash crops. There are 110jeribs cereals, 260jeribs fruits, 70jeribs animal feed, 70jeribs beans and potatoes, 30jeribs Rice. In addition there are 60 cows, 180 sheep's and goats, 15 donkeys.	is recommended.			

g. Villages surveyed on the Baksmand River and sub-watersheds

Nearly all these villages obtain their water from karezes and springs, but in some cases the distribution channel may be quite long and resemble a canal. The exception is part of Belandi at the bottom of the valley which is irrigated from one of the main canals off the Chak River. Nearly all these karezes need cleaning, some have been damaged by recent floods, and in many cases the distribution channels need deepening and lining with trees to prevent evaporative water loss. On the upper areas, there is a lot of scope for work to mitigate flooding by terracing, check dams and by planting trees. Although all villages on the main river would benefit, it is unlikely that they will contribute to work at a great distance. Therefore the villages surveyed have been divided arbitrarily into three groups and in the central section especially, it might be possible to stimulate joint community action, but bearing in mind that Ochodak and Badqhol are off the main valley and less likely to benefit. Above Soja, each village is on a separate sub-watershed and would be dealt with on an individual basis.

Rehabilitating karezes damaged by flood is the top priority. Secondly, much water is wasted in some of the distribution systems: deepening channels and stabilising the banks with trees would be beneficial. Thirdly and long-term, work on water harvesting, infiltration and flood mitigation is needed.

Several villages at the upper end of the valley would also benefit greatly from improvements to infrastructure, especially roads along the whole length of the valley. At higher elevations, many farmers grow fruit and have difficulty accessing markets. Time and distance from medical treatment is also a problem.

Figure 9 Map of Baksmand River and sub-watersheds

Lower (southern) section (2,150m – 2,300m)

Name: Village	Population Jeribs	GPS N E Altitude (m)	Village description	Water supply	Cost estimate USD	Cost per beneficiary USD	Cost per jerib irrigated USD
Belandy [8] بلندی WD-CH-016	Pop.1500 Total.620j Irrig.500j	N 34.13539 E 68.64308 Alt. 2,129m	There 150 households are benefiting from irrigated agriculture, the soil type is clay and silt. The population has doubled in last 30 years, Out of 1,500jeribs,500jeribs are irrigated,500jeribs are cultivated and the income of 100 families are from growing Cash crops crops, there are 205jeribs cereals,220jeribs fruits,20jeribs animal feed,50jeribs potatoes, beans. There are 100 cows,200sheeps	This village has one spring, one karez and one canal. This canal is shared between 5 villages, 800 households benefiting from this canal and its irrigated 3000jeribs. The karez irrigated 300jeribs are irrigated now, 80 household benefiting from this karez. There 480 households benefiting from this spring, 500 jeribs are irrigated. Cleaning, Repairing of the karez,spring, and canal is recommended	Canal 150,000 Karez 80,000 Spring 30,000		
Tatang تتنگ WD-CH-005	Pop . 400 Total 800j Irrig. 500j	N 34.15999 E 68.63419 Alt. 2237.5m	This village is located in middle of sub watershed. There are poplar woodlots on hillside. The soil is sandy the water source is from karezes and springs. Population has doubled in last 30 years. 40 families dependent on irrigated agriculture. The soil is clay. Out of 600 jeribs, 500 are irrigated; there are 210 jeribs of cereals, 300	The water source of this village is from springs and karez. Recent flood destroyed all the shafts of this karez. The spring was badly affected by recent flood and was full of mud and stones. This tube well is full mud and stones. Cleaning, digging new shafts	Karez 35,000 Spring 85,000 Surface well		

[8] Belandi is also served by the Sayed Bari Akhunzada canal which also supplies Zaman Khel, Gulie and Zarif

Name: Village	Population Jeribs	GPS N E Altitude (m)	Village description	Water supply	Cost estimate USD	Cost per beneficiary USD	Cost per jerib irrigated USD
			jeribs of fruits. There are 60 cows and 150 sheep & goats. Building of cold storage, bee farm and power station is recommended by people.	for karezes springs are recommended by people.	1,111		

Central Section (2,300m – 2,500m)

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Urdu اردو WD-CH-004	Pop.500 Total. 500j Irrig. 340j	N 34.18820 E 68.61524 Alt.2319m	The water source is from springs and karezes. 45 families dependent on irrigated agriculture. The population increase in last couple of years. The soil is sandy, 350 jeribs are irrigated. The income of 20 families is from growing Cash crops, There are 100 jeribs of cereal crop and 13 jeribs of fruits and there are 40 cows, 220 sheep's and goats. The people were asking for improved seeds.	The water source of this village is from springs and karezes. The situation of takak spring is very bad it's full of mud and stones. Also the Urdu karez is full of mud and stones cleaning and Repairing the whole shafts of this karez is recommended. The water of this well is decreased compared to past the reason is several years drought and less rainfall. Recently flood damaged this karez.	Spring 45,000 Karez 125,000 Surface well 18,000		
Badqol باد کول WD-CH-011	Pop. 300 Total.720j Irri. 400j	N 34.18357 E 68.60668 Alt. 2322m	Out of 22 household 22 are dependent on irrigated agriculture. The soil type is clay, out of 400jeribs are irrigated land and 400jeribs are 400jeribs are cultivated,200jeribs are rain fed land, the income of 15 household is from growing Cash crops. There are 230jeribs cereal, 100jeribs fruits, 30jeribs animal feed, and there are 25 cows, 210 sheep's and goats.	This village has two karezes and two springs. This village doesn't shear the water with any other village. The karezes are fulled by flood, need to be clean. The springs are also full of mud and stones. Cleaning of karezes and springs is recommended.	Karez 100,000 Spring 20,000		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Hasan Khan حسن خان WD-CH-003	Pop.400 Total 400j Irrig. 300	N 34.19645 E 68.6177 Alt 2331 m	The people of this village had good agriculture income in the past but from last couple of years the less rainfall and snowfall decreased the level of water and the water now is not sufficient for the whole agri land to irrigate. Out of 30 families, 20 are dependent on irrigated agriculture. Population has doubled from last 30 years from the elder's interview. The soil is sandy, out of 400 jeribs, 300 are irrigated. The hill side vegetation is sparse and erosion is a problem. The wheat is 80 j, Maize, Barley 40 J, 140 j fruit orchard seem there are more orchard trees. The people were asking for improved fruit saplings. There are 30 cows and 200 sheep, goats.	The source in this village is from spring and karez. The spring was badly affected by recent flood and was full of mud and stones. The water level had decreased compare to past. Need serious attention to clean and restore the water. The karez is also badly affected by recent flood and all the shafts of karez are full of mud and stones. Cleaning and repairing for the whole shafts of karez is recommended. The canal going from karez has leaks in the way to field and need to clean to stop the leaks.	Spring 60,000 Karez 150,000		
Sarferaz سرفراز WD-CH-013	Pop.500 Total.1000 Irri.500	N 34.20345 E 68.62645 Alt. 2384m	Out 32 household 20 are benefiting from irrigated agriculture, the soil is clay. The population has doubled in last 30 years, 500jeribs are irrigated land and 500jerbs are cultivated. There are 150jeribs cereals, 300jeribs fruits, 30jeribs animal feed and there	This village is located in middle of sub watershed, it has two springs and one karez, this village gets water every 7 days. The springs are full of mud and stones. And the karez is also full of mud and stones its irrigated 300jeribs. Cleaning springs karez and digging the shafts	Spring 60,000 Karez		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			are 40 cows, 240 sheep's.	of karez is recommended.	150,000		
Rindu ریندو WD-CH-012	Pop.400 Total.800j Irri. 500j	N 34.21275 E 68.61804 Alt. 2619m	Families 40 are benefiting from irrigated agriculture, out of 500 jeribs 500jeribs are irrigated, 500jeribs are cultivated and the income of the 30 families are from growing Cash crops crops. The hillside vegetation is spares There are 120jeribs cereals, 260jeribs fruits, 40jeribs animal feed, 80jeribs beans and potatoes. There are 60 cows, 250 sheep's, and goats.	The water source of this village is from one canal, this village gets water every 15 days for 5 days. The source of this canal is the Baksmand, the length is 600m and 4 villages shears the water of this canal. And it irrigated 1700jeribs, 250 household benefiting from this canal. This well is full of mud and stones need to be clean, 30 households benefiting from this well. Cleaning and concreting of the canals are recommended.	Canal 120,000 Surface well 450		
Ochodak آچتود ک WD-CH-015	Pop.250 Total.100j Irrig.40j	N 34.21234 E 68.60686 Atl. 2,434m	Out of 25 households, 25 are benefiting from irrigated agriculture, the soil type is clay, out of 60jeribs, 40jeribs are irrigated and 40jeribs are cultivated. The hillside vegetation is sparse. The income of 10 families are from growing Cash crops, the population has doubled in last 30 years, there are 30jeribs cereals,10jeribs fruits ,10jeribs animal feed. And there are 20 cows, 100sheeps.	The water source of this village is from karez and surface well. The canals from this karez has leaks and blockages, its irrigated 40jeribs land, 40housholds benefiting from this karez. The surface well is served by 20 families. Cleaning the karez shafts and surface well is recommended.	Karez 100,000 Surface well 444.444444		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Edel عادل WD-CH-053	Pop. 500 Total. 900j Irrig. 400j	N 34.22296 E 68.61969 Atl. 2414m	Out of 46 households 42 are benefiting from irrigated agriculture, the soil type is clay and the population has doubled in last 30 years, the hillside vegetation is sparse. Out of 900 jeribs total land of village 400 jeribs are irrigated agriculture land,400 jeribs are cultivated and the income of 30 families are from growing Cash crops, there are 100 jeribs cereals,140 jeribs fruits,45 jeribs animal feed,100 jeribs beans and potatoes. In addition there are 40 cows, 280 sheep's and goats, 35 donkeys.	This village has one spring and one surface well. 46 households are benefiting from this spring and its irrigated 250 jeribs land, this spring is badly damaged by recent flood. From surface well 20 households benefiting and it's full of mud and stones. Cleaning and Repairing of the spring and surface well is recommended.	Spring 60000 Surface well 1000		

