BAL OCHISTAN MINOR IRRIGATION AND AGRICULTURAL DEVELOPMENT PROJECT

THE KORAKAN RIVER

A STUDY ON FLOOD IRRIGATION

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1 INTRODUCTION

The Gazetteer of Balochistan has described the Korakan River as follows:

> *The **Korakan river** rises at the Zhal pass in the Garr hills and runs south-westward under the name of the Zhal river. Curving south-westward it runs parallel with the Baddo which it joins above Khargushki Band. It is called the Korakan after entering the plain. Near Langen Kahur it is joined by the Gazno from the north-east and by the Chutok from the east. From the east numerous other torrents also meet Korakan. In the Kharan valley the water is used for irrigation where possible by the construction of dams, but owing to its narrow bed, about 50 yards, and the heights of its banks but little water can be obtained. Important dams are situated at Naurozabad, Tagazzi and Gazzi. It has a poor reputation for irrigation among the people owing to its floods by which their dams are generally carried away.*

The Garruk River is an important tributary of the Korakan and therefore it description in the Gazetteer is also included:

> *The **Sarap or Garruk river** is formed by the junction of the Sajid and Mazardan streams, rising respectively in the Sajid hills and at the upper end of the Besima valley. At the junction of the two streams at Zayak the river runs with a perennial stream for about a mile, its bed being well clothed with tamarisk jungle. After leaving Zayak the stream passes the Besima valley by a subterranean channel and the bed is dry up to Pathk where a few springs appear and again disappear. Thence to Garruk in Kharan it continues dry, but the presence of water beneath the surface is evidenced by the abundance of tamarisk jungle in its bed. At Garruk there is a small permanent supply used by the Kharan Chief for irrigating a few plots of land. At this point up to it is known as the Garruk, its bed is shallow, stony and about 300 yards wide, and confined by hills on both sides. It now proceeds westward and its water is taken off at frequent intervals for irrigation in the Sarawan niabat. An attempt has been made near Madagan to take its water into the Korakan, but the dam erected for the purpose generally breaks and the main stream in 1904 made its way south of Kalaghan-i-Kalat from which point it turns westward and joins the Korakan at Band-i-Sher Khan. The Garruk/Sarap forms a very important source of irrigation in upper Kharan. Reckoning from its source the principal confluents are the Jur, Nausherwan-Pishi, Siah Tak, Mamudi and Ger-bast or Ged-bast. The Garruk is about 120 miles long. (Baluchistan through the ages Volume I: 490-493)*

2 SUMMARY AND CONCLUSIONS

For many communities along the Korakan river, this water course was an important source to irrigate their fields with its flood water. Besides a number of individual bunds and many free offtakes, 11 collective bunds have been identified during the survey, which has been conducted by BMIADP's WUA Liaison Section during the months of November and December 1993. Before the degradation process started during the 1970s, about 2,000 landholding families and at least more than 100 tenants, living in at least 33 communities, were depending on these 11 collective bunds for the irrigation of their fields with diverted flood water.

As the result of the degradation process, 6 collective bunds cannot be rebuilt by the farmers/water users any more, because the river bed has become too wide and/or too deep at the site of the previous bunds. The water users of Madagan I bund and Jamak

bund are only capable to rebuild their bund due to the access to free bulldozer hours, which have been provided by the local MPA fund. If these free bulldozer hours will not be available any more, it would be very difficult for the water users to reconstruct the bund at the beginning of the flood season and this could have negative consequences for the two most downstream Jamak and Karkhi bunds.

2.1 Degradation Process

According to the water users in all the communities along the Korakan river, the degradation process started downstream of their bunds at the beginning of the early 1970s. These observations are confirmed by the following sequence of years, in which the different bunds could be rebuilt for the last time by the water users:

- 1976, the (old) Madagan I bund and Madagan II bunds could be rebuild every year by the water users;
- 1979, the Nothani bund and the Shah bund were washed away;
- 1982, the bridge across the Korakan river near Sarawan village collapsed after a large flood;
- 1988, the Karkhasi bund could be rebuilt for the last time; and
- 1989, the Novak bund and Qaiser bund were operational for the last time.

The degradation process is a natural phenomena, but its speed and intensity could be increased by human action. In the first place, the cutting of trees in and along the river bed could have reduced the vegetative protection and, consequently, the river bed became more vulnerable to erosion processes. Secondly, overgrazing of the vegetation in and along the river by herds of sheep and goats also decreased the vegetation density of Tamarix bushes. Thirdly, the construction of flood channels at unsuitable sites may also have increased the degradation process, i.e. during a large flood in 1979, the Korakan river changed its course near Nothani village by following one of the flood channels instead of the original course. Consequently, the flood channel has been scoured out due to fact that flood channels are cleaned regularly and, therefore, the vegetation density is less than in the original river bed.

Except the construction of a number of earthen spurs by the villagers of Topian village and gabion spurs by the Irrigation Department near Topian village and Shayan village to protect both villages against flood damage, the water users have not developed concrete activities to stop further degradation of the river bed. Probably, the water users do not have the knowledge and/or the means to prevent (further) degradation of the river bed. More detailed investigation in the causes of the degradation process may give an answer if the water users could take measures to prevent the degradation of the river bed of the Korakan river.

According to the villagers, the degradation process seems to have stopped for the last 3 to 4 years. At many places the river bed has silted up again and the vegetation density has also increased. For instance, upstream of the Karkhi bund the level of the river bed has risen several feet over a length of 5 to 6 miles due to the fact that the bund has not breached for the last two years. Near Nothani village, the degradation process has also stopped and the vegetation has become denser, which has resulted in the deposit of silt. The former water users of the Karkhasi bund have reported that the degradation process has stopped for the last three years.

One possible explanation for the standstill of the degradation process could be the absence of large floods for the last three to four years. Another explanation, which was mentioned by water users in Nothani and Shayan villages, could be the reconstruction of the Madagan I bund since 1985.

2.2 Korakan river as a potential Flood Irrigation Scheme

According to the water users, the Korakan river is a reliable flood river with an average of 15 to 20 flood a year. Until the early 1970s, the farmers living in the different communities along the Korakan river, were capable to build their diversion bunds and to irrigate their fields with flood water. But due to a degradation process, many bunds have not been rebuilt by the water users for many years and, consequently, their fields could not be irrigated any more. For about 3 to 4 years, the degradation process seems to have stopped and it may be possible that some communities will be able to rebuild their bunds again in the (near) future.

For BMIADP, it may be very useful to understand the exact causes of the degradation process during the 1970s and 1980s and its halt for the last 3 to 4 years. A detailed investigation of the hydrology of the Korakan river could give the necessary answers and it would increase the knowledge about the characteristics and behaviour of one of the more important flood rivers in Balochistan. This knowledge could also be useful to understand better the characteristics and behaviour of other flood rivers in other parts of the province.

The detailed hydrology investigation could also give the possibilities for BMIADP to improve flood irrigation for communities along the Korakan river by constructing improved diversion weirs with head regulators and/or flood protection structures, including the use of vegetation in a protective way (see Annex D.1: Tamarix Flood Protection of the Barag Feasibility Study Volume 2 for more details).

A possible Korakan Flood Irrigation Scheme could also give the opportunity to apply a alternative approach towards flood irrigation, which concerns the active management of the flood rivers. Under this approach one does not try to control the river, but tries to manage it. This requires a more comprehensive look at the river system and a different repertoire of interventions. These interventions mainly involve earthmoving and resemble existing flood water farmers techniques of manipulating siltation and scour processes. Wherever possible, farmers should continue to be the prime implementers under the river management approach. Floods could be better controlled if a large number of offtakes exists along the river, because the velocities of the flood stream will be less than if only a few offtakes are present. Due to its relatively high investment in diversion structures, the engineering approach often proposes to replace a large number of traditional offtakes in the nullah by the construction of one high cost diversion structure. An important reason behind this decision is the need to meet minimum economic rates of return by increasing the command area (over 1,000 acres) which is served by the to-built high cost diversion structure. The consequence of this approach could be an increase in the velocities of the flood flows, which could be detrimental for the sustainability of the high cost diversion structures themselves. The Ground Water Consult report concluded that smaller flood irrigation schemes, which only serve one community or a limited number of closely related communities, have most change of success. Larger flood irrigation schemes, which have replaced a large number of traditional offtakes, have less chance of success due to their size and complexity.

Whereas the techniques, proposed under the river management approach, are not new, the most important innovation in most circumstances is an appropriate organisational framework. Since the interventions involve changes that affect several intakes simultaneously, an institutional structure is required that supersedes the interests of the land owners on a single flood channel only. The organisations involved also need to have a permanent character, since management never stops and the build-up of knowledge on the river's behaviour is essential. Local governments are an option, but the alternative is a special river management authority. In both options arbitrariness would be avoided and flood water farmers commitment increased, if a parallel or integrated

confederacy would be set up of farmers/water users associations, representing the different components of the river system.

Whereas the investment/engineering approach is probably adequate for isolated and confined flood irrigation systems, the management approach is more appropriate for many complicated lowland flood rivers, since it is better suited to cope with a situation of constantly changing river morphology and the existing water rights. The management approach should have the opportunity to prove its feasibility, since flood irrigation provides a livelihood to large number of economically deprived people.

More detailed sociological survey will be needed to find out if the water users, who are resident in the different communities along the Korakan river, are interested to establish a Federation of Water Users Associations, which will be responsible for the implementation of the river management approach.

3 DESCRIPTION OF THE COLLECTIVE BUNDS ON THE KORAKAN RIVER

3.1 JAMA BUND

Near the village of Sir Topian, the first bund, called Jama Bund, has been built in the Korakan River, which is 8 feet high and about 200 feet long. This bund diverts the flood water to the right side into the flood channel, which is called Karkhasi and is the old river bed of Landoi Kaur.

Hydrology

According to farmers, twenty floods occur in an average year, whereas they do not experiences years without a flood at all. Three to five of these twenty yearly floods are considered as large floods, because they are washing away the bund. It seems that there are not large fluctuation in the number of floods between years. Most of the flood take place during the rabi season (from November till March) and in the kharif season two floods or less occur.

Just a few hundred meters upstream of the Jama Bund, the Landoi Kaur (Balouch for river), the Chutok Kaur and the Zhal Kaur are joining each other. Upstream of the Jama Bund it is difficult to identify one main river bed. Water coming from the catchment area follows a very large number of small courses/river channels and it flow pattern resembles sheet flow.

Due to the fact that the river bed consists of small, flat stones and pebbles, its level has not changed during the last 10 to 20 years. At the site of the bund the density of vegetation in and along the river bed is very dense. According to the farmers, the floods do not contain much silt. Most of the silt is flowing into the flood channel.

Sociology

1. Tribes and communities

The following seven Brahvi speaking tribes are entitled to use flood water for irrigation, which is diverted by the Jama Bund into the flood channel: Baranzai (12 households), Samalani (15 households), Zarozai (35 households), Shaikh (2 households), Mohammad Hasani (5 households), Mengal (5 households) and Essazai (5 households). All these 79 households are resident in the following seven villages: Sar Topian, Jal Topian, Shafat Killi, Shafat Killi no.2, Zarozai, Hayat Khan and Badal Khan Killi.

2. Existing maintenance and reconstruction system

The bund, made of stones and pebbles, normally breaches 4 to 5 times during one year, but in some years it only breaches 1 to 2 times. The bund does not require maintenance work. After every breach, the farmers are capable to rebuild the bund within 5 days with the help of tractors. For instance, they spent Rs. 15,000 for rent of tractors in 1992. For many generations the bund has been rebuilt every year. In the past, it took one month to rebuild the bund with the help of bullocks. The bund has never been breached deliberately by the farmers. The farmers are totally free to choose a site in the river bed for the (re)construction of the bund. Other local, customary rules and regulations do not existed either.

For the reconstruction of the bund, each water user has to contribute labour and/or cash according to the number of *jora* to be irrigated. There is not a miriaab in charge for the organisation and supervision of the reconstruction works. If a water user does not contribute his share of the labour and/or cash, he loses automatically his entitlement to use flood water for irrigation purposes. Upstream as well as downstream water users have to contribute equally. Downstream water users are not compensated by the upstream water users for their lower probability to receive (sufficient) flood water to irrigate their fields. Normally, the reconstruction of the bund is undertaken by the downstream water users, who have not irrigated their fields yet.

Most of the seven communities and their fields are located closely to the river course of the Korakan River. If the bund breaches, the flood water is following this original river bed and it forms a threat for these villages and fields. The farmers themselves have built a large number of earthen spurs, which are strengthened at the head by stone pitching, bushes and wooden sticks. To protect the Sar Topian village from flood damage, the Department of Irrigation has built seven gabion spurs in 1992.

Maintenance of the flood channel occurs irregularly and it involves cleaning from head to tail.

3. Water distribution

In general a system of flow division is applied by the water users. During the first flood, the shareholders in Zarozai have the right to divert one-third of the flow into their own flood channel and the remaining two-third flows into the main flood channel, called Shah Guaz, which is shared by the shareholders in the six other communities. In the Shah Guaz, a total number of 14 free intakes are built by individual or groups water shareholders.

Every upstream water user has always the first right to divert water to his fields. But an individual water user or a group of water users is not allowed to divert all the flood water due to the fact that the width of each intake depends on the number of *jora* to be irrigated. If the spate flow is medium to large, each individual intake is only able to divert a portion of the flood water. But if the flood flow is (very) small, one intake will be capable (and allowed?) to divert all the water. Each intake will only be closed by the water user(s) if all the fields have been irrigated sufficiently.