Northern High Section (above 2,500m)

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Soja سوجه WD-CH-042	Pop. 400 Total.1700j Irrig. 500j	N 34.23329 E 68.62174 Alt. 2446 m	Out 32 households 30 are benefiting from irrigated agriculture, the soil type is clay and out of 1700jeribs total land of village 500jeribs are irrigated agriculture and 500jeribs are cultivated, the income of 15 families are from growing Cash crops. The hillside vegetation is moderate; the population has doubled in last 30 years. There are 120jeribs cereals, 280jeribs fruits, 60jeribs animal feed, 35jeribs beans and potatoes. In addition there are 320 cows, 28sheeps and goats, 30 donkeys.	This village has one spring, one karez and one canal. The spring is served by 30 households and its irrigated 3jeribs, and from karez 12 households benefiting and it's irrigate 10jerib but the shafts of karez is full of mud and stones. The source of canal is from spring and it's served by 30 households its irrigate 40 jeribs. Cleaning and enlarging of canal is recommended.	Spring 20,000 Karez 10,000 Canal 20,000		
Jawooze جووز WD-CH-049	Pop. 800 Total.1500j Irrig. 350j	N 34.24410 E 68.63005 Atl. 2573 m	Out of 95 households 92 are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years, and the hillside vegetation is moderate. Out of 1500 jeribs total lands of village 350 jeribs are irrigated agriculture, 350 jeribs are cultivated. The income of 45 families are from growing Cash crops, there are 110 jeribs cereals,150 jeribs fruits,25 jeribs animal feed,70 jeribs beans and potatoes. In addition there are 85 cows, 560 sheep's and goats, 60	This village has one karez, one spring and one surface well. From karez 85 households are benefiting and its irrigated 50 jeribs land has leaks and blockages. And from spring 90 households benefiting, it's irrigated 30 jeribs land and it's badly damaged by recent flood. 90 households are benefiting from surface well.	Karez 25000 Spring 25000 Surface well		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			donkeys.	Cleaning and Repairing of surface well, spring and karez is recommended.	22.2222222		
Zay Khaida ذوالقا عده WD-CH-051	Pop. 400 Total.1200j Irrig. 600j	N 34.25312 E 68.64080 Alt. 2674 m	Out of 35 households 30 are benefiting from irrigated agriculture, the soil type is sandy, the population has doubled in last 30 years, and the hillside vegetation is sparse. Out of 12 jeribs total land of village 600 jeribs are irrigated agriculture,600 jeribs are cultivated and 20 jeribs are fainfed, the income of 20 families are from growing Cash crops, there are 140 jeribs cereals,160 jeribs fruits,60 jeribs animal feed,150 jeribs beans and potatoes. In addition there are 30 cows, 350 sheep's and goats, 30 donkeys.	This village has one karez and one surface well. From karez 30 households are benefiting, it's irrigated 60 jeribs. From the surface well 30 families are benefiting but it's full of mud and stones. Cleaning and Repairing of karez shafts and surface well is recommended.	Karez 32000 Surface well 1000		
Palezak اندرپالیزک WD-CH-044	Pop. 600 Total.1000j Irrig. 320j	N 34.26315 E 68.60096 Alt. 2723m	Out of 60 households 60 are benefiting from irrigated agriculture, the soil type is clay, the hillside vegetation is moderate and the population has doubled in last 30 years. Out 1000jeribs total land of village 520jeribs are agriculture land, 320jeribs are irrigated land and 320jeribs are cultivated, the income of 40 families are from growing Cash crops. There are 150jeribs cereals, 250jeribs fruits, 45jeribs animal feed, 70jeribs beans and potatoes. In	This village has just one karez. This village gets water every 5 days. From this karez 40 households benefiting and its irrigated 30jeribs, and the shafts of this karez is full of mud and stones. Cleaning and Repairing of this karez is recommended.	Karez 20000		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			addition there are 55 cows, 320 sheep's and goats, 40 donkeys.				
Hassan khel حسن خیل WD-CH-043	Pop. 300 Total. 800j Irrig. 450j	N 34.26111 E 68.59910 Atl. 2689m	Out of 20 households 20 are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years. Out of 800 jeribs total land of village 450jeribs are irrigated agriculture and 450jeribs are cultivated, the income of 10 families are from growing Cash crops, and there are 130jeribs cereals,220jderibs fruits,70jeribs animal feed,25jeribs beans and potatoes. In addition there are 15 cows, 300 sheep's and goats, 15 donkeys.	This village has just one karez. From this karez 25 households benefiting and it's irrigate 30jeribs, the shafts of this karez is full of mud and stones. Cleaning and Digging the shafts of kares is recommended.	Karez 9000		
Syahaw سیا ناب WD-CH-041	Pop. 550 Total. 700j Irrig. 150 j	N 34.27119 E 68.59417 Alt. 2838 m	Out of 50 households 45 are benefiting from irrigated agriculture, the soil type is clay. The population has doubled in last 30 years, the hillside vegetation is moderate. Out of 700jeribs total land of village 150jeribs are irrigated agriculture, 150jeribs are cultivated. The income of 20 families are from growing Cash crops, there are 50jeribs cereals, 50jeribs fruits, 30jeribs animal feed, 18jeribs beans and potatoes. In addition there are 35 cow, 400 sheep's and goats, 55 donkeys.	This village has one spring one karez and one surface well. The spring is served by 40 households and irrigated 3jeribs land and it's badly damaged by recent flood, and from karez 100 households benefiting its irrigated 40jeribs, Cleaning and Repairing of spring and karez is recommended. And from surface well 40 households are benefiting, Cleaning and Digging of well is recommended.	Spring 40000 Karez 8000 Surface well 1,333		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Tawa[9] تاوه WD-CH-050	Pop. 350 Total. 600j Irrig. 300j	N 34.26770 E 68.64622 Alt. 2756 m	Out of 30 households 25 are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years, out of 600 jeribs total land of village 320 jeribs are agriculture land and 300 irrigated, 300 jeribs are cultivated and 20 jeribs are rainfed. The hillside vegetation is moderate, The income of 12 families are from growing Cash crops, there are 80 jeribs cereals,180 jeribs fruits,20 jeribs animal feed,35 jeribs beans and potatoes. In addition there are 25 cows, 300 sheep's and goats, 25 donkeys.	This village has one karez, one spring and one surface well. From karez 20 households benefiting and it's irrigated 100 jeribs. And the spring is served by 20 households, it's irrigated 6 jeribs and it's full of mud and stones. And from surface well 20 families are benefiting. Cleaning and Repairing of spring, karez and surface well is recommended.	Karez 28000 Spring 3500 Surface well 555.555556		
Sebak سیبک WD-CH-045	Pop. 600 Total.1200j Irrig. 700j	N 34.28192 E 68.61728 Atl. 2706 m	Out of 60 households 50 are irrigated agriculture, the soil type is clay and the hillside vegetation is moderate, the population has doubled in last 30 years. Out of 1200jeribs total land of village 700jeibs are irrigated agriculture and 700jeribs are cultivated, the incomes of 35 families are from growing Cash crops. There are 200jribs cereals, 300jeribs fruits, 80jeribs animal feed, 110jeribs beans and potatoes. In addition there are 40 cows, 400 sheep's and goats, 36 donkeys.	This village has one karez and one spring. The karez is served by 65 households, and its irrigated 200jeribs land, Cleaning and Repairing of karez is recommended. And from this spring 65 households benefiting and its irrigated 50 jeribs land. Cleaning and Repairing the spring is recommended.	Karez 18000 Spring 10000		

[9] See Figure 2 above – Pictures of Tawa Village

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Karez-e-Surkh كاريز سرخ WD-CH-048	Pop. 450 Total. 900j Irrig. 500j	N 34.29988 E 68.60473 Alt. 2941 m	There are 20 households benefiting from irrigated agriculture, the soil type is clay and sandy, out of 900 jeribs total land of village 500 jeribs are irrigated agriculture, 500 jeribs are cultivated, the income of 10 families are from growing Cash crops. The hillside vegetation is sparse, There are 140 jeribs cereals, 180 jeribs fruits, 100 jeribs animal feed, 76 jeribs beans and potatoes. In addition there are 18 cows, 400 sheep's and goats, 20 donkeys.	This village has two karez and one spring. 20 households benefiting from this karez and its irrigated 40 jeribs, the shafts of this karez is full of mud and stones. And from spring 14 households benefiting, it's irrigated 8 jeribs land. Cleaning and Repairing of karez and spring is recommended.	Karez 25000 Spring 35000		

h. Villages surveyed in the Dersh Shalay sub-watershed

This sub-watershed is easily accessible off the main river valley and would make a convenient unit for a whole range of interventions starting with repairs to existing structures, especially those suffering from flood damage. See the section describing Qurbanay and Sprinkalay above and the map – Figure 7 above. There is a general shortage of water for agriculture and horticulture which could be remedied in the short-term by constructing off-stream reservoirs and in the long-term by improving water harvesting and infiltration to ground water in the upper reaches of the watershed. The sandy soil necessitates frequent irrigation and the method of sharing water between farmers should reflect this. Part of the cause of the flooding and shortage of water is the increase in population and livestock. Agreement on restricting grazing and collection of fuel-wood would be necessary as part of long-term interventions.