On a secondary flood channel, the flood water is also distributed according to flow division. The size of the field outlets depends on the number of *jora*, which should be irrigated. If the water flow in each secondary flood channel is large enough, several field outlets are diverting water to the fields at the same time. A field-to-field system is not applied by the water users. Every individual water user can divert as much water as needed to his own fields.

It is not necessary for a upstream water user to wait for a second irrigation until all the other downstream water users have irrigated their fields once. But each individual water user can only divert flood water for a second time to his fields on the condition that he has contributed to the reconstruction of the bund, if it had breached after his first irrigation turn.

The probability for downstream water users to receive flood water to irrigated their fields (sufficiently) decreases if the bund breaches several times early in the season. At a certain stage, the group of downstream water users, who have not received water yet, will become too small to rebuild the bund before the next flood event due to the fact that the upstream water users, who have irrigated their fields sufficiently, will not contribute labour and/or cash for the reconstruction of the bund during that particular season. If the downstream water users have not received flood water at all during one season, they are not compensated by obtaining the first right to irrigate their fields at the beginning of the next season. Downstream water users, who were not able to irrigate their fields, have to find work as tenant or day-labourer.

4. Command area

The command area of the Jama Bund is larger than 2,000 acres and nearly all the land is owner-operated. Members of the Mengal tribe have bought land in the past. Only in Zarozai village, 10 to 15 hereditary tenants (marusi) are cultivating the land of local landlords and they pay one-sixth of the harvest (shashik) to these land owners. The tenant is fully responsible for maintaining and reconstructing the field bunds and to contribute labour and/or cash for the reconstruction of the bund.

5. Risk coping strategies

Water users, who were not able to irrigate their fields (sufficiently), have different options to earn an income. Most of them migrate temporarily to other areas where they try to find work as tenants-at-will or day-labourers. Others are cutting daily branches of the tamarix tree in the vicinity of their communities and sell the wood locally or in the city of Kharan. A few have found government jobs.

Tractors have replaced of the bullocks and, therefore, many families have sold their bullocks.

6. Agriculture

The main crop is wheat, which is grown during the rabi season. If the farmers get floods in the kharif season, water melon and sorghum is cultivated.

It seems that the farmers do not manipulate the flow of silt to the fields actively during the first flood in order to increase the fertility of the soils.

Livestock is not so important in the seven communities due to the fact that the probability of flood irrigation is relatively high and most families are able to grow wheat on their fields. Therefore, most families only possess a few goats and sheep.

7. Perception of the water users

Degradation of the river bed is not occurring at the site of the Jama Bund and, therefore, the water users are able to reconstruct their bund every time when it breaches. The degradation process starts downstream of Topian Killi near the site where the flood channel is joining the river bed of the Korakan River. At that place the river bed does not consist of stones and pebbles any more but is predominantly sandy. Vegetation

in the river bed has disappeared completely. Degradation in the flood channel is in comparison with the water course of the Korakan River less advanced.

The only point of concern is flood damage to the villages and the fields if the bund breaches and the flood water follows the original river bed of the Korakan River. Therefore, flood protection works are requested by the inhabitants of these communities and the farmers with land close to the river bed.

3.2 KARKHASI BUND

Hydrology

The Karkhasi bund was located in the original river bed of the Laindo Kaur near Shafat Killi, which is, in fact, the flood channel of the Jama Bund. For the last four years, the Karkhasi Bund could not be built by the ten shareholding families due to the fact that the bed of the flood channel/Laindo Kaur has become too wide (200 to 250 feet) and too deep (16 to 25 feet) as the result of degradation. At the time that the bund could be built every year, the Karkhasi Bund was 150 feet long and 8 feet high.

According to the water users, the degradation process started in 1982. In that year, the bridge over the Korakan River near Sarawan Village was washed away and the level of the river bed decreased dramatically. It seems that the degradation process stopped three years ago, which could be explained by the reconstruction of the Madagan Bund.

Upstream of the Karkhasi Bund, the water users of the Jama Bund have built 14 free intakes, which divert flood water to the fields. At the time that the water users of the Karkhasi Bund were able to built their bund, they were only receiving flood water, if the flood was so large that the water users of the Jama Bund could not divert all the flood water to their fields or if they closed all the 14 free intakes because all the field were sufficiently irrigated. If the Jama Bund breached, the Karkhasi Bund would not receive flood water at all until the Jama Bund had been reconstructed.

Sociology

All the cultivable land, which was irrigated by the Karkhasi Bund, was owner-operated. The total command area has a size of about 10 *jora*. Without the bund, the original water users are not capable any more to cultivate their land. Cutting and selling of wood and working as day-labourers are the main economic activities for these 10 families in Shafat Killi. All bullocks have been sold in order to buy food.

3.3 NOVAK BUND

Four families (one Afghan and three belonging to the Samalani tribe) are entitled to use the flood water from the Novak Bund to irrigate their fields. These four families are resident in Jal Topian and Shafat Killi. The Novak Bund is situated in the vicinity of Shafat Killi in the river bed of a tributary of the Korakan River, which is also called Korakan River. For the last three years the bund could not be rebuilt by the four families, because the depth of the river bed is 30 feet instead of 15 to 20 feet due to the degradation process.

The command area has a size of about 4 to 6 *jora* and these families have also sold their bullocks to but food. Working as day-labourers and selling wood are also their main economic activities since the bund is not rebuilt any more.

3.4 QAISER BUND

The Qaiser Bund was constructed downstream of the Novak Bund by four families. One family belongs to the Qambarani tribe and lives in Sarawan village, whereas the other three families belong to the Nidamzai tribe and resident in Mach Killi. This bund has not been rebuild for the last three years due to the fact that the width of the river bed has increased from 15 feet to 100 feet. Therefore, the four families are not capable to rebuild the bund.

In some years, the Qaiser bund was breached deliberately by the water users to protect their fields from flood damage.

These four families are still able to build a large bund in Washboi Kaur with the help of free bulldozer hours. This bund is breaching every year due to piping caused by rats.

All four families have still their bullocks, which they use for preparing the fields and for the maintenance and reconstruction of the field bunds. Three families are cultivating their own fields, whereas one family is hiring a tenant for this purpose. If the tenant is using his own bullocks, he will receive 50% of the harvest. If the landlord is providing the bullocks, the tenant only obtains 25% of the harvest.

Perception of water users of Karkhasi, Novak and Qaiser Bunds

If the degradation process could be stopped and reversed, it would be possible for the water users to rebuild their bund as soon as the level of the water course has increased sufficiently. To stop the degradation process and to promote the siltation process, the water users are of the opinion that a bund should be constructed downstream of the site of the Karkhasi Bund.

3.5 SHAH BUND

Near the village of Shayan, another collective bund, called Shah Bund, was usually built in the river bed of the Korakan river before 1979. This bund was 20 feet high and 250 feet long. Flood water was diverted to the command area on the right bank. But since 1979, the water users are not capable any more to rebuild the bund due to the degradation process and the right bank command has not been used for 14 years (see photo 1 and 2).

Hydrology

According to farmers, 18 to 20 floods occur in an average year and 3 to 5 of these floods are considered as large floods. Most of the floods are taking place during the Rabi season.

The water users of Shayan village are still able to divert flood water from the Garruk river to a command area on the left bank of the Korakan river by building by about 10 free offtakes. One of the Garruk flood channels is releasing its surplus water into the Korakan river near the village. Since the degradation process in the Korakan river started, the bed of this flood channel is also degrading due to scouring processes and the command area is eroding rapidly.

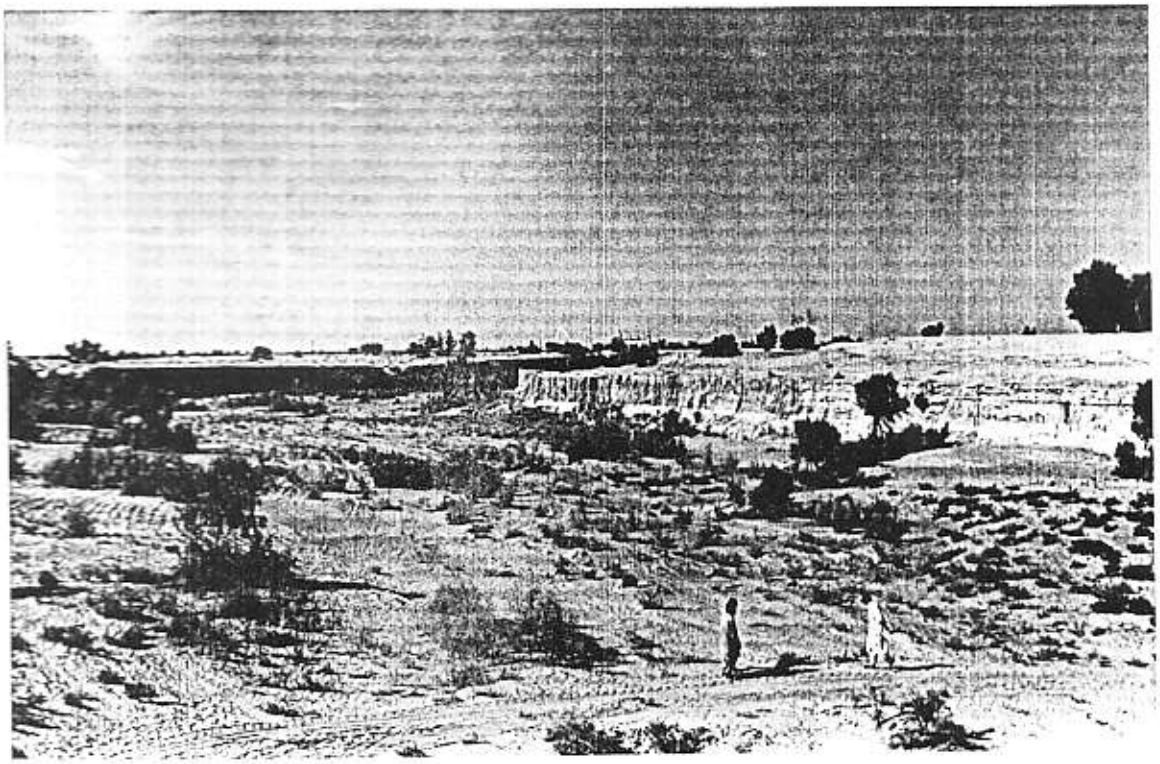

PHOTO 1: RIVER BED UPSTREAM OF SHAYAN VILLAGE

PHOTO 2: RIVER BED NEAR SHAYAN VILLAGE WITH ONE GABION SPURS

Sociology

1. Tribes and communities

Ten families, belonging to the Syed tribe and resident in the Shayan village, were benefiting from the Shah bund. A total number of 50 to 60 households are living in Shayan village.

2. Existing Maintenance and reconstruction system

The bund, which was made of sand, breached partially with every large flood. With the help of their own bullocks, 20 to 25 tenants-at-will, who were cultivating the arable land of these ten families, could rebuild the breached portion of the bund within one to two days. Each tenant had to contribute labour for the construction of the bund according to the number of *jora* to be irrigated. The reconstruction of the bund was done without the supervision of a miriaab. As a part of the tenancy arrangement, the tenant had the obligation to contribute his labour for the reconstruction work and was organised as an *asher*. Consequently, after each breaching of the bund, all the tenants were participating in the rebuilding of the bund, also those who had already irrigated their land.

In 1992, the Irrigation Department had built 2 gabion spurs near Shayan village to protect the village itself against flood damage. Since these two spurs have been built, no large floods occurred and, therefore, the effectiveness of these two structures has not been proved yet (see photo 3).

3. Water distribution

The most upstream water users along the flood channel always have the first right to divert (all) the flood water to their land during every flood and they do not have to wait until all downstream water users have irrigated their land for the first time. Normally, flow division in the flood channel was not practised and an individual water user had the right to divert all the flood water to his land. Only if the flow in the flood channel was too large to be managed by one single water user, a portion of the flood water could be diverted to his field.

4. Command area

The command area of the of the Shah bund had an acreage of about 8 to 10 joras and all the land was cultivated by tenants-at-will. Although these tenants-at-will had to do all the field work (rebuilding the diversion bund, maintaining the field bunds, cleaning the flood channel, preparing the land and harvesting), they were only getting 50% of the harvested crop (wheat and sorghum) and they were also allowed to collect the stubbles as fodder for their livestock.

5. Agriculture

The main crop is wheat, which is grown during the Rabi season. During the Kharif season, if enough flood water was available for irrigating the fields, water melon, sweet melon and sorghum were cultivated. For the ten landholding Syed families as well as for the tenants, livestock was not so important at the time that the Shah bund was operational. They were only keeping some livestock for home consumption.

6. Perception of the water users

If the degradation process could be stopped, it would be possible to rebuilt the Shah bund as soon as the level of the river bed has increased sufficiently. According to the

PHOTO 3: GABION SPUR, BUILT BY IRRIGATION DEPARTMENT, NEAR SHAYAN VILLAGE

landowners, the degradation process would stop permanently, if the Madagan bund, situated immediately downstream of the former Shah bund, could be constructed every year. Due to the fact that the Madagan bund has been rebuild since 1985, the degradation process of the river bed near Shayan village has stopped for three years.

3.6 NOTHANI BUND

Until 1979, a collective bund, called Nothani bund, was built in the river bed of the Korakan river at a site east of Nothani village. At that particular site, the Korakan river has a width of 50 to 60 feet and the depth was 3 to 4 feet. The bund itself, made of sand and reinforced with bushes and stones on the top, had a height of 9 to 10 feet. Flood water was diverted into two flood channels; one flood channel on the right bank of the Korakan river was located about 100 meters upstream of the bund, whereas the left bank flood channel was situated next to the bund.

Hydrology

According to farmers, 15 to 18 floods occur in an average year and 3 to 5 floods are considered as large floods. Most of these floods take place during the rabi season.

Since 1979, farmers are unable to rebuilt the Nothani bund due to the fact that a very large flood with a duration of about 5 days changed the course of the Korakan river. In stead of following the original river bed, all the flood water was flowing into the left bank flood channel, which was scoured out considerably, and it became the new course of the Korakan river. About 1.5 kilometres downstream of the Nothani bund, the left bank flood channel is joining the original river bed of the Korakan river again. Consequently, the Nothani bund, which is still in place, is not functioning any more due to the change of the river course.

The water users are not capable to rebuild the bund on another site, because the depth and the width of the original river bed and the right bank flood channel as well has increased to 25 and 250 feet, respectively (see photo 4 and 5)

According to information given by the farmers, the degradation process of Korakan river has stopped for the last two to three years and a siltation process has started, which is possible due to the growth of new vegetation (Tamarix) in the (new) river bed. The water users are convinced that the construction of the Madagan bund is the main reason that the degradation process has finished (see photo 6 and 7)

On the north side of Nothani village, the Gazzi river is flowing and it is joining the Korakan river bout 3.5 miles downstream of the Nothani bund. Until the early 1980s, farmers were diverting water from the Gazzi river to a separate command area by building individual off-takes. But for about the last 10 years, the water users are not capable divert water from the Gazzi river due to the fact that the degradation process also started. According to the farmers, this degradation process in The Gazzi river is the result of the degradation of the river bed of the Korakan river (see photo 8)

Sociology

1. Tribes and communities

Until 1979, 100 families, belonging to the Nothani tribe, were the beneficiaries of the Nothani bund. The village has the following social amenities: a primary school for boys and a solar energy system, a gift of a Skeikh of an Arabic country, but it does not

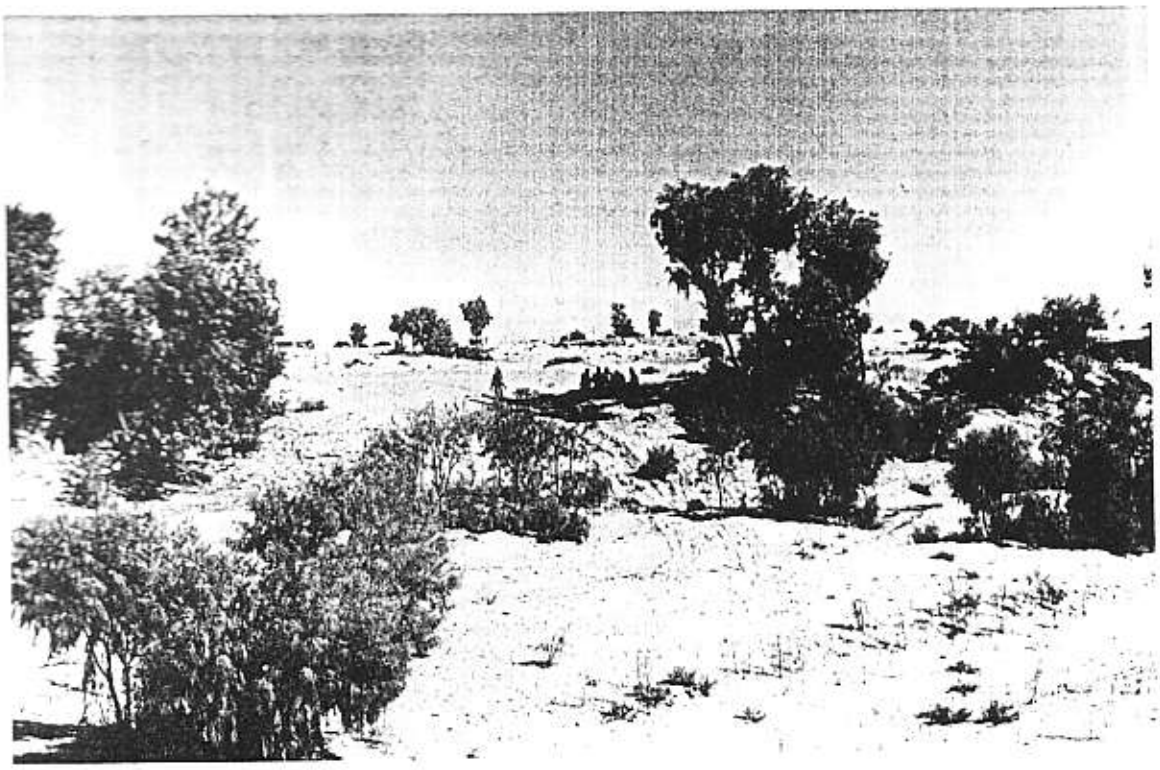

PHOTO 4: DIFFERENCE BETWEEN THE LEVEL OF OLD RIVER BED (PEOPLE SITTING) AND THE NEW RIVER BED NEAR NOTHANI VILLAGE

PHOTO 5: RIVER BED NEAR NOTHANI VILLAGE

PHOTO 6: NEW RIVER COURSE (PREVIOUS FLOOD CHANNEL) WITH NEW GROWING TAMARIX VEGETATION NEAR NOTHANI VILLAGE

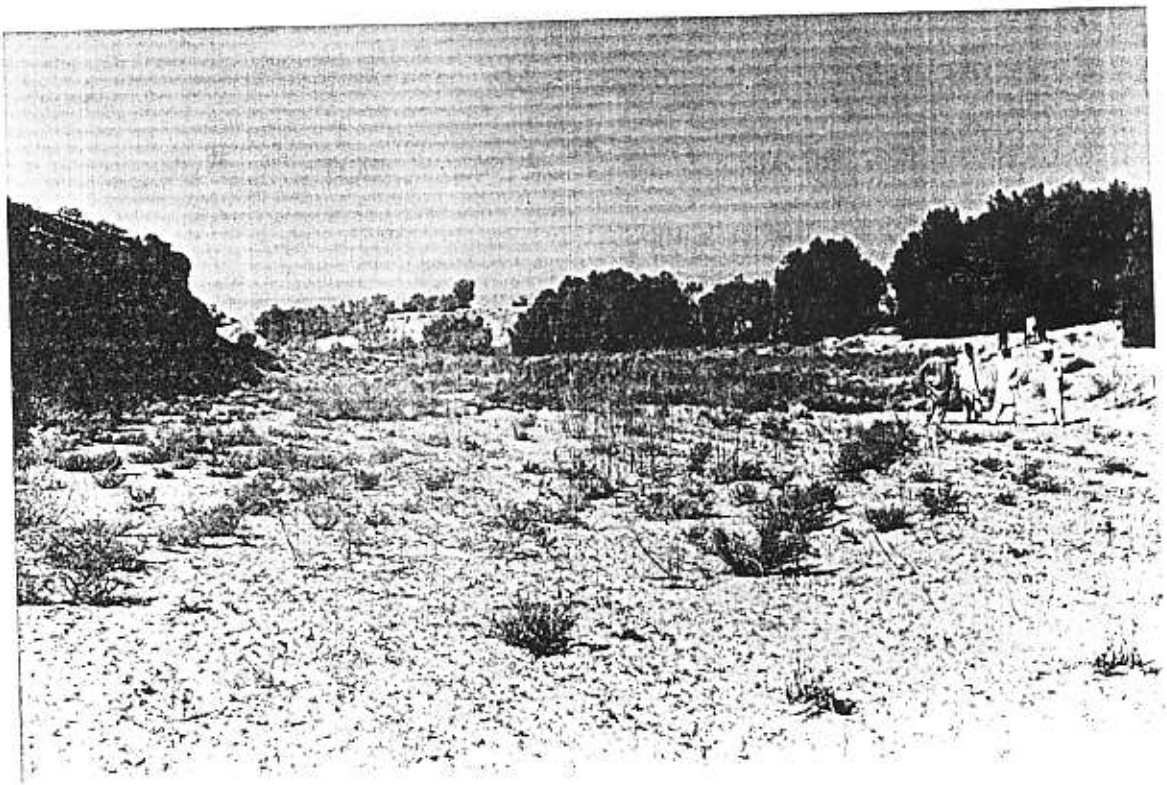

PHOTO 7: NEW TAMARIX VEGETATION GROWING IN NEW RIVER COURSE NEAR NOTHANI VILLAGE

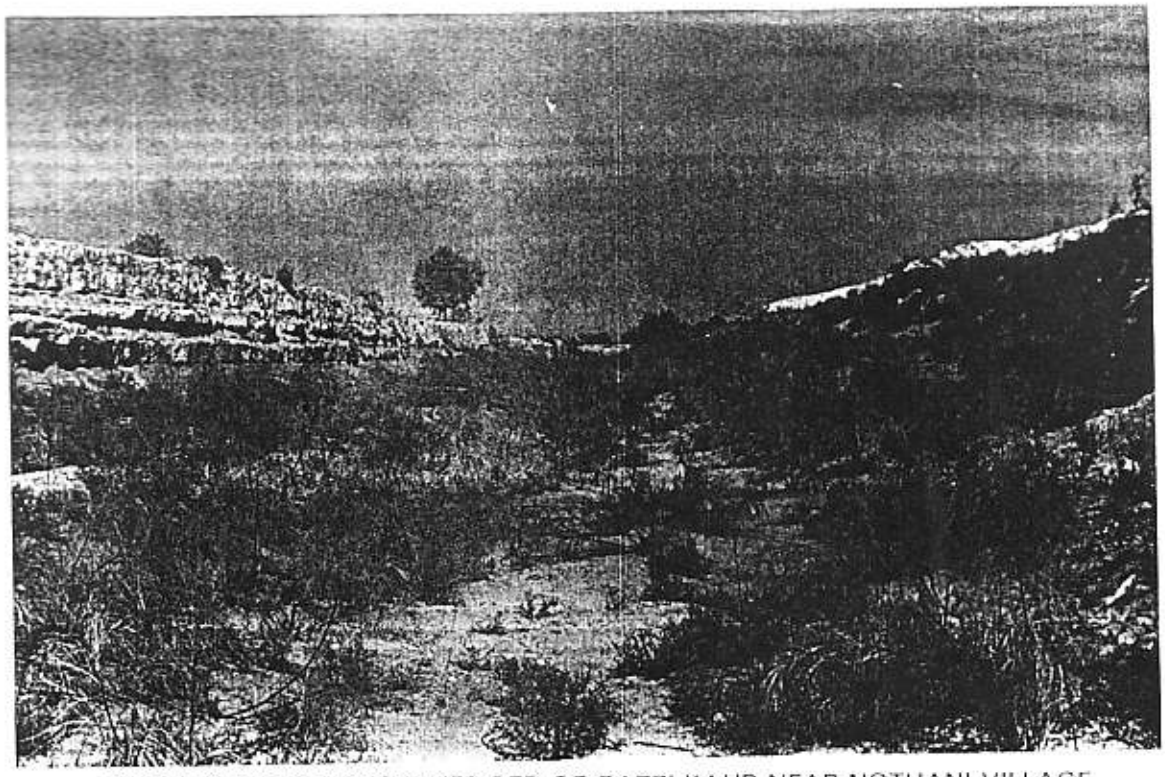

PHOTO 8: DEGRADING RIVER BED OF GAZZI KAUR NEAR NOTHANI VILLAGE

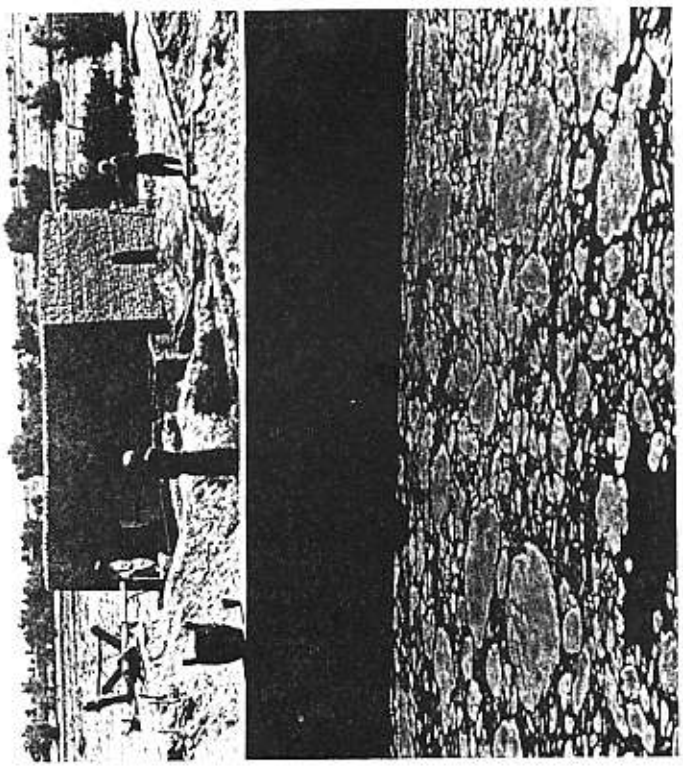

PHOTO 9: DUGWELL WITH WATER STORAGE TANK NEAR NOTHANI VILLAGE

function for the last 4 to 5 years. The village is connected with Kharan city by a sandy track. During the 1979 flood, a portion of the village was washed away.

2. Maintenance and reconstruction system

Before 1979, the Nothani bund only breached once every three to four years, because most flood water was diverted into the left bank flood channel. If the bund breached, the water users were able to rebuild the bund within a few days with the help of bullocks. Every individual water user had to contribute labour according to the number of *jora*, which were irrigated with flood water from the Nothani bund. A miriaab was responsible to organise the reconstruction work and to mobilise all the water users. Although it only happened rarely that one of the water users did not contribute labour, he was fined Rs.50 for each missed working day.