Name: Village	**Population Jeribs**	**GPS N E Altitude (M)**	**Village Description**	**Water Supply**	**Cost Estimate USD**	**Cost Per Beneficiary USD**	**Cost Per Jerib Irrigated USD**
Moqamkhel محکم خیل WD-CH-008	Pop. 650 Total 1,200j Irrig. 400j	N 34.08817 E 68.55226 Alt. 2,196m	Out of 60 families, 50 are dependent on irrigated agriculture; the soil is clay and sandy. Out of 600 jeribs agriculture land, 400 jeribs are irrigated. The population has doubled in last 30 years. There are 180 jeribs cereals, 120 jeribs fruits, 80 jeribs animal feed. The survey states that the hillside vegetation is moderate, but looking at the pictures and Google Earth, the area looks bereft of trees. The people of this village asking for improved seed, cleaning canals, digging tube well, and advanced agriculture equipment. There are 45 cows and 230 sheep & goats	The water source of this village is from karezes and springs. The spring is full of mud and stones. The karez is also full of mud and sand. It needs to be repaired and cleaned. 30 years ago 18 jeribs were irrigated by this karez but now irrigated 2 jeribs. 20 household benefiting from this karez. Cleaning and Concreting of karez and spring is recommended. Tree planting should be seriously considered.	Spring 45,000 Karez 130,000		
Qurbanay قربانی	Pop. 800 Total. 2000	N 34.07599 E 68.56695	out 75 households 65 are benefiting from irrigated agriculture, the soil type is clay and out of 1200jeribs	This village has four karezes, The 4 karezes have been badly damaged by floods and water distribution	Karez		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
WD-CH-023	Irrig. 200	Alt. 2299 m	agriculture land 200 jeribs are cultivated,200jeribs are irrigated,1000jeribs are rainfed and the income of 20 families are from growing Cash crops crops. There are 1010jeribs cereals,90jeribs fruits,40jeribs animal feed,50jeribs beans,potatoes.in addition there are 60 cows,800 sheeps,goats ,65 donkey.	systems need repair. Cleaning karezes and Concreting the cannel of these karezes are recommended.	60,000 Karez 35,000		
Spinkalay قلعه سفید WD-CH-006	Pop.600 Total .4000j Irrig.250j	N 34.07819 E 68.56946 Alt .2306m	This village is located in high mountain. The income of the people is from agriculture, out of 60 families 60 families are dependent on irrigated agriculture. The population has doubled in last 30 years. There 1000 jeribs agriculture land, out of 1000 agri land 250 irrigated land and 150 rainfed land. There are 220 jeribs of cereals, 80 jeribs are fruits and 30 jeribs animal feed, 70 jeribs potatoes and onions. There are also 50 cows, 350 sheep's and goats.	The water source of this village is from springs. Spinkalay gets water every 10 days. The hillside vegetation is sparse. The water of karezes decreased compared to past, it's full of mud and stones. This tube well is full of mud and stones. Building of new shafts for karez and cleaning of karez is recommended.	Karez 90,000 Surface well 1,111		

i. Miscellaneous Villages surveyed dependent on karezes or springs

Malik Khel, Sayadan, Kharooti, Alishah and Chapdara are on a small tributary parallel and to the east of the Baksmand River. This is called the Alisha River. Only Kharooti mentions flood damage. However these five villages and any others not surveyed would make a convenient unit for intervention relatively accessible from the main road in the Chak valley. All villages need karez cleaning, followed by improvements to reservoirs and distribution channels. However, from photographs it is clear that there has been recent work on constructing reservoirs and concreting parts of the distribution system. Much of the valley sides are not steep and there is plenty of scope for terracing and afforestation. The large numbers of livestock, especially the sheep and goats in the higher villages, would need to be controlled.

Gunda Chushma, Kashu, Patal Khel, Qala and Delak Khel form a group in the far east of Chak called Alasang. There are large areas of flattish land, barren and sparsely populated. No urgent repairs are mentioned, but there would seem to be great scope for afforestation and improving grazing. The construction of large storage reservoirs would open up the possibility of fruit growing as the sloping land would be frost free and the lower elevation would be suitable for several different fruits – apples, pears, plums, cherries, almonds, apricots and peaches. Soil conditions would have to be investigated first, but water quality in the karezes is good. The initial assessment is that this is a low priority area, but with considerable long-term economic potential as it is close to Highway One.

Name: Village	**Population Jeribs**	**GPS N E Altitude (M)**	**Village Description**	**Water Supply**	**Cost Estimate USD**	**Cost Per Beneficiary USD**	**Cost Per Jerib Irrigated USD**
Malikhel ملی خیل WD-CH-058	Pop. 500 Total. 800j Irrig. 500j	N 34.18105 E 68.69179 Alt. 2265.5 m	Out of 40 households 40 are benefiting from irrigated agriculture, the soil type is clay and silt, out of 800 jeribs total land of village 500 jeribs are irrigated agriculture, 500 jeribs are cultivated. The incomes of 30 families are from growing Cash crops. There are 120 jeribs cereals, 160 jeribs fruits, 70 jeribs animal feed, 110 jeribs beans and potatoes. In addition there are 650 cows, 40 sheep's and goats, 30 donkeys.	This village has two karezes and on surface well. From these karezes 100 households are benefiting and its irrigated380 jeribs land, it's full of mud and stones, and from surface well 25 households are benefiting. Cleaning and Repairing of karezes and surface well is recommended.	Karez 25000 Surface well 500		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Sayadan سیدان WD-CH-062	Pop. 650 Total. 600j Irrig. 400j	N 34.18461 E 68.69277 Alt. 2299 m	Out of 50 households 50 households are benefiting from irrigated agriculture, the soil type is clay and sandy, the population has doubled in last 30 years, the hillside vegetation is sparse. Out of 700 jeribs agriculture land 400 jeribs are irrigated and 400 jeribs are cultivated, the incomes of 35 families are from growing Cash crops. There are 360 jeribs cereals, 240 jeribs fruits, 35 jeribs animal feed, 60 jeribs beans and potatoes. In addition there are 50 cows, 650 sheep's and goats, 40 donkeys.	This village has just one karez; the karez is served by 60 households and its irrigated 400 jeribs land. Cleaning and Repairing of this karez is recommended.	Karez 16000		
Kharooti خروتی WD-CH-052	Pop. 600 Total. 430j Irrig. 300j	N 34.20070 E 68.68902 Alt. 2398 m	Out of 50 households 40 are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years, and the hillside vegetation is sparse. Out of 430 jeribs total land of village 300 jeribs are irrigated agriculture, 300 jeribs are cultivated, the income of 25 families are from growing Cash crops, there are 100 jeribs cereals, 100 jeribs fruits, 40 jeribs animal feed,55 jeribs beans and potatoes. In addition there are 40 cows, 400 sheep's and goats, 35 donkeys.	This village has just one karez. 45 households are benefiting from this karez and it's irrigated 280 jeribs and it's badly damaged by recent flood and it's full of mud and stones. Cleaning and Repairing of this karez is recommended.	Karez 40000		
Alishah علیشاه	Pop.15000	N 34.20275	Out of 85 households 80 are benefiting from irrigated agriculture, the soil type	This village has two karez, from these karez 120 households are			