The two flood channels did not need much maintenance.

3. Water distribution

The upstream farmers had the first right to irrigate their fields during each flood. Despite this first right rule, all the downstream farmers were receiving enough flood water during every flood season to irrigate their fields at least once.

In the case of a small flood, the right bank flood channel will be able to divert flood water to its command area. The left bank channel will only receive flood water, if medium to large floods occur.

4. Command area

The two command areas of the Nothani Bund have together a size of about 50 to 100 Joras. Each water using family had land in the left bank and in the right bank command area as well. A large portion of the farmers with a share in the Nothani bund, were also using flood water from the Gazzi river to irrigate their fields.

According to the farmers, all the land was prepared and cultivated by the landowners themselves. No tenants were applied to do the field work on the land of the landlords.

One farmer has bought a diesel motor with a loan from the Agricultural Development Bank of Pakistan and it is used for running a flour mill as well as the pump of a 100 feet deep dugwell. On the fields irrigated with water from the dugwell, the farmers is cultivating wheat, sorghum, cumin and vegetables (carrot and onion). The land is prepared with the help of a pair of bullocks (see photo 9 and 10).

5. Risk coping strategies

Since the Nothani bund is not functioning, many households are earning an income with cutting branches of the Tamarix trees and selling it on the market in the town of Kharan (see photo 11 and 12). Many male family members are also working as day-labourers in the different areas of Balochistan and Sindh, whereas some other have a government job. Besides three to four pair of bullocks, all the other bullocks have been sold in the early 1980s.

6. Agriculture

In the rabi season, the main crops was wheat and if the farmers were receiving enough flood water during the kharif season to irrigate their fields sufficiently, they also grew sorghum and water melon.

PHOTO 10: PREPARATION OF DUGWELL COMMANDED LAND WITH PAIR OF BULLOCKS NEAR NOTHANI VILLAGE

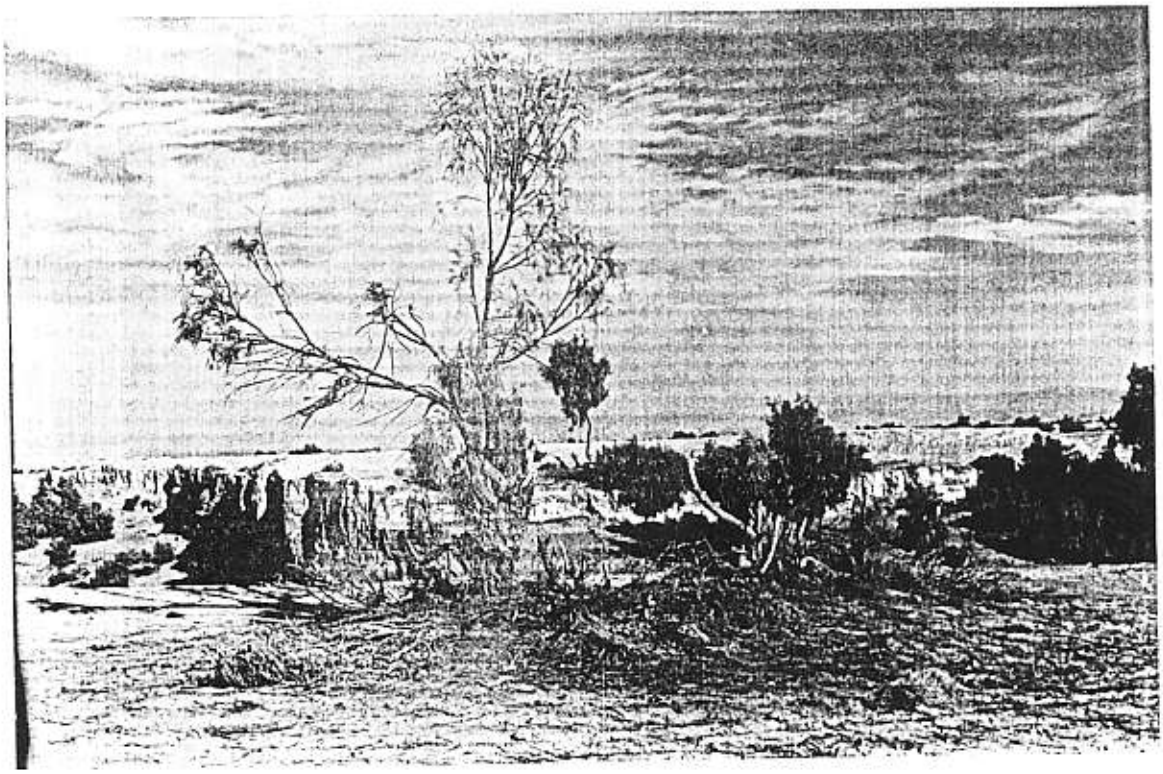

PHOTO 11: TAMARIX TREE WITH CUT BRANCHES

PHOTO 12: COLLECTION OF TAMARIX BRANCHES NEAR NOTHANI VILLAGE

7. Perception of the water users.

If a large pucca bund with gates and flood protection structures could be built near Nothani village, the water users would be able to irrigate their fields again.

3.7 MADAGAN I BUND

Before 1976, the Madagan bund was built near the village of Tirathi, which is about 1 mile upstream of the actual Madagan bund. Between 1976 and 1985/86, the water users were not capable to reconstruct the bund. But since 1985/86, they have received access to free bulldozer hours with the help of the local MPA fund and from that year, the Madagan bund is rebuilt every year near the village of Madagan (see photo 13).

Hydrology

For the flood event pattern, see chapter about Nothani bund.

In 1976, the old Madagan bund was washed away by a large flood, which also increased the size of the river considerably (see photo 14). Consequently, the water users were not capable any more to rebuild the bund with the help of only bullocks.

Sociology

1. Tribes and communities

All the land, which is irrigated with flood water from the Madagan bund, is owned by about 30 families, who are belonging to the Nausherwani tribe. After the old Madagan bund was washed away in 1976 and it could not be rebuilt any more during the next 10 years, all these 30 landowning families migrated permanently to Kharan town, where they have their businesses. These 30 landowning families also have land, which is irrigated with flood water from the Garruk river (40 *jora*) and by the Baddo weir (6 *jora*).

All the land irrigated by the old and new Madagan bund is cultivated by 80 tenants-at-will, belonging to the Chanal and Sumalanai tribes, and they were living in the following four villages: Tirathi (10 families), Kurkti (30 families), Purpate (15 families) and Tandwani (25 families).

2. Existing maintenance and reconstruction system

The old Madagan bund, made of sand, was breached by every large flood due to overtopping and sometimes due to piping caused by rats. The tenants were able to reconstruct with their bullocks the breached bund within a couple of days. Each tenant had to provide labour according the number of irrigated *jora*. If the damage to the bund was very large and the tenants were not able to rebuild it before the next expected flood, they could call the help of other tenants from other areas on the basis of *asher*.

The new Madagan bund is rebuilt with bulldozers; in 1993, 200 hours were provided by the local MPA fund and 100 hours were paid by the landowners. In 1992, this new Madagan bund breached within a couple of hours and it could not be rebuilt during the same flood season. The free bulldozer hours are also used to build a number flood protection bunds to prevent flood damage to the flood channel (see photo 15 and 16). In other years, the bund was sometimes deliberately breached by the tenants with the permission of the landlords after all the fields had been irrigated sufficiently and to protect their fields from flood damage. The reconstruction work by the bulldozer was supervised by two representatives of the landowning families: Mir Qadir Bux and Mir

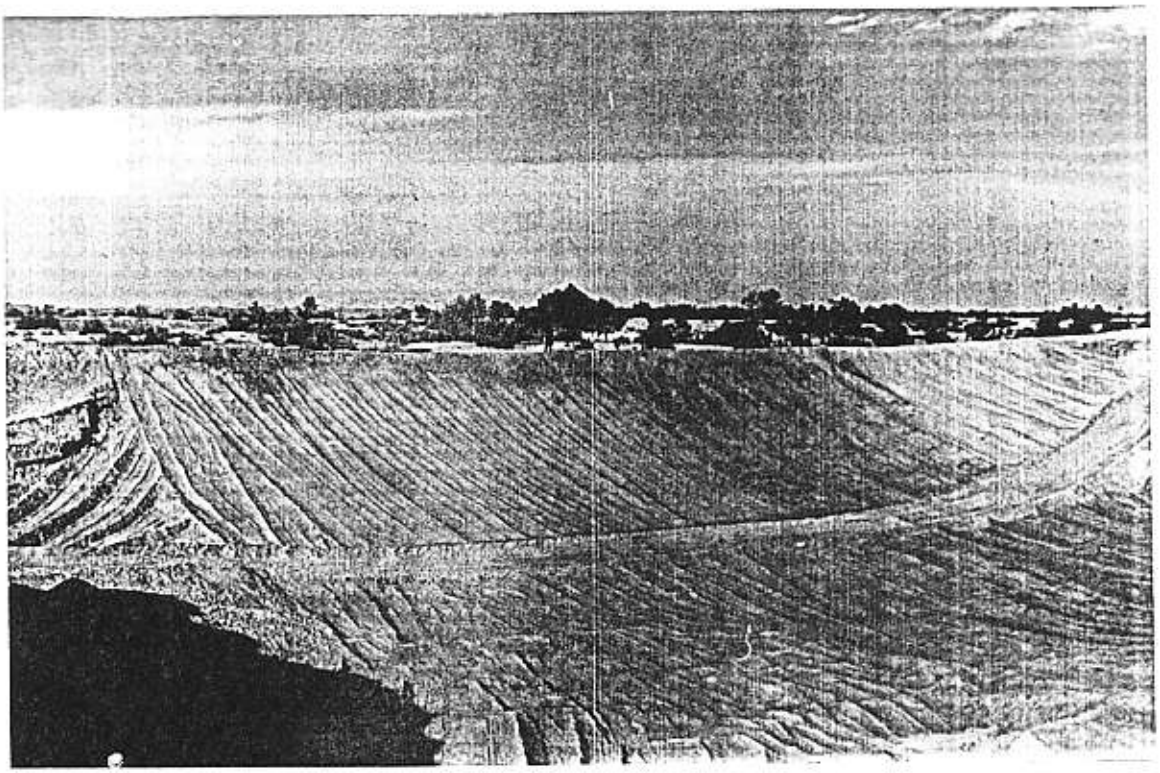

PHOTO 13: NEWLY CONSTRUCTED MADAGAN I BUND

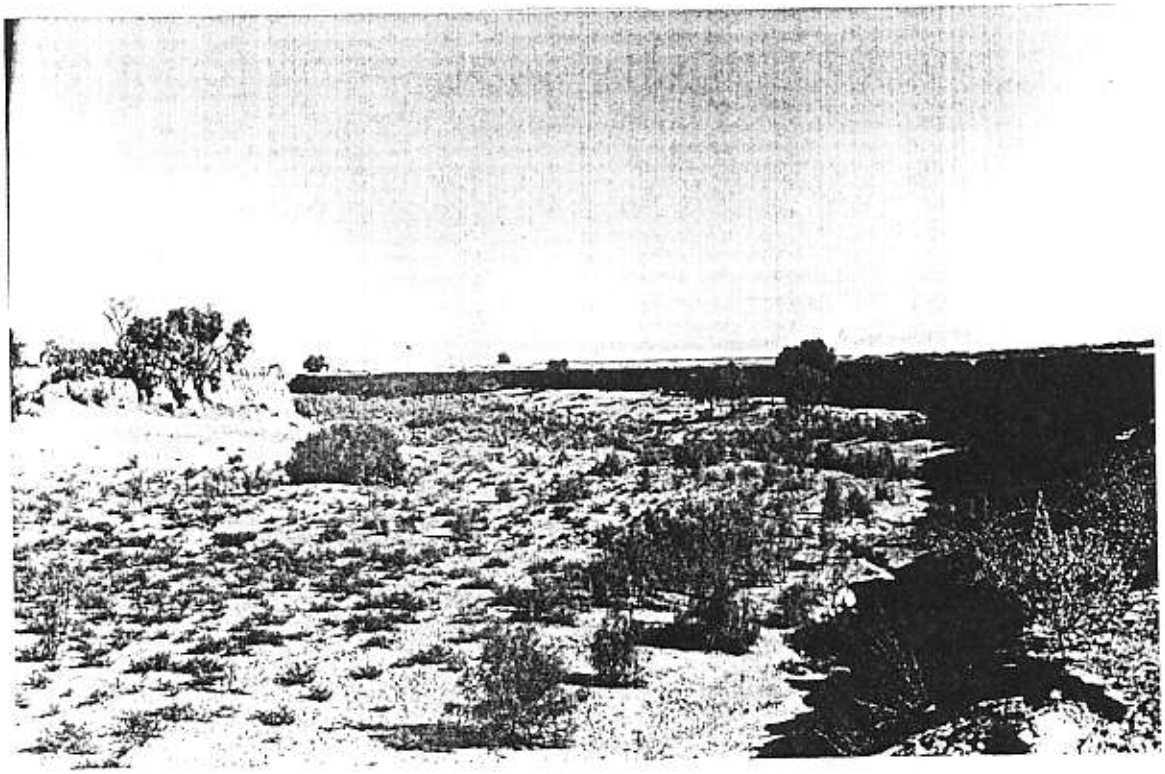

PHOTO 14: RIVER BED UPSTREAM OF MADAGAN I BUND

Majeed. Due to the fact that the former MPA has not be re-elected during the last provincial elections in October 1993, it is not expected that the landowners will receive free bulldozer hours from the new MPA at the end of 1994. Therefore, they will be unable to rebuild the Madagan bund at the beginning of the 1994/95 rabi season, because it will be very difficult to find a bulldozer at that time. Many bulldozers are out of order and the MPA's have the first right to use the available bulldozer hours.