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
WD-CH-056	Total.2000j Irrig. 800j	E 68.69238 Alt. 2424 m	is sandy, the population has doubled in last 30 years, the hillside vegetation is sparse, out of 2000 jeribs total land of village, 800 jeribs are irrigated agriculture and 800 jeribs are cultivated, the income of 60 families are from growing Cash crops. There are 350 jeribs fruits,70 jeribs animal feed, in addition there are 80 cows, 500 sheep's and goats, 40 donkeys.	benefiting and its irrigated 480 jeribs land. Cleaning and Digging the shafts of karez is recommended.	Karez 50000		
Chapdara چپ دره WD-CH-055	Pop. 400 Total. 700j Irrig. 500j	N 34.20810 E 68.67948 Alt. 2469 m	Out of 20 households 20 are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years, and the hillside vegetation is sparse. Out of 700 jeribs 500 jeribs are irrigated agriculture, 500 jeribs are cultivated, and the incomes of 15 families are from growing Cash crops. There are 300 jeribs cereals, 120 jeribs fruits, 45 jeribs animal feed, 30 jeribs beans and potatoes. In addition there are 18 cows, 320 sheep's and goats, 20 donkeys.	This village has one karez and one surface well; from this karez 200 households are benefiting, and its irrigated 200 jeribs land. This karez is full of mud and stones, and from surface well 13 households are benefiting. Cleaning and Repairing of kares and surface well is recommended.	Karez 45000 Surface well 22.2222222		
Gunda Chushma کنده چشمه WD-CH-053	Pop. 550 Total.2000j Irrig. 200j	N 34.19759 E 68.76370 Alt. 2482 m	Out of 50 households 40 are benefiting from irrigated agriculture, the soil type is clay, the hillside vegetation is sparse. Out of 1200 jeribs agriculture land 200 jeribs are irrigated and 600 jeribs are cultivated and 400 jeribs are rainfed. The income of 25 families are from	This village has two karez and one spring. From first karez 75 households are benefiting and its irrigated 66 jeribs land and from karez number two 70 households are benefiting ,its irrigated 30 jeribs land.	Karez 45000 Karez 45000		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			growing Cash crops, there are 550 jeribs cereals,350 jeribs fruits, 140 jeribs animal feed,120 jeribs are beans and potatoes. In addition there are 45 cows, 450 sheep's and goats, 28 donkeys.	Cleaning of karez and concreting the Reservoir of this karez is recommended. From spring 70 households are benefiting and its irrigated 5 jeribs land, it's full of mud and stones. Cleaning and Repairing of this spring is recommended.	Spring 30000		
Delak khel دلک خیل WD-CH-054	Pop. 800 Total.1800j Irrig. 750j	N 34.21923 E 68.76187 Alt. 2463 m	There are 70 households are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years. Out of 1500 jeribs agriculture land 750 jeribs are irrigated land and 750 jeribs are cultivated, the incomes of 50 families are from growing Cash crops. There are 300 jeribs cereals, 200 jeribs fruits, 70 jeribs animal feed, 150 jeribs beans and potatoes. In addition there are 60 cows, 1000 sheep's and goats, 60 donkeys.	This village has just one karez, from this 600 households are benefiting and its irrigated 700 jeribs land, this karez is full of mud and stones. Cleaning, Repairing and concreting the Reservoir of this karez is recommended.	Karez 50000		
Qala قلعه WD-CH-059	Pop. 500 Total. 700j Irrig. 300j	N 34.21274 E 68.76208 Alt. 2442 m	Out of 40 households 40 are benefiting from irrigated agriculture, the soil type is clay, the hillside vegetation is sparse. Out of 400 jeribs agriculture land 300 jeribs are irrigated and 300 jeribs are cultivated, the incomes of 20 families are from growing Cash crops. There are 110 jeribs cereals, 150 jeribs fruits,	This village has just one karez, 40 households are benefiting from this karez and its irrigated 100 jeribs land. Cleaning and Repairing of this karez is recommended.	Karez 24000		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			60 jeribs animal feed, 75 jeribs beans and potatoes. In addition there are 35 cows, 800 sheep's and goats, 30 donkeys.				
Kashu كاشو WD-CH-060	Pop. 290 Total.1000j Irrig.150j	N 34.19449 E 68.74375 Alt. 2350.5 m	Out of 25 households 25 are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years and the hillside vegetation is moderate. Out of 300 jeribs agriculture land 150 jeribs are irrigated and 300 jeribs are cultivated, 150 jeribs are rainfed. The incomes of 15 families are from growing Cash crops. There are 120 jeribs cereals, 120 jeribs fruits, 30 jeirbs animal feed, 20 jeribs beans and potatoes. In addition there are 25 cows, 1000 sheep's and goats, 20 donkeys.	This village has one karez and one spring. The karez is served by 20 households and its irrigated 100 jeribs land. The spring is served by 18 households and its irrigated 100 jeribs land. Cleaning and Repairing of spring and karez is recommended.	Karez 60000 Spring 21000		
Patalkhel پتل خیل WD-CH-061	Pop. 300 Total.1000j Irrig. 150j	N 34.20881 E 68.74786 Alt. 2455 m	Out of 30 households 30 are benefiting from irrigated agriculture, the soil type is clay, the population has doubled in last 30 years, and the hillside vegetation is moderate. Out of 300 jeribs agriculture land 150 jeirbs are irrigated and 150 jeribs are cultivated and the incomes of 15 families are from growing Cash crops. There are 100 jeribs cereals, 150 jeirbs fruits, 20 jeribs animal feed, 25 jeribs beans and potatoes. In addition there are 35	This village has one karez and one spring. The karez is served by 70 households and its irrigated 100 jeribs land and it's full of mud and stones. The spring is served by 80 households and its irrigated 50 jeribs land. Cleaning and Repairing of karez and spring is recommended.	Karez 35000 Spring 30000		

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			cows, 600 sheep's and goats, 20 donkeys.				

j. Miscellaneous Micro-watersheds

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Karez كاريز WD-CH-017	Pop.180 Total.200j Irrig.15j	N 34.14224 E 68.61792 Alt. 2197 m	There are 61 households benefiting from irrigated agriculture, the soil type is clay, out of 50jeribs, 50jeribs are cultivated, 35jeribs are rainfed land. The hillside vegetation is sparse, The income of 6 families are from growing Cash crops crops, there are 35jeribs wheat,5jeribs fruits,6jeribs animal feed, in addition there are 16cows,15 sheeps,goats and 150 donkey.	This village has two springs, one karez.every families gets water every 9 days. The karez irrigated 15jeribs, 16 households benefiting from this karez, Digging new shafts and Cleaning of karez is recommended. The springs are irrigated 10jeribs, It's full of mud and stone, Cleaning and Repairing of this spring is recommended.	Spring 30,000 Karez 75,000		
Qala Baba قلعه بابا WD-CH-18	Pop. 1500 Total.3000j Irrig.650j	N 34.13945 E 68.56897[10] Atl. 2405 m	There are 140 households benefiting from irrigated agriculture, the population has doubled in last 30 years and the hillside vegetation is spares, the soil type is clay and sandy, out of 800jeribs agriculture land, 650jeribs are cultivated, 650jeribs are irrigated. The income of 125 families are from growing Cash crops crops, there are 210jeribs cereals, 300jeribs fruits, 40jeribs animal feed, 50jeribs	This village has two springs, two canals and one karez, and canal shared between 20 villages. From karez 25 households benefiting, its irrigated 6jeribs,10 households benefiting from this karez and its irrigated 10jersibs. Cleaning and Repairing the springs, Canals and karez is recommended.	Spring 50,000 Canal 300,000 Karez 125,000		

[10] It is hard to determine the exact location of the village from the coordinates of features in the survey. It seems to stretch from the Chak River at Pana up a substantial sub-watershed which later divides and is fed by springs and karezes.

Name: Village	Population Jeribs	GPS N E Altitude (M)	Village Description	Water Supply	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			beans and potatoes, 50jeribs Rice. There 130 cows, 200sheeps, goats, 20 donkey.				

7. Physical Description of Canals, Karez and Other Components

This section covers the major water structures surveyed. It was written by local staff and has not been reviewed carefully, but it is included for reference. As it is not in any order, the best way to find any particular structure is to use the 'find' feature (CTRL-F) in word and search on the village name. Some villages appear several times according to the water structures (karezes, canals, dams etc.) in them. To search for all karezes, for example, it would be better to request GPFA staff to prepare a separate list from the original database.

Name: **Village** **Item**	**Type**	**GPS (Of Exit)** **N** **E** **Altitude (M)**	**Description**	**Condition &Repairs Needed**	**Cost Estimate USD**	**Cost Per Beneficiary USD**	**Cost Per Jerib Irrigated USD**
Modo Karezak	Karez	N 34.10925 E 68.60428 Alt 2,230 m	100m long Karez supplying 2 villages. Used to irrigate 100 jeribs, but now only 10. It irrigates a wide range of crops. Last cleaned 2005. New irrigation systems are being trialled by villagers. Water quality is acceptable for irrigation and drinking.	There is heavy soil erosion above the karez. Distribution channels have cracks, leaks and are blocked with stones. Karez shafts need cleaning and the distribution channels need unblocking and repairing Soil stabilisation needed above karez	100,000	33 per family	10,000
Tawa	Karez 'Tanga Yakha Spring'	N 34.2685 E 68.65132 Alt 2,800 m	130m long karez irrigating 100 jeribs at Tawa village. It used to irrigate 150 jeribs and has not been cleaned for 20 years.	The karez shafts, channels and the reservoir all need cleaning Moderate erosion is noted	40,000	2,000 per family	400
Dawrankhel	'Sayed' Canal	N 34.09702 E 68.57206 Alt 2,185 m	This is a long canal (c. 4km) which runs off the Chak River at Nurkhel. Although there are only 65 families depending on it for irrigation in Dawrankhel, the canal serves 20 villages in total with 1,200 households	The canal needs cleaning. There are leaks to repair. No data on the state of the off-take or the supply to the other villages. From the photos, the condition of the canal looks reasonable.	130,000?	110 per family	8.6

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			and some 15,000 jeribs.				
Karez-e-Surkh	Reservoir	N 34.30395 E 68.60725 Alt 2,934	This is an unlined reservoir of about 2,800 m^3 capacity. It is used for senayee irrigation of wheat, fruit and other crops as well as for drinking for the extensive livestock. It takes 12 hours to fill the reservoir every day but it is not clear where the water comes from. 80 jeribs are irrigated.	The reservoir is 80% shaded and just needs cleaning out, but the channels from it are blocked or leak	40,000	2,857	500
Allahkhel	Bakheband Canal	N 34.120925 E 68.603095 Alt 2,171 m	1000 m long Canal supplying 15 villages, 15000 households are benefiting from it and its irrigated 16000 jeribs. The source of this canal is sarband River. There is vegetation in and outside of canal the vegetation type is trees and grasses the irrigation type is in furrow and flood and the water is not potable.	This Canal is natural and it's full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	135,000	9 per family	8,437
Delak khel	Landakay Zhawar karez	N 34.21922 E 68.76187 Alt. 2462 m	220 m long karez its irrigates 760 jeribs and it was cleaned 20 years ago, the soil type is gravel and 600 households are benefiting from it and its irrigated 700 jeribs land the	The shafts of karez are full of mud and stones, the channel have leaks and blockages, needs to Cleaning and Repairing.	50,000	83 per family	67

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			irrigation system is in the shape of furrow and flood and the water is potable.				
Belandy	Belandy spring	N 34.16998 E 68.64418 Alt. 2237 m	480 households are served by this spring and its irrigated 500 jeribs, the water is decreased compare to past the reason is drought and the spring is full of mud and stones, vegetation and erosion is moderate. The water is potable.	This spring is full of mud and stones, has leaks and blockages, need to Cleaning and Repairing. The channel from this spring has leaks and cracks need to be Repair.	30,000	62 per family	60
Pana	Taaka canal	N 34.11721 E 68.59314 Alt. 2090 m	4500m long canal supplying 16 villages and its irrigated 18000 jeribs, 1500 households are benefiting from this canal and its irrigate 18000 jeribs, the water is not potable and the canal has shrubs and grasses in and out of it.	This Canal is full of mud and stones, has leaks and blockages and the intakes of this canal is natural need to Repair.	100,000	66 per family	55
Qurbanay	Karez Darsheelay	N 34.07338 E 68.57177 Alt. 2319 m	100m long canal supplying 140 households and its irrigate 80 jeribs, the soil type is gravel, erosion is noted moderate above the karez there are much vegetation in and out canal and the irrigation system is in the shape of furrow and flood. The water is potable.	This karez is full of mud and stones, has leaks and blockages. Need to Cleaning and Repairing, the erosion is a problem.	60,000	428 per family	750

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Modo	Zarboom spring	N 34.08970 E 68.61491 Alt. 2389	120 households benefiting from this spring, and it irrigates 100 jeribs, the erosion is heavy above the spring; there are grasses in and out of spring the water is potable.	This spring is filled by flood, Cleaning, Repairing and Making a dam for this spring is recommended.	1111	9 per family	11
Jawooze	Spring Reservoir	N 34.24126 E 68.63097 Alt. 2572 m	300 m3 Reservoir supplying 800 households and it irrigate 40 jeribs, This reservoir filled in 12 hours, the water is used for irrigation, livestock and drinking, this reservoir built in last 80 years. The water is potable and the erosion is a problem, the irrigation system is in the shape of senayee.	This Reservoir is damaged and full of mud, stones. and has vegetation in and around it. Cleaning and Repairing is recommended.	15000	18 per family	375
Jawooze	Mosque well	N 34.24135 E 68.63001 Alt. 2569 m	This well supplying 90 households, and it was dug 8 years ago; the waster is used for drinking and livestock.	This well is full of mud and stones, digging and installation of hand pump above the well is recommended.	222.222222		
M.yarkhel	Malik yaar canal	N 34.12392 E 68.62091 Alt. 2170 m	3000m long Canal supplying 20 villages, the source is sarband chak, it's served by 1700 households and irrigates 20000 jeribs land, the water is potable.	This Canal is full of mud and stones, has leaks and blockages. Needs to Cleaning and Repairing.	130,000	76 per family	6.7

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Qurbanay	Karez Darsheelay	N 34.07338 E 68.57177 Alt. 2319 m	From this karez 140 households are benefiting and its irrigates 80 jeribs of land , the soil type is sandy, erosion is moderate and the water is potable but much grasses and trees are seems in both side of canal.	This karez is full of mud and stones, need to Cleaning and Repairing.	60,000	428 per family	750
Modo	Star Khawz	N 34.10289 E 68.60918 Alt. 2282 m	The source of this Reservoir is Abkhana karez, it has 3600m3 capacity and this reservoir is built 280 years ago, the reservoir purpose is irrigation, drinking and livestock, it take12 hours to fill, its irrigates 5 jeribs land and 300 households are benefiting from this Reservoir, the water is potable and the irrigation system is canal and furrow.	This Reservoir is full of mud and stones and has grasses inside the Reservoir. Cleaning and Repairing is recommended.	80,000	266 per family	16000
Modo	Zarboom spring	N 34.08970 E 68.61491 Alt. 2389 m	This spring is served by 120 households and its irrigates 100 jeribs land, the irrigation system is canal but some of them is using furrow also, the erosion is a problem and the water is potable.	This spring is full of mud and stones and the canal of this spring has leaks and blockages. Cleaning and Repairing of this spring is needed.	1111	9 per family	11.11

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
M.Daad Masjid Alya	Taaka canal	N 34.15449 E 68.66423 Alt. 2140 m	2000 long canal supplying 20 villages and 1500 households are benefiting from it, is irrigates 8250 jeribs. The irrigation system is furrow and flood, the water is not potable.	This canal badly damaged by flood and it's full of mud and stones.	150,000	100 per family	18.18
Khalily	Karez Hajyan	N 34.33310 E 68.41321 Alt. 2345.5 m	This karez is supplying 100 households and it irrigates 5 jeribs, the soil is sandy, the water is potable and the irrigation system is furrow and flood.	The karez shafts is full of mud and stones, need to Cleaning and Repairing.	120,000	1200 per family	24000
Spinkalay	Band Qala Saphedd Reservoir	N 34.07613 E 68.56659 Alt. 2287 m	The source of this Reservoir is spring, it has 3375 m3 capacity, the Reservoir built 20 years ago, it takes 6 hours to fill,80 jeribs irrigated from this Reservoir, the irrigation system is furrow and flood, the water is potable.	This Reservoir is full of mud and stones. Cleaning and Repairing is recommended.	20,000	58 per family	250
Jawooze	Village Spring	N 34.24123 E 68.63097 Alt. 2571 m	This spring supplying 90 households and irrigates 30 jeribs, erosion is moderate above the spring, the irrigation is in shape of senayee and the water is potable.	This spring is full of mud and stones. Cleaning and Repairing is necessary.	25000	277 per family	833

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Modo	Sayed canal	N 34.1120 E 68.59769 Alt. 2120 m	500m long Canal supplying 10 villages and 1300 households are benefiting from this Canal, it irrigates 12,000 jeribs land, and the irrigation system is canal and furrow.	This Canal is full of mud and stones, Cleaning and Repairing are recommended.	120,000	92 per family	10
Syahaw	Marqha karez	N 34.27260 E 68.58840 Alt. 2892 m	This karez is supplying 100 households and it irrigates 40 jeribs land, last cleaned was 20 years ago, the flow of water is decreased compared to past by drought and new tube near to this karez, the soil type is sandy and the erosion is moderate, the irrigation system is senayee and the water is potable.	This karez is full of mud and stones, has leaks and blockages. Cleaning and enlarging the Reservoir of this karez is necessary.	8,000	80 per family	200
Patalkhel	Chushma Reservoir	N 34.20934 E 68.74849 Alt. 2439 m	The source of this Reservoir is spring and it has 240 liter capacity and it was built 35 years ago, it takes 8 hours to fill and it irrigates 100 jeribs land and this Reservoir supplying 600 households, the irrigation system is furrow and flood, the water is potable and its used for drinking and livestock.	This Reservoir is full of mud and stones. Cleaning and enlarging the Reservoir is necessary.	16,000	26 per family	160
Patalkhel	Wech Houzacki Spring	N 34.20939 E 68.74849 Alt. 2439 m	This spring supplying 80 households and irrigates 50 jeribs,	This spring is full of mud and stones, Needs to Cleaning and Repairing.	30,000	375 per family	600

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			The erosion is moderate, the water is decreased compared to past the reason is drought, new tube well near to spring and spring dirty, the irrigation system is in the shape of furrow and flood, the water is potable.				
Chak	Canal Reservoir Dam	N 34.10462 E 68.57773 Alt. 2180 m	The source of this dam is River, dam propose is irrigation and saving the village from flood.	The dam is full of silt and stones, has leaks and blockages, and needs to Cleaning and Repairing	20,000	117 per family	
Ali Himat	Malik yaar canal	N 34.12279 E 68.61569 Alt. 2159 m	3000m long Canal supplying 20 villages and the Canal source is sarband, 1500 households are benefiting from this, it irrigates 15000 jeribs land, the irrigation system is furrow and flood, the water is not potable.	This Canal is full of mud and sands, also has leaks and blockages.	160,000	106 per family	10.6
Jawooze	White Mosque karez	N 34.24438 E 68.63511 Alt. 2620 m	This karez supplying 85 households and irrigates 50 jeribs land, erosion is moderate and the irrigation system is senayee. The water is potable.	This karez is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	28,000	329 per family	560
Karooti	Landy karez Reservoir	N 34.20054 E 68.69074	The source of this reservoir is landy karez, and it has 900 liter	This Reservoir is full of mud and stones, Cleaning and	40,000	88 per family	133

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
		Alt. 2392 m	capacity, It was built 80 years ago, it takes 6 hours to fill, 450 households are benefiting from this reservoir, 300 jeribs are irrigated by this Reservoir. The irrigation type is furrow and flood, the water is potable.	Repairing are recommended.			
Gunda Chushma	Wech Houzacki spring	N 34.20568 E 68.76189 Alt. 2395 m	70 households are benefiting from this spring and it irrigates 5 jeribs land, the irrigation type is furrow and flood and the water is potable.	This spring is full of mud and stones. Cleaning and Repairing is recommended.	30,000	428 per family	6000
Ali Himat	Ali Himat mosque tube wel	N 34.12028 E 68.61032 Alt. 2166.5 m	This well is dogged 5 years ago, 30 households are benefiting from this tube well, the water is used from drinking and livestock, and the water is potable.	This tube is full of mud and stones. Cleaning and Repairing is recommended.	20,000	666 per family	
Malikhel	Malikhel Dam	N 34.18315 E 68.69338 Alt. 2260 m	The source of this dam is from River and supplying 150 households, it was built 30 years ago, last cleaned 30 years ago and there is sing of erosion near dam.	This dam is full of mud and sands. Cleaning and Repairing is necessary.	35000	233 per family	
Zawara	Malik yaar canal	N 34.12471 E 68.62822 Alt. 2148 m	2500m long Canal supplying 20 villages and 1500 households are benefiting, it irrigates	This Canal is full of mud and stones, has leaks and blockages.	200,000	133 per family	16.66