3. Water distribution

All the flood water was diverted by one flood channel to the command area on the right bank of the Korakan river. The flood water in the flood channel is also here distributed according to the rule that the first water user has the first right to irrigate his field.

4. Command area

The total size of the command area is about 100 *jora* and is belonging to one tribe. Before 1976, when the tenants were responsible for the reconstruction of the old Madagan bund, their share of the harvest was 50%. Although the landlords have become responsible for the rebuilding of the new Madagan bund with the help of a bulldozer, the tenancy arrangement has not changed yet and the tenants at will still receive 50% of the harvest. But the landlords have the intention to change the existing arrangement and give the tenants a smaller share. Actually, the tenants are responsible to maintain the field bunds with the help of bullocks and camels.

5. Risk coping strategies

During the period that the Madagan bund could not be rebuilt by the tenants, many of them have migrated temporarily to other area to find work as day-labourers.

6. Agriculture

Wheat is the only crop, which is cultivated during the rabi season. Sorghum and water melon could be grown during the kharif season, if enough flood water is available to irrigate the fields.

7. Perception of the water users

The landlords are of the opinion that an improved bund should be built at the site of the old Madagan bund near Tirathi village. This would make it possible to construct a second flood channel on the left bank of the Korakan river.

3.8 MADAGAN II BUND

Before 1976, a second Madagan bund was built by 6 hereditary tenants (maorosi), belonging to Merani and Tondwani tribes, who are living in Purpate and Jamak villages. This bund was located 1 mile upstream of Purpate village. These occupancy tenants are cultivating the land of one member (Haji Qadir Bux) of the Nausherwani tribe. The command area has a size of 6 *jora*.

Due to absence of these 6 hereditary tenants, more information about this bund is not available yet.

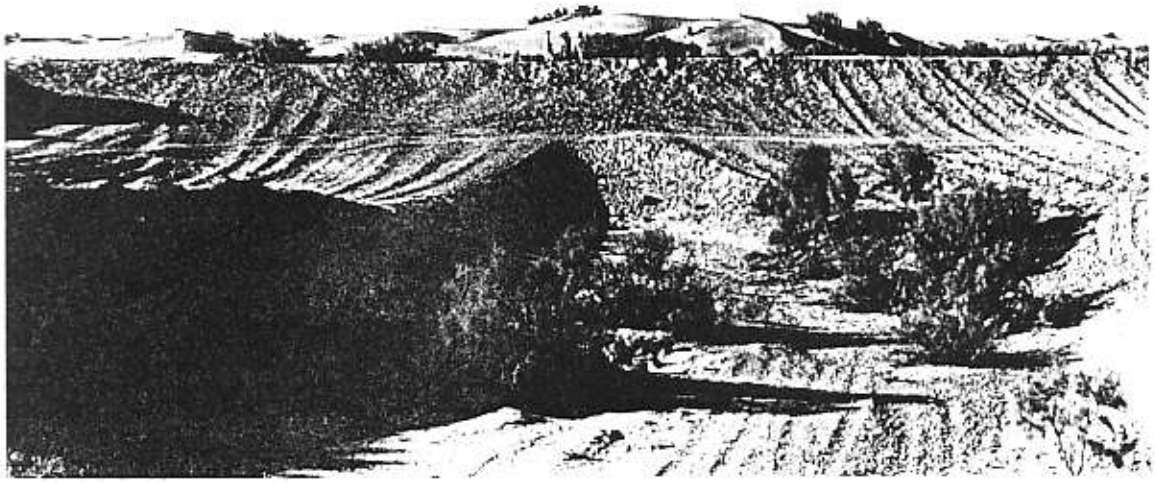

PHOTO 15: BUND PROTECTING MADAGAN I FLOOD CHANNEL

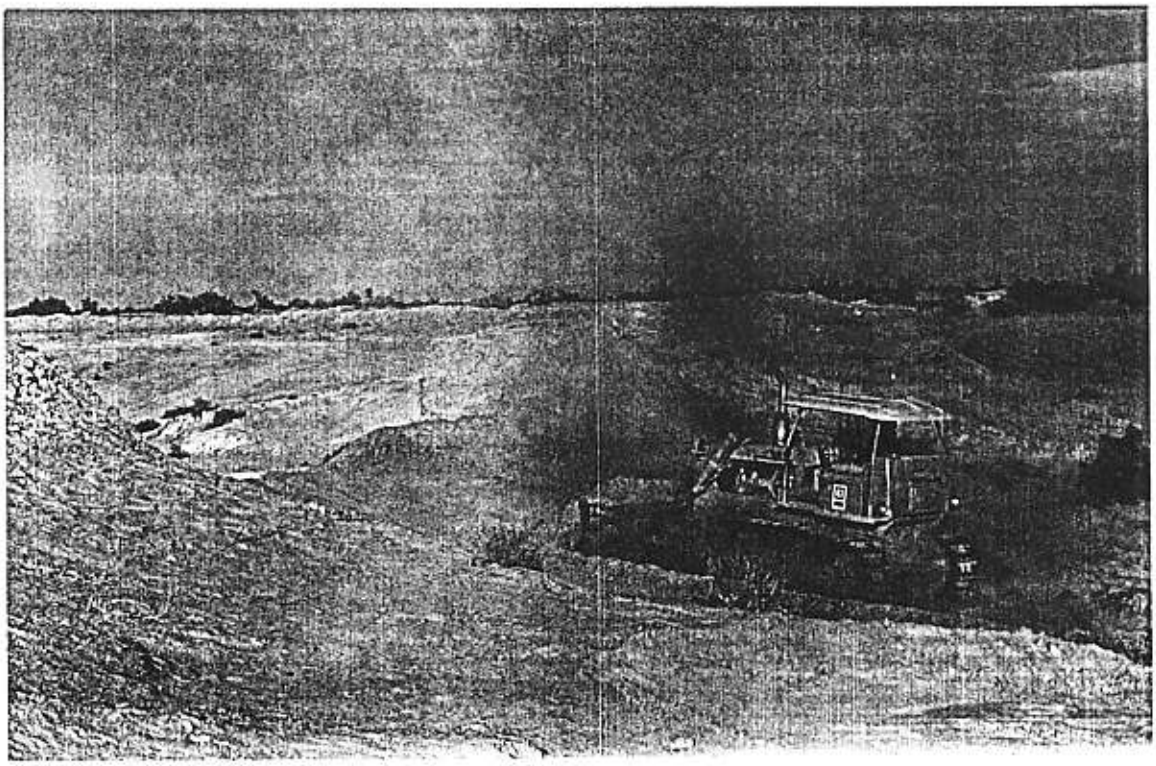

PHOTO 16: CONSTRUCTION OF FLOOD CHANNEL PROTECTION BUND NEAR MADAGAN VILLAGE

3.9 JAMAK BUND

A 200 feet long and 40 to 50 feet high earthen bund has been built in the Korakan river with the help of a bulldozer east of Jamak village, just downstream of Purpate village. The bund is located about 35 km south west of Kharan city.

Hydrology

See previous chapters.

Sociology

1. Tribes and communities

About 500 families, who are belonging to Sar Baloch, Zehri, Faqirzai and Mullahzai tribes, are shareholders in the Jamak bund. These families are living in a number of village, such as Jamak (Sohur Badini and Rind tribes), Marbund (Sohur Badini and Zehri tribes), Ghazbastan (Faqirzai, Rind, Mullahzai and Ghulam tribes) and Seazari (Sohur Baloch).

2. Existing maintenance and reconstruction system

Although the river bed has become very deep, the water users are capable to rebuild the bund every year with the help of free bulldozer hours, provided by the local MPA fund. For the reconstruction of the bund, they need 450 hours. In 1992, the bund only lasted for 1 hour before it breached due to piping (see photo 17 and 18).

3. Water distribution

At present, the flood water is diverted into three flood channels; one flood channel is serving a command area on the right bank and is constructed adjacent to the bund. The other two flood channels are diverting the flood water to the left bank.

The right bank flood channel has a length of about 3 km and it is serving the command area of Jamak village, whereas both left bank flood channels divert water to the command areas of the other three villages. The left bank flood channels have a total length of more than 20 kilometres.

4. Command area

The size of all different command areas together is more than 1,000 acres and more land is available for expansion.

5. Agriculture

The farmers are growing wheat, cumin, melon, water melon, sorghum and pulses.

6. Perception of farmers

The farmers requested the construction of a weir which could divert a reliable amount of flood water into the flood channels.

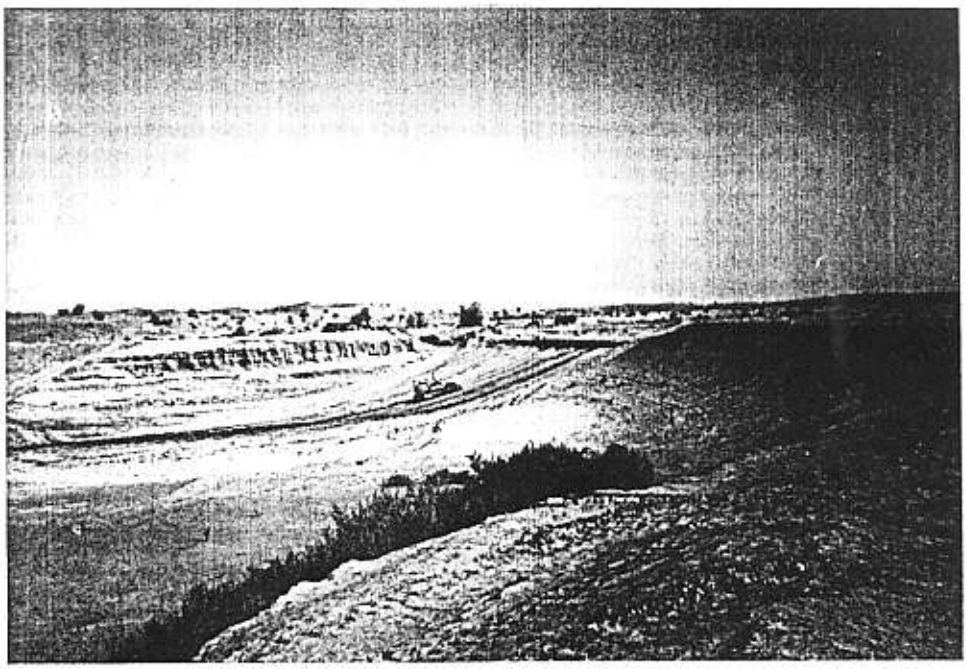

PHOTO 17: CONSTRUCTION OF JAMAK BUND

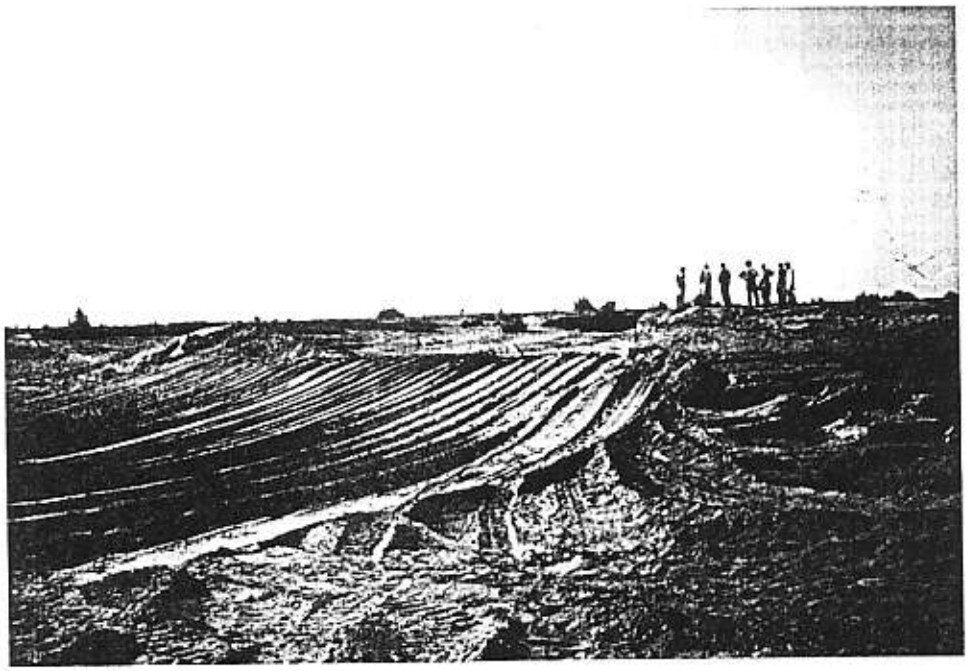

PHOTO 18: JAMAK BUND UNDER CONSTRUCTION

3.10 KARKHI BUND

In the river bed of the Karkhi river, the collective bund, called Karkhi bund, has been built by farmers from 12 different communities. The Karkhi bund has height of about 20 feet and its length is more than 300 feet (see photo 19). The location of the Karkhi bund is about 70 km south east of Kharan city.

Hydrology

Between the Jamak Bund and the Karkhi bund, the Korakan river, Garruk river and a tributary of the Baddo river are joining each other and it is called Karkhi river by the local population. Due to the fact that three separate river courses are coming together upstream of the Karkhi bund, the catchment area of the Karkhi river is very large. The frequency of floods varies from summer to winter and the maximum number of floods are reported in the months from January to March.

As a result of the fact that the Karkhi bund has not breached for the last two to three years, the degradation process has stopped completely and the river bed has silted up several feet over a total length of more than 6 miles.

Five individual tubewells are also operated to supplement the need of irrigation water during the dry season.

Sociology

1. Tribes and communities

About 1,260 households living in 12 different communities are beneficiaries of the Karkhi bund. The main tribes are Kubdani, Essazai, Duragzai, Sopuk, Momoga, Mullazai, Nausherwani and Klagani, who are resident in the following villages: Sorgazo (400 households), Nizar (50 households), Koshk (20 households), Puljut (100 households), Kamar (200 households), Ureke (100 households), Tumani (50 households), Yuloki (50 households), Sahib Dad (20 households), Soro Sharif Khan (20 households), Nock Asghal Killi (20 households) and Nick Kali Naib Abdul Razziq (50 households).

2. Existing maintenance and reconstruction system

The Karkhi bund has not been washed away for the last two to three years due to absence of large floods. Consequently, the river bed has silted up several feet upstream of the bund.

Water users from all 12 communities have to contribute labour and money according to their land shares for the reconstruction and maintenance of the Karkhi bund. Water users, who are living the communities at the tail-end of the flood channels, have to contribute in the same as the upstream water users. The tail-end water users are not compensated for the fact that their probability to receive flood water is less in comparison with upstream water users. To rebuild the bund after it had been washed away by large floods, about Rs. 55,000 were spent for the rent of a bulldozer. The cash contributions are collected by the village leaders in each community.

3. Water distribution

The total command area is situated at both sides of the Karkhi river and the flood water is diverted into two flood channels, which are commanding both command areas. Like in the other upstream flood irrigation schemes, the upstream water users also have the first right to divert the flood water to their fields. The probability of receiving flood water

PHOTO 19: KARKHI BUND

decreases considerably for the downstream water users. Flood water is only diverted into the left bank flood channel during high flood, whereas the right bank flood channel is even receiving flood water during low floods.

4. Command area

The total area, which could be commanded by the Karkhi bund, is approximately more than 3,000 acres. During a reconnaissance visit in July 1993, not more than 50 acres were cultivated. A portion of the arable land is cultivated by hereditary tenants, who are receiving 75% of the harvest, whereas tenants at will only receive one-third of the harvested crop. The tenants at will only provide the labour, while the landlords supply all the inputs and are responsible for the maintenance of the field bunds. The hereditary tenants have to do all the field work, included the maintenance of the field bunds, as well as the provision of the inputs (seed).

5. Agriculture

During the rabi season, the farmers are cultivating wheat and cumin, whereas sorghum and pulses are grown during the kharif season.

6. Perception of the water users

If the water users have permanent access to a bulldozer, they would be able to rebuilt their bund quickly after every breaching and the bund could also built much stronger. The water users would like to raise the existing bund, because they want to prevent the flood water from flowing downstream and get wasted in the desert near Oskardon. With a bulldozer, the flood channels and the command areas could also be protected against flood damage and the farmers could prepare their fields more easily. The bund itself could be improved by constructing a pucca weir with two main offtake structures.

3.11 PIR BUND

About 15 to 20 miles downstream of the Karkhi bund, the Pir bund is built. More information about this particular bund is not available.

BALOCHISTAN MINOR IRRIGATION AND AGRICULTURAL DEVELOPMENT PROJECT

AGRO-ECONOMIC PROFILE

OF

KHARAN DISTRICT

Prepared by: WUA Liaison Section

Quetta, February 1994

1 INTRODUCTION

1.1 Population

In 1981, the population of the Province of Balochistan rose to 4,3 million (5,1% of the total for Pakistan), achieving an average density of 12 persons per km². Kharan District with 128,040 inhabitants supported 3% of the total population with very low population density of only 3 persons per km². The population pressure in Kharan District on cropped area is relatively high compared with the average of the whole Province of Balochistan; 3.31 persons and 1.69 persons per hectare, respectively (see table 1.1 and 1.3).

According to a population assessment of the PDD-GD Project, the total population in Balochistan increased to 6,554,000 and in Kharan District to 180,483 inhabitants (2.75% of total) in March 1992. The population density for Kharan District rose to 4.2 persons per km² (see Table 1.3)

According to the population Census of 1981, Kharan District had an urban population of 10,472 (8.2% of total), whereas the proportion of the urban population in the total population of the Province of Balochistan was 15.0% (see Table 1.1).

During the first four decennia of this century, the population in Balochistan stayed relatively stationary (around 833,000 inhabitants). However, these figures are not hundred percent reliable, because the registration at that time was still underdeveloped due to poor communication in large parts of the Province. From 1951, the population both in the whole Province of Balochistan as in Kharan District as well increased considerably. Between 1951 and 1961, the population increased with an average of 1.5% annually in the province, whereas the Kharan District saw its population decline with 12,090 (-2.2% a year) during the same period. During the 1960s (1961-1971), the population of the Province rose with an average of 9.4% per annum and in Kharan District with 8.1% per year. Between 1971 and 1981, the average annual increase of the population was 7.7% and 6.8% in the Province and Kharan District, respectively. According to the population assessment of the PDD-GD Project, the population in the Province increased with an average of 4.7% annually between 1981 and 1992. These high population growth figures could be explained by an increasing birth rate and a dropping death rate due to better health care and improved access to health facilities as well as by the migration of people from other parts of Pakistan as well as from neighbouring countries to the Province of Balochistan. The improvement of communication in the Province will also be responsible for a better coverage of the more recent Census (see Table 1.2).

Table 1.1: Population divided in sub-divisions, (sub-)tehsils and rural and urban areas in March 1981 and March 1992

Administrative unit	March 1981	March 1992
Kharan District	128,040	180,482
- rural	117,568	165,721
- urban	10,472	14,761
Kharan Sub-division	69,187	97,524
- rural	58,715	82,763
- urban	10,472	14,761
Rakhshan Sub-division	44,051	62,093
- rural	44,051	62,093
- urban	0	0
Mashkel Sub-division	14,802	20,865
- rural	14,802	20,865
- urban	0	0

Source: PDD-GD: Development statistics of Balochistan, an assessment and presentation data on population, education and agriculture, September 1992, p.25)

Table 1.2: **Development of population.**

Region	1901	1911	1921	1931	1941	1951	1961	1971	1981
Balochistan	810,750	834,700	799,630	868,640	857,840	1,086,590	1,251,840	2,428,680	4,305,000
Quetta Division	382,110	414,410	420,650	463,510	501,630	514,110	630,120	1,321,050	2,633,000
Kalat Division	428,640	420,290	378,980	405,130	356,200	572,480	621,720	1,107,630	1,672,000
- Kharan	-	22,660	27,740	23,360	33,830	54,570	42,480	76,800	129,000
Urban population	-	-	-	-	-	2,600	2,700	6,100	10,500

Source: Siddiqi, p.157

Table 1.3: **Population density and pressure in 1981**

Region	1972	1981	% of population	total area (km^2)	population density per km^2	total cultivated area (ha)	% cultivated area of total area	total cropped area (ha)	cropped area (%)	population pressure on cropped area	
										persons/ acre	persons/ ha
Balochistan	2,429,000	4,305,000	100	358,750	12	2,547,300	7,1	480,000	100	4.18	1.69
Quetta Division	926,000	1,625,000	37.7	108,333	15	525,900	4,9	99,400	20.7	7.63	3.09
Sibi Division	660,000	1,008,000	23.4	43,826	23	1,326,300	30.3	251,000	52.3	1.87	0.76
Kalat Division	536,000	1,020,000	23.7	145,714	7	560,400	3.8	105,600	22.0	4.49	1.82
- Kharan	77,000	129,000	3.0	43,000	3	38,900	0.9	7,200	1.5	8.06	3.31
Makran Division	307,000	652,000	15.2	59,272	11	128,100	2.2	24,000	5.0	12.54	5.09

Source: Siddiqi, p.163 and 199

1.2 Agriculture

According to the Agricultural Census 1980, 170,691 acres were considered in Kharan District as farm area, but only 57% (97,840 acres) was cultivated area and the other 43% was classified or as culturable waste or as unculturable (including forest). The 1,252 farms smaller than 1 acre of farm area were cultivating 100% of the available farm area, whereas the farms ranging from 1 to 7.5 acres of farm area only cultivated 52% of it. Farms of 7.5 to under 50.0 acres of farm area had about 65% cultivated, while only 28% of all the farm was under cultivation by farms of 150.0 and above.(see Table G)

According to the Agricultural Census 1980, the total cultivated area had an acreage of 39,611 hectares (97,840 acres), whereas the Agricultural Statistics of 1987-88 mentions 59,174 hectares; an increase of 19,563 hectares (49.4%). Between 1987-88 and 1989-90, the total cultivated area in Kharan District increased with an additional 1,448 hectares to 60,622 hectares.

The total net sown area in 1980 was 15,077 hectares (37,240 acres), which was 38% of the total cultivated area, and 16,225 hectares was reported as cropped area (see Table K). In 1987-88, the net sown area would be declined 67.2% to 4,952 hectares (12,231 acres), of which 3,114 hectares had perennial irrigation facilities, representing 8.4% of the total cultivated area. In 1989-90, the net sown area had increased again to 6,984 hectares (17,250 acres), of which 3,131 hectares was irrigated. This means that 11.5% of the total cultivated area was used for cultivation in that particular year. (see Tables 1.3, 1.4 and H) This means that the total area under cultivation increased about 40% in two years. Especially the increase of wheat cultivation on unirrigated land (2,630 hectares) is responsible for this significant of extension of land under cultivation. The good rainfall pattern during the rabi season of 1989-90 is one explanation for this development. The area under perennial irrigation only rose with 17 hectares.

Although the total area under cultivation expanded significantly, the total production increased slightly 541 tonnes (1.5%) between 1987-88 and 1989-90. Although the production of (unirrigated) wheat augmented sharply from 950 tonnes to 3,960 tonnes, the production of vegetables, sorghum, melons and pulses declined.

Table 1.4: Land utilisation in Kharan District for 1987-88

	1987-88	1989-90
Total area	4,805,104	4,805,104
Cultivated area	59,174	60,622
- cropped area	4,952	6,984
- current fallow	54,222	53,638
Uncultivated area	3,534,205	3,532,757
- cultivable waste	768,875	767,427
- forest	127,425	127,425

Source: Agricultural Statistics Balochistan 1987-88 (p.119) and 1989-90 (p.141)

1.2.1 Land distribution.

The total cultivated area of 97,840 acres was occupied by a total number of 14,129 farms, of which 1,252 farms (8.9% of total) were smaller than 1 acre and they had access to 375 acres of cultivated land (0.38%); an average of 0.30 acres of cultivated land per farm. All the 5,140 farms smaller than 5 acres of farm area (36.4%% of total) owned together 5,161 acres of cultivated land (5.3% of total) and the average farm size of this group is exactly 1.0 acres of cultivated land. The group of 7,431 farms between 5 acres and 25 acres of farm area (52.6% of total) possessed together 52,480 acres of cultivated land (53.6% of total); an average farm size of 7.1 acres of cultivated land. The 1,558 farms of 25 acres and above of farm area (11.0% of total) are the owners of 40,199 acres of cultivated land (41.1% of total) and their average farm size is 25.8 acres of cultivated land. The 56 farms of 150 acres of farm area (0.4% of total) owned 4,059 acres of cultivated land (4.2% of total) and their average farm size is 72.5 acres of cultivated land.

Table 1.5: Land distribution in Kharan District in 1980

FARM AREA SIZE OF FARMS (ACRES)	TOTAL FARMS			TOTAL CULTIVATED AREA			NET SOWN CULTIVATED AREA		
	NUMBER	%		ABSOLUTE	%		ABSOLUTE	%	
ALL FARMS	14,129	100.00		97,840	100.00		37,240	100.00	
UNDER 1.0	1,252	8.86	36.38	375	0.38	5.27	365	0.98	10.29
1.0 TO UNDER 2.5	2,243	15.88		1,826	1.87		1,513	4.06	
2.5 TO UNDER 5.0	1,645	11.64		2,960	3.03		1,955	5.25	
5.0 TO UNDER 7.5	2,030	14.37	52.59	5,611	5.73	53.64	2,745	7.37	53.97
7.5 TO UNDER 12.5	2,944	20.84		17,788	18.18		7,523	20.20	
12.5 TO UNDER 25.0	2,457	17.39		29,081	29.72		9,829	26.39	
25.0 TO UNDER 50.0	1,044	7.39	11.03	22,294	22.79	41.09	6,562	17.62	35.74
50.0 TO UNDER 150.0	458	3.24		13,846	14.15		3,417	9.18	
150.0 AND ABOVE	56	0.40		4,059	4.15		3,331	8.94	

Source: Agricultural Census 1980

Taking into consideration the net sown cultivated area in 1980, the group of farms under 5 acres see their share increase from 5.3% to 10.3% of the total net sown cultivated area, whereas the share of the group of farms between 5 and 25 acres stayed nearly the same at 54%. The share of the group of farms of 25 acres and above declined with 5.4% to 35.7% of the total net sown cultivated area in 1980.