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			12000 jeribs land, trees and grasses are seems on Canal side and the irrigation type is furrow and flood, the water is not potable.	Cleaning and Repairing is necessary.			
Belandy	Karez Belandy	N 34.15999 E 68.63419 Alt. 2237.5 m	This karez is supplying 80 households and irrigates 300 jeribs land, the soil type is sandy, the erosion is a problem, the water is potable and the irrigation type is furrow and flood.	This Canal is badly damaged by recent flood and full of mud and stones. Cleaning and Repairing is necessary.	80,000	1000 per family	26.66
Edel	Sarband Reservoir	N 34.22187 E 68.61986 Alt. 2402 m	The source of this reservoir is sarband spring and has 264.5 m3 It was built 70 years ago, it takes 14 hours to fill,400 households are benefiting and it irrigates 400 jeribs land, water is potable and the irrigation type is senayee.	The Reservoir is full of mud and silt, has leaks and blockages. Cleaning and Repairing is necessary.	25000	62.5 per family	62.5
Zaman Khel	Berana Spring	N 34.13496 E 68.65362 Alt. 2113 m	This spring is supplying 45 households, the water is potable.	This spring is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	1,000	22 per family	
Mohmadkhel	Mohmadkhel Dam	N 34.08421 E 68.55892	This dam supplying 120 households, it was cleaned 3	This dam is full of mud and stones, has leaks and	60000	500 per family	

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
		Alt. 2262 m	years ago, and erosion is a problem.	blockages. Cleaning and Repairing is necessary.			
Khalily	Bakheband canal	N 34.12845 E 68.63799 Alt. 2150 m	2000m long Canal supplying 1300 households and irrigates 12000 jeribs, this canal is shared between 19 villages, the irrigation type is furrow and flood, the water is not potable.	This canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is necessary.	200,000	153 per family	16.66
Alishah	Karez Wach Hawz	N 34.19823 E 68.69269 Alt. 2374 m	This karez supplying 80 households and irrigates 250 jeribs land, the soil type is sandy, erosion is a problem, the irrigation type is furrow and flood, the water is potable.	This karez is full of mud and stones. Cleaning and digging is necessary.	45000	562 per family	180
Kashu	Karez Reservoir	N 34.19418 E 68.74396 Alt. 2337 m	The source of this Reservoir is karez and it has 6000 liter capacity, and this Reservoir supplying 400 households, irrigates 150 jeribs land, it takes 6 hours to fill, the irrigation type is furrow and flood , the water is potable.	This Reservoir is full of mud and stones. Cleaning and Repairing is recommended.	15000	38 per family	100
Sewak	Village Spring	N 34.28242 E 68.61742 Alt. 2687 m	This spring supplying 65 households and irrigates 50 jeribs land, the irrigation type is	This spring is full of mud and stones. Cleaning and Repairing is	10000	153 per family	200

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			senayee, the water is potable.	recommended.			
Fagiray	Fagiray and Mandokhel Dam	N 34.09309 E 68.5448 Alt. 2260 m	This dam stores water from the river and it was built 28 years ago, 90 households are benefiting from this dam.	This dam is full of silt and mud. Cleaning, Enlarging and Digging is recommended.	45000	500 per family	
Senikhel	Sayed canal	N 34.10882 E 68.58862 Alt. 2139 m	4000m long Canal supplying 1300 households and irrigates 17000 jeribs land, this Canal is shared between 15 villages, the irrigation type is furrow and flood and the water is potable.	This Canal has leaks and blockages. Cleaning and Repairing is recommended.	80,000	61.53 per family	4.70
Gunda chushma	Gunda shama karez	N 34.20018 E 68.76174 Alt. 2435 m	This karez supplying 75 households and irrigates 66 jeribs land, the soil type is sandy, erosion is moderate, vegetation seems in and out of karez and the irrigation type is furrow and flood, the water is potable.	The shafts of this karez are full of mud and stones. Cleaning and Concreting is recommended.	45000	600 per family	681.81
Gunda Chushma	Wech Houzacki Reservoir	N 34.20536 E 68.76123 Alt. 2394 m	The source of this Reservoir is spring and it has 160 cu m capacity, it was built 30 years ago, it takes 15 hours to fill, 300 peoples are benefiting from this Reservoir and	This Reservoir is full of mud and stones. Cleaning and Enlarging of this Reservoir is recommended.	30000	100 per family	1500

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			irrigates 20 jeribs land, the irrigation type is furrow and flood, the water is potable.				
Edel	Edel Spring	N 34.22187 E 68.61986 Alt. 2402 m	This spring supplying 46 households and irrigates 250 jeribs, the irrigation type is furrow and flood, the water is potable.	This spring is full of mud and stones, the Canals of this spring have leaks and blockages. Cleaning the spring and Reservoir of this spring is necessary.	60000	1304 per family	240
Mandokhel	Manokhel and Fagiray Dam	N 34.09309 E 68.5448 Alt. 2260 m	The source of this dam is khawat River, 90 households are benefiting from this dam, it was built 28 years ago.	This dam is full of mud and stones. Cleaning, Digging and Concreting of dam is necessary.	45000	500 per family	
Rashidan	Sayed canal	N 34.1092 E 68.5931 Alt. 2185.5m	3500m long Canal supplying 1300 households and irrigates 17000 jeribs land and this Canal is shared between 15 villages, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning, Enlarging the canal and concreting the channels of this canal is recommended.	130,000	100 per family	7.64
Gunda chushma	Doshnia karez	N 34.20210 E 68.75735 Alt. 2376 m	This karez supplying 70 households and irrigates 30 jeribs land, the soil type sandy and erosion is moderate, karez last cleaned 20 years ago, the irrigation type is furrow and	The shafts of this karez are full of mud and sands. Cleaning and Digging the shafts of karez is recommended.	45000	642 per family	1500

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			flood, the water is potable.				
Zay khaida	High Reservoir	N 34.25383 E 68.64331 Alt. 2713 m	The source of this Reservoir is spring and it has 390 m3 capacity and its was built 180 years ago, it takes 24 hours to fill, 280 households are benefiting from this Reservoir and irrigates 100 jeribs land, the irrigation type is senayee, the water is potable.	This Reservoir is full of silt and mud. Cleaning and Concreting is recommended.	18000	64.28 per family	180
Urdu	Takake spring	N 34.18825 E 68.61521 Alt. 2267 m	This spring supplying 45 households and the water is just using for drinking.	Its full of mud and stones. Cleaning and building of Canal for this spring is recommended.	45,000	1000	
Dawrankhel	Sombul Akhi Dam	N 34.09722 E 68.5625 Alt. 2199 m	This dam supplying 80 households and it was built 15 years ago.	This dam is full of silt and sands, has leaks and blockages. Cleaning and concreting is recommended.	18000	225 per family	
Dawrankhel	Sayed canal	N 34.09702 E 68.57206 Alt. 2185.5m	4000m long Canal supplying 1200 households and irrigates 15000 jeribs land, this Canal is shared between 20 villages, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Concreting is recommended.	130,000	208 per family	6500
Patalkhel	Patalkhel karez	N 34.20905 E 68.74837	This karez supplying 70 households and irrigates 100	This karez is full of mud and stones and the channels has	35000	500 per family	350

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
		Alt. 1445 m	jeribs land, the soil type is sandy, karez last cleaned was 20 years ago, the irrigation type is furrow and flood, the water is potable.	leaks and blockages. Cleaning and Repairing is recommended.			
Chapdara	Karez Reservoir	N 34.20980 E 68.67993 Alt. 2474 m	The source of this Reservoir is karez,it has 6000 liter capacity, this karez supplying 280 households and irrigates 200 jeribs land,the irrigation type is furrow and flood, the water is potable	This Reservoir is full of mud and stones and has leaks. Cleaning and Repairing is recommended.	3000	150 per family	
Tatang	Paan spring	N 34.15920 E 68.63339 Alt. 2260 m	This spring supplying 40 households, erosion is moderate; the water is only used for drinking.	This spring is full of mud and stones. Cleaning and Repairing is recommended.	85,000	2125 per family	
Dawrankhel	Sombul Akhi Dam	N 34.09722 E 68.5625 Alt. 2199 m	This dam is supplying 80 households, it was cleaned 15 years ago.	This dam is full of mud and stones. Cleaning and Repairing is recommended	1000	12.5 per family	
Nurkhel	Sayed canal	N 34.09722 E 68.6525 Alt. 2199 m	3000m long Canal supplying 1200 households and irrigates 14000 jeribs land and this Canal is shared between 18 villages, the irrigation type is furrow and flood and the water is not	This Canal is full of mud and stones and has leaks and blockages. Cleaning and Repairing is recommended.	100,000	83 per family	7.142

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			potable.				
Hasan khan	Sarferaz karez	N 34.20429 E 68.62012 Alt. 2360 m	This karez supplying 65 households and irrigates 300 jeribs land, the soil type is sandy and the irrigation type is senayee and the water is potable.	This kerez is full of mud and stones. Cleaning and Repairing is recommended.	150,000	2307 per family	500
Alishah	Hawz Karez Reservoir	N 34.20476 E 68.69751 Alt. 2442 m	The source of this Reservoir is from karez, 280 households are benefiting from this Reservoir and irrigates10 jeribs land, it takes 3 hours to fill, the irrigation type is furrow and flood, the water is potable.	This Reservoir is full of mud and stones. Cleaning and Repairing is recommended.	35000	125 per family	3500
Syahaw	Zeyarat spring	N 34.27291 E 68.59419 Alt. 2826 m	This spring supplying 40 households and irrigates 3 jeribs land, the soil type is sandy, the irrigation type is senayee and the water is potable.	This spring is full of mud and stones. Cleaning and Repairing is recommended.	40000	1000 per family	13333
Edel	Spring dam	N 34.22115 E 68.61979 Alt.2411.5 m	The source of this dam is from spring and it was built 10 years ago.	This dam is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	20000	435 per family	
Qala-i-Baba	white canal	N 34.11486 E 68.59037	2000m long Canal supplying 1100 households and irrigates	This Canal is full of mud and stones, has leaks and	300,000	272 per family	23