For all farms in Kharan District, only 38% of all cultivated area has been sown in 1980, but this percentage is ranging from 97% for farms under 1.0 acres and 25% for farms of 50.0 to under 150.0 acres. It is remarkable, that 82% of the farm area of farms above 150.0 acres is cultivated.(see Table H)

1.3 Sources of Irrigation

In 1981, the cultivated area with irrigation facilities (tubewell, well, karez, spring, a.o.) had an acreage of 9,926 hectares (24,516 acres), which was 25.1% of the total cultivated area. The most important perennial irrigation source were karezes, which irrigated 7,231 hectares (17,860 acres) of cultivated land or 72.8% of all the cultivated land with irrigation facilities. Another 2,508 hectares (6,195 acres) were irrigated by springs, rod kohi, bandat or water from tanks.(see Tables 1.6 and J)

According to the Agricultural Statistics 1987-88, the cultivated area irrigated by different sources of irrigation was only 2,010 hectares (4,965 acres), which is 20% of the cultivated area with irrigation facilities in 1981. The cultivated area irrigated by karezes declined considerably between 1980 and 1987-88, whereas the tubewell irrigated area rose from 218 hectares to 880 hectares (88 tubewells) in the same period. Two years later, the irrigated area increased to 3,320 hectares (65.2%). The number of tubewells rose to 113, which irrigated 1,000 hectares of land (30.1% of total irrigated land), while 120 hectares were irrigated by 30 wells and 2,200 hectares (66.3% of total) by karezes, springs and other sources.

It is difficult to explain the dramatic decline in irrigated cultivated land between 1980 and 1987-88. The rapid development of tubewells in Kharan District during the 1980s and the collapse of karezes as the result of poor maintenance could be reasons for the drop of area irrigated by karezes. The collection method of statistical information may be another reason for the enormous difference in acreage under perennial irrigation.

Another important source of irrigation is sailaba or flood/spate irrigation. In 1980, 62,776 acres (64.2% of total) of the total cultivated area of 97,840 acres was considered as sailaba land, whereas 10,546 acres (10.8% of total) was classified as barani (rainfed) land (see Table J). About 48,500 acres (77% of total) of sailaba land is belonging to farms with an average size of 7.5 to under 50.0 acres of farm area. Of the total cultivated area for farms under 5 acres of farm area (5,161 acres) about 25% (1,275 acres) has sailaba irrigation, whereas for farms ranging in farm size from 5 acres to 150 acres about 66% of all cultivated land is under sailaba.

Table 1.6: Distribution of irrigated area by sources of irrigation (1983-84)

Region	% of total cultivated area with irrigation facilities	canal	tubewell	well	karez	other
Balochistan	35	51	12	2	14	21
Kharan	25	0	1	1	73	25

Source: Siddiqi, p.191

Table 1.7: Area irrigated by different sources of irrigation in Kharan District for 1987-88 and 1989-90

SOURCE OF IRRIGATION	1987-88	1989-90
CANALS	0	0
TANKS	0	0
WELLS	130	120
TUBEWELLS	880	1,000
KAREZES, SPRINGS & OTHERS	1,000	2,200
TOTAL	2,010	3,320
NUMBER OF WELLS	25	30
NUMBER OF TUBEWELLS	88	113

Source: Agricultural Statistics 1987-88 and 1989-90.

1.4 Crops

According to the Agricultural Census 1980, 76% of the total cropped area of 40,076 acres was under wheat cultivation, whereas 18% was used for the production of vegetables and 2% was under orchards. The remaining 6% had been used by farmers to cultivate jawar/bajara (2%), rice, maize, oilseeds, pulses, fodder and other crops. Farms under 1 acre only used 8% of their land for wheat cultivation, whereas 64% was dedicated for the production vegetable and 18% for orchards. Farms ranging in size from 2.5 acres to under 50.0 acres, had an average of 81% under wheat, 13% under vegetables and 1% used for orchards. Farms of 150 acres and above were using 54% of their cropped area for wheat cultivation and 37% for vegetables, while 7% was under orchards (see Table K).

These figures of the Agricultural Census 1980 do not correspond with figures found in the Agricultural Statistics. According to the Agricultural Statistics

1987-88, only 26% of the total area of 4,952 hectares was under wheat cultivation, whereas 28% under orchards and 27% used for the production of vegetables (13%) and melons (14%). However, the Agricultural Statistics 1989-90 reports that two years later 57% of the total area of 6,936 hectares was under wheat, 20% under orchards and 14% planted with vegetables (7%) and melons (7%) (see Tables A and B).

1.4.1 Wheat

Wheat is the most important crop in Kharan District, occupying a total area of 1,300 hectares and an annual production of 950 tonnes during the cropping year 1987-88. Only 300 hectares are irrigated by a perennial irrigation source, whereas the remaining 1,000 hectares is sailaba land. Irrigated wheat is generally sown from the beginning of October to the end of December. On sailaba land, wheat is not grown unless there are floods, which are providing moisture that is carefully preserved for sowing as soon as the heat subsides in October. Harvesting of wheat starts by the beginning of April and is finished by the end of May. According to the Agricultural Statistics 1987-88, the average yield per hectare for irrigated land was 1.667 kg, whereas the average yield for the total area under wheat was 731 kg per hectare.

Between the cropping years 1987-88 and 1989-90, the total area under wheat cultivation had increased from 1,300 to 3,930 hectares (200%), whereas the irrigated area under wheat rose with 230 hectares to 530 hectares (77%). The total wheat production in Kharan District was 3,960 tonnes, which is an increase of 317% in comparison with the total wheat production of 1987-88. Besides an increase of the total acreage under wheat, the average yield per hectare of unirrigated land also improved significantly; from 731 to 1,008 kg/hectare. The average yield for irrigated area only increased slightly to 1,698 kg/hectare.

1.4.2 Jowar/Sorghum

The total area under sorghum declined between 1987-88 and 1989-90; from 420 hectares to 106 hectares (-75%). Consequently, the total production also dropped with 120 tonnes to 50 tonnes, whereas the average yield per hectare improved; from 405 to 472 kg/hectare.

1.4.3 Onion

Compared with 1987-88, the total irrigated area under onion in 1989-90 increased with 20 hectares to 200 hectares and the total production rose during the same period with 340 tonnes to 2,500 tonnes. The average yield per hectares was 12,500 kg/hectare.

1.4.4 Cumin

Between 1987-88 and 1989-90, the total irrigated area dedicated to the cultivation of cumin increased 50% to 210 hectares and the total production rose to 107 tonnes.

1.4.5 Vegetables

In comparison with the cropping year 1987-88, the total area under vegetables in 1989-90 decreased 22.5% to 488 hectares. During the rabi season, 288 hectares were used for vegetable production, while in the summer months vegetables were grown on 200 hectares. The total production was 6,210 tonnes of vegetables. The most important vegetable is tomato; 200 hectares produced 2,700 tonnes. With 109 hectares and a total production of 900 tonnes, okra/ladyfinger is the second most important vegetable crop in Kharan District, whereas pumpkin is the third most important.

1.4.6 Pulses

According to the Agricultural Statistics 1989-90, the production of mung and mash had stopped completely, whereas two years earlier 67 hectares was under pulses with a total production of 25 tonnes.

1.4.7 Melons

After the cultivation of wheat and dates, melons is the most important crop in Kharan District with a total acreage of 486 hectares and a total production of 5,070 tonnes during the cropping year 1989-90. Compared with 1987-88, the total area under melon dropped about 31%. Like sorghum, melon is a typical flood irrigation crop and both crops saw their total acreage and production decline between 1987-88 and 1989-90. This could be an indication that the cropping year 1989-90 was drier than those in 1987-88 and fewer floods occurred.

1.4.8 Fodder

During the 1989-90 cropping year, 119 hectares of irrigated land was used by farmers for the production of fodder (lucerne and sorghum). Although not mentioned in these statistics, sorghum and wheat on sailaba land is also used as fodder, especially in drier years when these fields did not receive sufficient flood water.

1.4.9 Orchards

Dates

In Kharan District, great attention is paid to the planting and raising of date trees. Fresh trees are raised from offsets, and they produce fruit after three to eight years. Flowering starts in March, and the fruit starts shaping and colouring in June; the harvest lasts from July to September. The fruit is preserved in various ways, most commonly by pressing and packing in palm-leaf baskets. A total of 1,320 hectares are planted with date palms and the total production in 1989-90 was 12,400 tonnes; an average yield of 9,502 kg/hectare was reported. About 95% of the total area under orchards in Kharan District was used for the cultivation of dates in 1989-90.

Pomegranates and grapes

In 1989-90, the cultivation of these two fruits is limited to 30 and 18 hectares respectively, from which acreages a total production of 430 and 140 tonnes has been harvested by the farmers.

Table 1.8: Distribution of area under orchards

Region	1975 - 1980			1981 - 1984			percentage change 1981-1984 over 1975-1980
	hectares	acres	%	hectares	acres	%	
Balochistan	26,543	65,590	100	31,781	78,534	100	19.73
Quetta Division	14,203	35,097	53.51	16,272	40,210	51.20	14.57
Sibi Division	1,781	4,401	6.71	2,283	5,642	7.18	28.19
Kalat Division	3,889	9,610	14.65	4,267	10,544	13.43	9.72
- Kharan	1,288	3,183	4.85	1,339	3,309	4.21	3.96
Makran Division	6,670	16,482	25.13	8,959	22,139	28.19	34.32

Source: Siddiqi, p.235

Table 1.9: Shares of different orchards crops

	Apple	Apricot	Grape	Date	Pomegranate	Almond	Plum	Peach	Other
% of orchard land used for different fruits in Kharan District	-	-	0.31	98.15	0.93	-	0.31	-	-
Orchard land in Kharan District as % of total area under orchards in Balochistan	-	-	0.17	14.59	0.09	-	-	-	-

Source: Siddiqi, p.236, 239 and 243

Table A: **Area and production in Kharan District in 1987-88**

CROP	TOTAL AREA IN HECTARE	TOTAL IRRIGATED AREA IN HECTARE	TOTAL PRODUCTION IN TONNES	TOTAL PRODUCTION IN TONNES (IRRIGATED)	YIELD PER HECTARE IN KG.	YIELD PER HECTARE IN KG. (IRRIGATED)
WHEAT	1,300	300	950	500	731	1,667
JOWAR	420	140	170	60	405	429
ONION	180	180	2,160	2,160	12,000	12,000
CUMIN	140	50	60	30	429	600
CHILIES	14	14	14	14	1,000	1,000
FRUIT	1,397	1,397	12,795	12,795		
- dates	1,320	1,320	12,240	12,240	9,452	9,452
- pomegranates	30	30	370	370	20,556	20,556
- grapes	18	18	50	50	10,000	10,000
VEGETABLES	630	630	7,640	7,640		
- rabi	376	376	4,860	4,860		
- kharif	254	254	2,780	2,780		
* tomatoes	240	240	2,880	2,880	12,000	12,000
* okra	93	93	900	900	9,677	9,677
* tinda	45	45	450	450	10,000	10,000
* bottle gourd	27	27	240	240	8,889	8,889
* pumpkin	46	46	800	800	17,391	17,391
* carrot	40	40	630	630	15,750	15,750
* radish	35	35	520	520	14,857	14,857
* spinach	21	21	300	300	14,286	14,286
* turnip	20	20	330	330	16,500	16,500
PULSES	67	49	25	15	373	306
- mung	47	47	14	14	298	298
- mash	20	2	11	1	550	500
MELONS	702	252	6,830	3,900	9,729	15,476
FODDER	102	102	4,300	4,300	42,157	42,157
- lucerne	45	45	2,600	2,600	57,778	57,778
- jowar	57	57	1,700	1,700	29,825	29,825
TOTAL	4,952	3,114	34,944	31,414		

Source: Agricultural Statistics 1987-88

Table 8: Area and production in Kharan District in 1989-90

CROP	TOTAL AREA IN HECTARE	TOTAL IRRIGATED AREA IN HECTARE	TOTAL PRODUCTION IN TONNES	TOTAL PRODUCTION IN TONNES (IRRIGATED)	YIELD PER HECTARE IN KG.	YIELD PER HECTARE IN KG. (IRRIGATED)
WHEAT	3,930	530	3,960	900	1,008	1,698
JOWAR	106	57	50	30	472	526
ONION	200	200	2,500	2,500	12,500	12,500
CUMIN	210	140	107	80	510	571
CHILIES	8	8	8	8	1,000	1,000
FRUIT	1,397	1,397	13,120	13,120		
- dates	1,320	1,320	12,400	12,400	9,502	9,502
- pomegranates	30	30	430	430	20,476	20,476
- grapes	18	18	140	140	10,769	10,769
VEGETABLES	488	488	6,210	6,210		
- rabi	288	288	3,990	3,990		
- kharif	200	200	2,220	2,220		
* tomatoes	200	200	2,700	2,700	13,500	13,500
* okra	109	109	1,100	1,100	10,092	10,092
* tinda	0	0	0	0	0	0
* bottle gourd	0	0	0	0	0	0
* pumpkin	55	55	770	770	14,000	14,000
* carrot	13	13	200	200	14,385	14,385
* radish	25	25	370	370	14,800	14,800
* spinach	25	25	330	330	12,800	12,800
* turnip	25	25	400	400	16,000	16,000
PULSES	0	0	0	0	0	0
- mung	0	0	0	0	0	0
- mash	0	0	0	0	0	0
MELONS	486	162	5,070	2,470	10,432	15,247
FODDER	119	119	4,460	4,460	37,479	37,479
- lucerne	49	49	2,500	2,700	51,020	51,020
- jowar	70	70	1,960	1,960	28,000	28,000
TOTAL	6,936	3,131	35,485	29,778		

Source: Agricultural Statistics 1989-90

Table C: Number and area of farms by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRES	FARMS		FARM AREA		CULTIVATED AREA		CULTIVATED AREA AS % OF FARM AREA	AVERAGE SIZE OF	
	NUMBER	%	TOTAL	%	TOTAL	%		FARM AREA	CULTIVATED AREA
ALL FARMS	14,129	-	170,691	-	97,840	-	57	-	-
UNDER 1.0	1,252	9	375	<0.5	375	<0.5	100	0.3	0.3
1.0 TO UNDER 2.5	2,243	16	3,484	2	1,826	2	52	1.6	0.8
2.5 TO UNDER 5.0	1.645	12	5,726	3	2,960	3	52	3.5	1.8
5.0 TO UNDER 7.5	2,030	14	11,074	6	5,611	6	51	5.5	2.8
7.5 TO UNDER 12.5	2,944	21	28,712	17	17,788	18	62	9.8	6.0
12.5 TO UNDER 25.0	2,457	17	43,365	25	29,081	30	67	17.6	11.8
25.0 TO UNDER 50.0	1,044	7	33,964	20	22,294	23	66	32.5	21.4
50.0 TO UNDER 150.0	458	3	29,340	17	13,846	14	47	64.1	30.2
150.0 AND ABOVE	56	<0.5	14,651	9	4,059	4	28	261.6	72.5

Source: Agricultural Census 1980

Table D: Tenure classification of farms by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRES	NUMBER OF FARMS							
	TOTAL		OWNER		OWNER-CUM-TENANT		TENANT	
	NUMBER	%	NUMBER	%	NUMBER	%	NUMBER	%
ALL FARMS	14,129	100	12,412	88	749	5	971	7
UNDER 1.0	1,252	100	1,252	100	-	-	-	-
1.0 TO UNDER 2.5	2,243	100	2,194	98	-	-	49	2
2.5 TO UNDER 5.0	1.645	100	1,537	93	42	3	66	4
5.0 TO UNDER 7.5	2,030	100	1,586	78	189	9	256	13
7.5 TO UNDER 12.5	2,944	100	2,423	82	245	8	277	9
12.5 TO UNDER 25.0	2,457	100	2,105	86	155	6	197	8
25.0 TO UNDER 50.0	1,044	100	909	87	78	7	58	6
50.0 TO UNDER 150.0	458	100	353	77	38	8	67	15
150.0 AND ABOVE	56	100	53	95	2	4	1	2

Source: Agricultural Census 1980

Table E: Tenure classification of farm area by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRES	FARM AREA							
	TOTAL		OWNER		OWNER-CUM-TENANT		TENANT	
	ACRES	%	ACRES	%	ACRES	%	ACRES	%
ALL FARMS	170,691	100	144,753	85	12,356	7	13,583	8
UNDER 1.0	375	100	375	100	-	-	-	-
1.0 TO UNDER 2.5	3,484	100	3,386	97	-	-	98	3
2.5 TO UNDER 5.0	5,726	100	5,332	93	148	3	247	4
5.0 TO UNDER 7.5	11,074	100	8,511	77	1,119	10	1,444	13
7.5 TO UNDER 12.5	28,712	100	23,728	83	2,378	8	2,607	9
12.5 TO UNDER 25.0	43,365	100	37,382	86	2,775	6	3,207	7
25.0 TO UNDER 50.0	33,964	100	29,573	87	2,609	8	1,783	5
50.0 TO UNDER 150.0	29,340	100	22,795	78	2,747	9	3,797	13
150.0 AND ABOVE	14,651	100	13,671	93	580	4	400	3

Source: Agricultural Census 1980

Table F: Farm area by tenure and by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRES	FARM AREA					
	TOTAL	OWNER OPERATED AREA	TENANT OPERATED AREA			
			TOTAL	SHARECROPPED	LEASED	OTHER
ALL FARMS	170,691	151,940	18,754	18,278	274	202
UNDER 1.0	375	375	-	-	-	-
1.0 TO UNDER 2.5	3,484	3,386	98	98	-	-
2.5 TO UNDER 5.0	5,726	5,410	317	314	3	-
5.0 TO UNDER 7.5	11,074	9,155	1,919	1,919	-	-
7.5 TO UNDER 12.5	28,712	25,140	3,574	3,510	8	56
12.5 TO UNDER 25.0	43,365	38,996	4,369	4,223	-	146
25.0 TO UNDER 50.0	33,964	31,344	2,621	2,590	31	-
50.0 TO UNDER 150.0	29,340	24,283	5,056	4,874	182	-
150.0 AND ABOVE	14,651	13,851	800	750	50	-

Source: Agricultural Census 1980

Table G: Land utilisation by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRES	TOTAL FARMS		FARM AREA CULTIVATED	CULTIVATED AREA AS % OF TOTAL FARM AREA	FARM AREA UNCULTIVATED		
	NUMBER	AREA			TOTAL	CULTURABLE WASTE	UNCULTURABLE INCLUDING FOREST
ALL FARMS	14,129	170,691	97,840	57	72,851	65,524	7,327
UNDER 1.0	1,252	375	375	100	-	-	-
1.0 TO UNDER 2.5	2,243	3,484	1,826	52	1,658	1,597	61
2.5 TO UNDER 5.0	1,645	5,726	2,960	52	2,766	2,602	164
5.0 TO UNDER 7.5	2,030	11,074	5,611	51	5,463	5,118	345
7.5 TO UNDER 12.5	2,944	28,712	17,788	62	10,924	10,385	539
12.5 TO UNDER 25.0	2,457	43,365	29,081	67	14,284	13,508	776
25.0 TO UNDER 50.0	1,044	33,964	22,294	66	11,670	11,358	312
50.0 TO UNDER 150.0	458	29,340	13,846	47	15,494	14,190	1,304
150.0 AND ABOVE	56	14,651	4,059	28	10,592	6,766	3,826

Source: Agricultural Census 1980

Table H: Cultivated area by type and by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRES	TOTAL FARMS		TOTAL CULTIVATED AREA	NET SOWN		CURRENT FALLOW	
	NUMBER	AREA		AREA	% OF CULTIVATED AREA	AREA	% OF CULTIVATED AREA
ALL FARMS	14,129	170,691	97,840	37,240	38	60,600	62
UNDER 1.0	1,252	375	375	365	97	10	3
1.0 TO UNDER 2.5	2,243	3,484	1,826	1,513	83	313	17
2.5 TO UNDER 5.0	1,645	5,726	2,960	1,955	66	1,005	34
5.0 TO UNDER 7.5	2,030	11,074	5,611	2,745	49	2,866	51
7.5 TO UNDER 12.5	2,944	28,712	17,788	7,523	42	10,265	58
12.5 TO UNDER 25.0	2,457	43,365	29,081	9,829	34	19,252	66
25.0 TO UNDER 50.0	1,044	33,964	22,294	6,562	29	15,732	71
50.0 TO UNDER 150.0	458	29,340	13,846	3,417	25	10,429	75
150.0 AND ABOVE	56	14,651	4,059	3,331	82	728	18

Source: Agricultural Census 1980

Table I: Irrigation status of farms and farm area by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRE	FARMS REPORTING IRRIGATED AREA AS % OF CULTIVATED AREA								UNIRRIGATED FARMS	
	UNDER 51 PERCENT		51% TO UNDER 76%		76% TO UNDER 100%		100 PERCENT		NUMBER	CULTIVATED AREA
	NUMBER	CULTIVATED AREA	NUMBER	CULTIVATED AREA	NUMBER	CULTIVATED AREA	NUMBER	CULTIVATED AREA		
ALL FARMS	1,514	36,201	113	2,096	14	174	3,591	13,514	4,778	45,849
UNDER 1.0	-	-	-	-	-	-	1,217	358	35	17
1.0 TO UNDER 2.5	42	66	-	-	-	-	863	1,163	376	597
2.5 TO UNDER 5.0	21	77	14	42	-	-	397	1,120	542	1,722
5.0 TO UNDER 7.5	56	285	7	35	-	-	356	1,276	864	4,015
7.5 TO UNDER 12.5	244	2,449	28	264	7	70	440	3,259	1,408	11,746
12.5 TO UNDER 25.0	689	12,939	35	591	-	-	188	2,222	1,001	13,330
25.0 TO UNDER 50.0	348	11,304	22	677	7	104	65	477	410	9,733
50.0 TO UNDER 150.0	132	8,208	7	487	-	-	37	822	133	4,329
150.0 AND ABOVE	9	873	-	-	-	-	28	2,817	9	370

Source: Agricultural Census 1980

Table J: **Cultivated area classified by mode of irrigation and by size of farm for Kharan District in 1980**

SIZE OF FARMS IN ACRE	TOTAL CULTIVATED AREA	CULTIVATED AREA WITH IRRIGATION FACILITIES							CULTIVATED AREA WITHOUT IRRIGATION FACILITY	
		TOTAL	BY CANAL ONLY	BY TUBEWELL ONLY	BY WELL ONLY	BY KAREZ ONLY	TANK BANDAT SPRING RODKOHI ETC.	UNSPEC. SOURCES	SAILABA	BARANI
ALL FARMS	97,840	24,516	-	218	129	17,860	6,195	116	62,776	10,546
UNDER 1.0	375	358	-	-	3	156	193	5	3	14
1.0 TO UNDER 2.5	1,826	1,191	-	-	-	809	361	21	225	411
2.5 TO UNDER 5.0	2,960	1,182	-	-	-	463	696	24	1,047	730
5.0 TO UNDER 7.5	5,611	1,366	-	-	-	407	956	3	2,669	1,576
7.5 TO UNDER 12.5	17,788	4,285	-	14	28	2,946	1,283	14	10,588	2,913
12.5 TO UNDER 25.0	29,081	6,740	-	35	28	5,930	700	49	20,563	1,777
25.0 TO UNDER 50.0	22,294	3,972	-	20	70	2,895	987	-	17,395	927
50.0 TO UNDER 150.0	13,846	2,311	-	29	-	1,645	636	-	9,407	2,128
150.0 AND ABOVE	4,059	3,111	-	120	-	2,609	383	-	879	70

Source: Agricultural Census 1980

Table K: Share of important crops in total cropped area by size of farm for Kharan District in 1980

SIZE OF FARMS IN ACRE	TOTAL CROPPED AREA	CROP AREA AS PERCENTAGE OF TOTAL CROPPED AREA									
		WHEAT	RICE	MAIZE FOR GRAIN	JAWAR & BAJARA FOR GRAIN	OILSEEDS	PULSES	FODDER	VEGETABLES	ORCHARDS	OTHER CROPS
ALL FARMS	40,076	76	<0.5	<0.5	2	<0.5	<0.5	<0.5	18	2	1
UNDER 1.0	529	8	-	-	-	-	-	-	64	18	11
1.0 TO UNDER 2.5	1,659	57	-	-	-	-	-	-	32	10	2
2.5 TO UNDER 5.0	2,092	75	-	-	<0.5	-	-	<0.5	18	2	4
5.0 TO UNDER 7.5	2,849	86	-	-	<0.5	-	<0.5	-	11	1	1
7.5 TO UNDER 12.5	8,025	79	-	<0.5	1	-	<0.5	<0.5	17	1	1
12.5 TO UNDER 25.0	10,215	86	-	-	2	-	<0.5	<0.5	9	1	1
25.0 TO UNDER 50.0	6,766	81	-	-	5	-	1	<0.5	12	1	-
50.0 TO UNDER 150.0	3,760	65	<0.5	-	4	<0.5	<0.5	<0.5	26	3	<0.5
150.0 AND ABOVE	4,181	54	-	-	<0.5	-	-	<0.5	37	7	2

Source: Agricultural Census 1980

Table L: Share of important crops in total cropped area by type of tenure for Kharan District in 1980

TYPE OF TENURE	TOTAL CROPPED AREA	CROP AREA AS PERCENTAGE OF TOTAL CROPPED AREA									
		WHEAT	RICE	MAIZE FOR GRAIN	JAWAR & BAJARA FOR GRAIN	OILSEEDS	PULSES	FODDER	VEGETABLES	ORCHARDS	OTHER CROPS
ALL FARMS	40,076	76	<0.5	<0.5	2	<0.5	<0.5	<0.5	18	2	1
OWNER FARMS	37,830	74	<0.5	<0.5	2	<0.5	<0.5	<0.5	19	3	1
OWNER-CUM-TENANT FARMS	1,245	96	-	-	-	-	-	-	4	<0.5	-
TENANT FARMS	1,003	99	-	-	-	-	-	-	1	-	-

Source: Agricultural Census 1980

Table M: **Use of fertilisers, manures and insecticides on all farms by size of farm for Kharan District in 1980**

SIZE OF FARMS IN ACRE	TOTAL FARMS	FARMS REPORTING USE OF							
		BOTH FERTILISERS AND MANURES		FERTILISERS ONLY		MANURES ONLY		INSECTICIDES	
		NUMBER	% OF TOTAL	NUMBER	% OF TOTAL	NUMBER	% OF TOTAL	NUMBER	% OF TOTAL
ALL FARMS	14,129	8	-	-	-	2,103	15	704	5
UNDER 1.0	1,252	-	-	-	-	1,036	83	-	-
1.0 TO UNDER 2.5	2,243	-	-	-	-	522	23	-	-
2.5 TO UNDER 5.0	1,645	1	-	-	-	118	7	1	-
5.0 TO UNDER 7.5	2,030	-	-	-	-	42	2	-	-
7.5 TO UNDER 12.5	2,944	-	-	-	-	160	5	125	4
12.5 TO UNDER 25.0	2,457	7	-	-	-	132	5	417	17
25.0 TO UNDER 50.0	1,044	-	-	-	-	43	4	125	12
50.0 TO UNDER 150.0	458	-	-	-	-	49	11	35	8
150.0 AND ABOVE	56	-	-	-	-	1	2	1	2

Source: Agricultural Census 1980