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
		Alt. 217.5 m	13000 jeribs land, the irrigation type is furrow and flood, the water is not potable.	blockages. Cleaning and Repairing is recommended.			
Sarferaz	Sarferaz karez	N 34.20429 E 68.62012 Alt. 2360 m	This karez supplying 65 households and irrigates 300 households, the irrigation type is senayee, and the water is potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	150,000	2307 per family	500
Hassan khel	Hassan khel Reservoir	N 34.26342 E 68.59457 Alt. 2756 m	The source of this Reservoir is from karez, this Reservoir supplying 200 households and irrigates 60 jeribs, it takes 6 hours to fill, the irrigation type is in the shape of senayee and the water is potable.	This Reservoir is full of mud and stones. Cleaning and Repairing is recommended.	2200	11 per family	37
Sarferaz	White spring	N 34.20384 E 68.62694 Alt. 2382 m	This spring supplying 32 households and irrigates 5 jeribs land, the water is potable.	This spring is badly damaged by Recent flood and it's full of mud and stones. Cleaning and Repairing is recommended.	60,000	1875 per family	12000
Soja	Asyab Dam	N 34.23321 E 68.6212 Alt. 2446 m	The source of this dam is from River, this dam supplying 30 households and it was built 80 years ago, the dam purpose is for irrigation.	This dam is full of mud and silt, has leaks and blockages. Cleaning and Repairing is recommended.	60000	2000 per family	

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Bahadur Koday	Taaka canal	N 34.11721 E 68.59314 Alt. 2090 m	3200m long Canal supplying 1000 households and irrigates 12000 jeribs land and its shared between 12 villages, the vegetation type is trees and grasses, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	130,000	130 Per family	10.83
Sewak	Small Tanga Karez	N 34.28256 E 68.61691 Alt. 2710 m	This karez supplying 65 households and irrigates 200 jeribs land, it was cleaned 10 years ago, the soil type is sandy, erosion is full in this area, the irrigation type is senayee and the water is potable.	This karez is full of mud and stones. Cleaning and Repairing is recommended.	18000	277 per family	90
Pana	Chal Reservoir	N 34.11809 E 68.58874 Alt. 2181.5m	The source of this Reservoir is from spring, it has 5400m3 capacity, it takes 7 hours to fill and it was built 25 years ago, this Reservoir irrigates 20 jeribs land and supplying 180 households, the irrigation type is furrow and flood, the water is potable.	This Reservoir is full of mud and sands. Cleaning and Repairing is recommended.	20,000	111 per family	1000
Soja	Village Spring	N 34.22979 E 68.61131 Alt. 2459 m	This spring supplying 30 households and irrigates 3 jeribs land, the soil erosion is moderate, the irrigation type is	This spring is full of mud and stones. Cleaning and Repairing is recommended.	20000	666.6 per family	6666.6

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			senayee and the water is potable.				
Hassan khel	Spring dam	N 34.26111 E 68.5991 Alt. 2689 m	The source of this dam is from karez and its supplying 25 households, it was built 12 years ago.	This dam is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	2000	80 per family	
Ahmad khell	Taaka canal	N 34.11721 E 68.59314 Alt. 2090 m	3000m long Canal supplying 980 households and irrigates 15000 jeribs land, this Canal is shared between 20 villages, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	10,000	10.20 per family	0.666
Spinkalay	Haouse Janqal karez	N 34.07891 E 68.56885 Alt. 2293 m	This karez supplying 60 households, the soil type is sandy, the irrigation type is furrow and flood, the water is potable.	This karez is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	90,000	1500 per family	
Qurbanay	Qurbanay Reservoir	N 34.07359 E 68.57232 Alt. 2326 m	This Reservoir supplying 120 households and irrigates 200 jeribs land, the irrigation type is furrow and flood, the water is potable.	This Reservoir is full of mud and stones. Cleaning and Repairing is recommended.	40,000	333.3 per family	200
Moqamkhell	Bara spring	N 34.08410 E 68.55875 Alt. 2165 m	This spring supplying 20 households and irrigates 2 jeribs land, erosion is moderate, the irrigation system is furrow and flood, the water	This spring is full of mud and stones. Cleaning and Repairing is recommended.	45,000	2250 per family	22500

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			is potable.				
Frarre	Taaka canal	N 34.1620 E 68.6373 Alt. 2179 m	5000m long Canal supplying 980 households and irrigates 600 jeribs land, this Canal is shared between 20 villages, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	125,000	127.5 per family	208.3
Malikhel	Karez Wacha Wayala	N 34.1914 E 68.68841 Alt. 2328 m	This karez supplying 60 households and irrigated 300 jeribs land, the soil type is sandy and the erosion is moderate, it was cleaned 20 years ago, the irrigation system is furrow and flood, the water is potable.	This kerez is full of mu and stones and has leaks. Cleaning and Repairing is recommended.	25000	416.6 per family	83.3
Badqhol	Band Badqhol Reservoir	N 34.18435 E 68.59735 Alt. 2380 m	The source of this Reservoir is from karez and it has 7000m3 capacity, this Reservoir supplying 150 households and irrigated 100 jeribs land, it takes 15 hours to fill from water and this Reservoir was built 70 years ago and the water is potable.	This Reservoir is full of mud and silt, has leaks and blockages. Cleaning and Repairing is recommended.	70,000	466.6 per family	700
Mohmadkhel	Mohmadkhel Spring	N 34.08410 E 68.55875 Alt. 2262 m	This spring supplying 20 households, erosion is moderate, water is potable.	This spring is full of mud and stones. Cleaning and Repairing is recommended.	13,500	675 per family	

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
Buksari	Yateemack canal	N 34.1134 E 68.5948 Alt. 2156 m	3050m long Canal supplying 900 households and irrigated 15000 jeribs land, this Canal is shared between 12 villages, the canal source is sarband, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning, enlarging and Repairing is recommended.	80,000	88.88 per family	5.33
Sayadan	Karez Ghawzba	N 34.18563 E 68.69355 Alt. 2260 m	This karez supplying 60 households and irrigated 400 jeribs land, the soil type is silt and gravel, erosion is moderate, the irrigation type is furrow and flood, the water is potable.	The shafts of this karez are full of mud and stones. Cleaning and Repairing is recommended.	16000	266.6 per family	40
Syahaw	Tanga Reservoir	N 34.27233 E 68.58868 Alt. 2890 m	The source of this Reservoir is from karez and it has 14000m3 capacity, it was built 50 years ago, this Reservoir takes 10 hours to fill, 100 households are benefiting from this Reservoir and irrigated 50 jeribs land, the irrigation type is senayee and the water is potable.	This Reservoir is full of mud and stones. Cleaning and enlarging is recommended.	35000	350 per family	700
Tawa	Village Spring	N 34.26775 E 68.64629 Alt. 2758 m	This spring supplying 20 households and irrigates 6 jeribs land, erosion is	This spring is full of mud and stones. Cleaning and Repairing is	3500	175 per family	583

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			moderate, the irrigation type is senayee and the water is potable.	recommended.			
Shekhyasin	Shekhyasin Canal	N 34.1374 E 68.6724 Alt. 2119 m	3000m long canal supplying 900 households and irrigates10000 jeribs land, this canal is shared between 10 villages, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	90,000	100 per family	9
Urdu	kareze Urdu	N 34.19645 E 68.61918 Alt. 2314 m	This karez supplying 50 households, the soil type is sandy and erosion is moderate, the irrigation type is senayee and water is potable.	This karez is full of mud and stones. Cleaning and Repairing is recommended.	125,000	2500 per family	
Karez	Reservoir	N 34.14063 E 68.62898 Alt. 2149 m	This Reservoir supplying 60 households and irrigated 3 jeribs land, it has 1400m3 capacity and it takes 6 hours to fill, this Reservoir was built 200 years ago, the irrigation type is flood and the water is not potable.	This Reservoir is full of mud and stones. Cleaning and Repairing is recommended.	120,000	2000 per family	40000
Kashu	Kashu Spring	N 34.19418 E 68.74396 Alt. 2338 m	This spring is supplying 18 households and irrigates 100 jeribs land, erosion is moderate, the irrigation type is furrow and flood, the water is	This spring is full of mud and stones. Cleaning and enlarging is recommended.	21000	1166.6 per family	210

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			potable.				
Mohmadkhel	Mohamdkhel canal	N 34.0923 E 68.5572 Alt. 2171 m	4500m long Canal supplying 900 households and irrigated 12000 jeribs land and this Canal is shared between 10 villages, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and enlarging the Canal is recommended.	40,000	44.44 per family	3.33
Kharooti	Spring karez	N 34.20059 E 68.69079 Alt. 2392 m	This karez supplying 45 households and irrigated 280 jeribs land, the soil type is sandy and erosion is a problem, the irrigation type is furrow and flood, the water is potable.	This karez is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	40000	888.8 per family	142.85
Ochodak	Ochodak karez Reservoir	N 34.21462 E 68.60521 Alt. 2442 m	This source of this Reservoir is from karez and this Reservoir supplying 40 households and irrigated 40 jeribs land, it has7500m3 capacity, this Reservoir was built 120 years ago, it takes 12 hours to fill, the irrigation type is senayee and the water is potable.	This Reservoir is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	70,000	1750 per family	1750
Karez	Up spring	N 34.16137 E 68.62946 Alt. 2199 m	This spring supplying 16 households and irrigated 3 jeribs land, erosion above the spring is moderate, the irrigation type is flood and the	This spring is full of mud and stones. Cleaning and Repairing is recommended.	30,000	1875 per family	10000

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			water is not potable.				
Highly	Sayed Bari Akhunzada	N 34.1350 E 68.6463 Alt.2128.5 m	3500m long canal supplying 800 households and irrigated 3000 jeribs land and this Canal is shared between 5 villages, the irrigation type is furrow and flood, the water is not potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	150,000	187.5 per family	50
Alishah	Karez Bezar	N 34.20575 E 68.69871 Alt. 2441 m	This karez supplying 40 and irrigated 220 jeribs land, the soil type is sandy and erosion is moderate, the irrigation type flood and the water is potable.	The shafts of this karez are full of mud and stones. Cleaning, Digging and Repairing is recommended.	50000	1250 per family	227.27
Palezak	Tanga Resevoir	N 34.26058 E 68.60216 Alt. 2674 m	The source of this Reservoir is from karez and its supplying 40 households, its irrigated 50 jeribs land, it has 453.5m3 cpacity, this Reservoir was built 120 years ago, it takes 12 hours to fill, the irrigation type is senayee and the water is potable.	This Reservoir is full of mud and stones. Cleaning and Repairing is recommended.	16000	400 per family	320
Hasan khan	Khosa spring	N 34.19611 E 68.61893 Alt. 2313 m	This spring supplying 15 households and irrigated 20 jeribs land, the soil erosion is moderate, the irrigation type is senayee and the water is	This spring is full of mud and stones. Cleaning,Repairing and making a dam for this spring is recommended.	60,000	4000 per family	3000

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			potable.				
Monkay	Monkay canal	N 34.0895 E 68.5428 Alt. 2209 m	2900m long Canal supplying 800 households and irrigates 1600 jeribs land, this Canal is shared between 6 villages, the irrigation type is furrow and flood, the water is potable.	This Canal is full of mud and stones, has leaks and blockages. Cleaning and Repairing is recommended.	90,000	112.5 per family	56.25
Ochodak	Karez Ochodak	N 34.21518 E 68.60491 Alt. 2448 m	This karez supplying 40 households and irrigates 40 jeribs land, the soil type is sandy and erosion is full above this karez, the irrigation type is senayee and the water is potable.	The shafts of this karez are full of mud and stones. Cleaning and Repairing the karez shafts is recommended.	100,000	2500 per family	2500
Pana	Chal spring	N 34.11732 E 68.59190 Alt. 2164 m	This spring is supplying 15 households and irrigates 8 jeribs land, erosion above the spring is moderate, the irrigation type is furrow and flood and the water is potable.	This spring is full of mud and stones. Cleaning and Repairing the spring its Canal is recommended.	20,000	1333 per family	2500
Adamkhel	Adamkhel canal	N 34.1191 E 68.5732 Alt. 2261 m	3000m long Canal supplying 700 households and irrigates 1900 jeribs land, this canal is shared between 8 villages, the source of this Canal is from khawat River, the irrigation type is furrow and flood, the	This Canal has leaks and blockages. Repairing of this Canal is recommended.	60,000	85.71 per family	31.57

Name: Village Item	Type	GPS (Of Exit) N E Altitude (M)	Description	Condition &Repairs Needed	Cost Estimate USD	Cost Per Beneficiary USD	Cost Per Jerib Irrigated USD
			water is not potable.				
Palezak	Tanga Karez chahar daw	N 34.26127 E 68.60114 Alt. 2683 m	This karez supplying 40 households and irrigated 30 jeribs land, the soil type is sandy and erosion is moderate, the irrigation type senayee and the water is potable.	This karez is full of mud and sands. Cleaning the shafts of karez and Enlarging the Reservoir of this karez is recommended.	20000	500 per family	666.66

8. Recent Water Intervention[11]

Village	Improvements
Adamkhel	
Ahmad khell	
Ali Himat	
Alishah	
Allah khel	
Badqhol	
Bahadur Koday	
Buksari	
Chak	
Chapdara	
Dawran khel	
Delak khel	
Edel	
Faqiray	
Frarre	
Gulie	
Gunda Chushma	
Hasan Khan	
Hassan khel	
Highely	
Jawary	
Jawooze	
Karez	
Karez-e-Surkh	
Kashu	
Khalily	
Kharooti	
Kodi Ali Mohmad	
M.khel	
M.yarkhel	
Malikhel	

[11] It is not possible to find this data in the Chak Survey. The questionnaire is being modified to cover it. It is suggested that this information and the willingness of villagers to contribute to any intervention should be investigated before final decisions on project work are made.

Mandokhel	
Modo	
Mohmad Daad Masjid Alya	
Monkay	
Moqamkhell	
Najoye	
Nurkhel	
Ochodak	
Palezak	
Pana	
Patalkhel	
Qala	
Qala Baba	
Qhani khel	
Qurbanay	
Rashidan	
Rindu	
Sarferaz	
Sayadan	
Sebak	
Senikhel	
Shekhyasin	
Soja	
Spinkalay	
syahaw	
Tatank	
Tawa	
Urdu	
Zaman khel	
Zarif	
Zawara	
Zay Khaida	

9. Potential Water Projects

Water projects can be divided into five types:

a) Urgent repairs to structures – often to repair damage caused by 2010 floods.

b) Measures to reduce evaporative water loss such as narrowing and deepening canals and distribution channels, lining them with trees of economic use (e.g. willows) and separating them from flood paths.

c) Longer term watershed improvements to prevent future floods, generate ground water replenishment through infiltration, increase sustainable grazing and fuel-wood supplies and to check soil erosion. Interventions might include the creation of deliberate flood plains, check dams, warping dams, terracing, planting of trees and shrubs, alternative fuels and fodder and enclosure of livestock.

d) Longer term water storage. At the moment, small reservoirs accumulate one day's water from a karez or spring so that there is sufficient volume and flow to fill distribution channels and carry out traditional flood, furrow or senayee irrigation. However, water is plentiful in spring and short in late summer when most needed by maize and fruit crops: no attempt is made at long-term off-season storage to supplement groundwater.

e) Pumping. Water from main rivers is carried by long canals which leak and are expensive to maintain. No attempt is made to pump water using sustainable energy (hydraulic rams or solar) to high elevation storage.

Most of the structures listed in Table 5 above are in need of some sort of attention. It is suggested that those damaged by the July floods are tackled first as villagers depend on them and may not have the resources to do repairs themselves. However, whilst tackling the immediate problem, other work should be considered to prevent a recurrence. Thus the karezes in Modo village should be a priority for repair, but the areas above the mother wells should also be assessed to see what measures could be taken to prevent further flooding. As the villagers have not cleaned the karez themselves for a long time, a village contribution should be sought for this work. The cost per jerib seems excessive, but it is understood that more land could be returned to production if the irrigation supply could be guaranteed.

For immediate work, the following are suggested:

a. Canals

The riparian land in the Chak Valley is highly fertile, heavily populated and very visible. Therefore, it would be good to survey and budget repairs and improvements firstly to the five large canals listed above:

- Sayed Canal
- Malik Yaar Canal
- Taaka Canal
- Monkay Canal
- Bakheband Canal

This should be done as soon as possible, so that repair work is under way by the Afghan New Year (March 21).

b. Sub-Watersheds

Several sub-watersheds form compact units where work is needed, principally on karez cleaning and distribution channels. However, work should not stop there: initial interventions should lead into long term measures as described above. The following watersheds are proposed:

- The Baksmand River and micro-watersheds: upper, middle and lower sections simultaneously.
- The Dersh Shalay / Darsheelay watershed.
- The Qala Baba micro-watershed
- The Alishah valley

c. Economic Development – Alasang Area

The large area in the east of Chak next to Highway One should be investigated for its potential either for improved grazing, or for forestry, or for fruit production. Initially a soil and hydrological survey would be required.

10. Potential Community Projects (non water)

There is a lot of fruit grown in Chak District and many elders suggested beekeeping and cold stores to service the industry. There is also a need for input stores (Farm Service Centres) and for farmer training. Most of the fruit is grown on the rich alluvial soils of the valley: these are very susceptible to spring frost. In most countries, sloping ground is chosen for fruit production. Gentle slopes on the sides of the valleys are not used because the irrigation technology has not developed. Demonstrations of how to grow fruit on a sloping frost-free site would be beneficial.

There is potential for developing fish farming where water is plentiful.

In valley bottoms at high risk of flooding, poplar woodlots are a good choice. They can withstand substantial flooding after two years and are cheap to replace if flooded.

The high ratio of livestock to fodder crops[12] indicates potential for training in livestock nutrition and the promotion of intercrops in young or extensive orchards.

In the remote villages, there are often access problems and roads are needed to enable villagers to reach markets with their produce. Several villagers mentioned the lack of bridges over rivers and canals effectively isolating them from markets. As well as markets, the elders described the lack of health, veterinary and education facilities within reasonable distance. In general, the doubling of the population and rising expectations is putting all infrastructures under pressure.

We have not attempted a list of non-water projects, but if, for example, a bee-keeping project is proposed, it would be easy to search the database for those villages that had specifically mentioned it.

11. Annexes

Annexes should contain detailed tables of data collected on survey. Should be easy to pull these off the database into reports. Use standard format for each district, village or water feature report.

Make tables easy to put into Excel and manipulate – use minimum of merged cells, formatting etc.

Need to discuss what tabulated data would be really useful for decision making. Tables should be referred to in main text. For example, number of farm families and jeribs of land serviced by each canal would help in deciding priorities for repairs.

One table should show progress of survey – who was interviewed by whom, when and where.

One table should give contact details for each village.

12. Photographs

Photographs of key features in above report should be attached. They should be given a reference number so that they can be referred to in text above. ***All photos need checking to ensure the caption is correct. One photo there may be other errors which would make us look very foolish if published.***

[12] It is difficult to get a true figure for fodder as a lot of orchards are intercropped and maize may also be grown mainly for fodder.

Note: One or two photos may be included in text of report for interest. However we need to supply complete photographic record of each village, water feature and watershed. Suggest photos are supplied on separate disk for each district. Selection of photos important to show important points referred to in text.