CHAPTER I

PHYSICAL SETTING

The title 'Kalwa', a derivation from the word 'Mai', was conferred upon the Central Tract of the Punjab by Banda Bairagi in recognition of the physical strength and valour of his soldiers who hailed from this area. The northern limit of the tract is the river Sutlej and the southern is the river Ghaggar. In the east are Sivalik hills while in the west Kalwa plain merges into the Thar desert of India and Pakistan. In heritage Kalwa is more akin to northern parts of Punjab rather than southern Hariana from which it differs economically, socially and culturally.

The tract, because of its position and productivity felt the full force of every important campaign in northern India and every political change left its impression on this soil. Though history goes back to antiquity yet the interesting events of the past begin during the later part of the eighteenth century when the hold of the Mogul rule was gradually relaxing in the Punjab. The Moguls were fast losing ground to the Marathas on the one hand and the Afghans on the other, and in this state of political instability, numerous Sikh warriors acquired considerable areas in between the Sutlej and the Jamuna. The last Afghan Governor of Sirhind

*Mai* is a Punjabi word meaning wrestler.

1. Imperial Gazetteer of India, Provincial Series, Punjab, Vol.1, Calcutta, 1906, 224.
fell to the Sikh forces under the command of Banda Bairagi in 1773 and the whole of the tract came under the Sikhs who parcelled it out in numerous States of varying size. Among these, Patiala, Jind, Faridkot and Nabha were noteworthy. During the early years of the nineteenth century a struggle for supremacy over the area arose between Maharaja Ranjit Singh and the British. Both of them were very strong and well established on the opposite sides of this tract. Ultimately by the treaty of 1809, this tract came under the protection of the British Government, though each of the native rulers, big and small, had civil, criminal and fiscal jurisdiction within his territory. The first Sikh War (1845-46) brought about a political change when many of the Sikh rulers were punished for their sympathy with the enemies of their protectors i.e. the Sikh armies. Leaving aside the states of Patiala, Jind, Faridkot, Nabha, Malerkotla and Kalsia all the other states were brought under the direct control of the British Government and within a few years the districts of Ambala, Ludhiana and Ferozepore assumed very nearly their present limits.

The remaining native states kept their identity during the hundred years of the British rule, though within a decade of Independence they have undergone a metamorphosis. Shortly after the birth of free India these states integrated voluntarily to form 'Patiala and East Punjab States Union' (PEPSU) and a democratic pattern of government, at par with other provinces of India, was set up in this Union. But PEPSU could maintain its separate status only for a few years.

In 1956, with the reorganization of the States of India, PEPSU was merged with Punjab and the people of the former British Territory and Princely Native States again came under one political set up.

The territorial extent of the Malwa tract under discussion is from 73°50' to 76°57' E and 29°32' to 31°10' N. In shape it is roughly rectangular, the maximum length from east to west is 170 miles and the maximum width, north to south, is 105 miles. The total area of the tract is 12,070 square miles (77,24,685 acres) and is inhabited by 4.73 million persons according to the 1951 Census, representing 25.5 per cent of the area and 33.3 per cent of the population of the Punjab. There are in all 6,220 villages constituting 51 assessment circles and are administratively grouped into 20 tahsils (Fig. 2). The tract is thus comprised of four complete districts (Ferozepore having 5 tahsils; Bathinda 3 tahsils; Ludhiana 3 tahsils; and Patiala 4 tahsils) and the northern parts of Ambala (Kharar and Rupar tahsils) and Sangrur (Malerkotla, Barnala and Sangrur tahsils) districts.

**PHYSICAL FEATURES**

From the geological and physiographic point of view the Malwa tract of the Punjab falls into two regions;

1. The Siwalik Region.

2. The Plain Region.

**The Siwalik Region:** This region covers the outer range of the Siwalik hills and consists of conglomerates, clays and
silts all having the character of fluviatile deposits of rivers and streams. The bulk of the material is closely similar to the present day alluvium of the rivers except that the former is now at a higher elevation and is compact, faulted and folded.

The lithology of the Siwaliks suggests the origin of the sediments as a water borne debris of the Himalayas. The alternating coarse and fine sediments show that the deposition has been seasonal; coarse and ungraded sediments reveal that it has been carried away by rapidly flowing streams and the similarity of the rock deposits indicates the continuous deposition over a long distance.

The origin of the Siwalik hills has been explained differently by different geologists. Pascoe advocates the present Siwalik range in the flood plain of a big river to whom Pilgrim gave the name of Indo-Brahaman and Pascoe as Siwalik. This river flowed from east to west. Many tributary streams from the Himalayas brought sediments and deposited that in the flood plain of the main river. According to M.S. Krishnan and N.K.N. Ayinger the basin of deposition was a continuous lagoon or fore-deep formed in front of the Himalayan range. The fore-deep came into existence with the uplift of the Himalayas and became the site of the deposition of the Siwalik strata which commenced in mid-miocene. Numerous short streams must have flown into this fore-deep. These streams were fed by the rainfall from the monsoons which

were probably set up with the uplift of the Himalayas. The coarser sediments by the streams were deposited during the wet seasons. The great thickness is because sinking kept place with the accumulation of sediments and was accelerated by the gradual compression to which the crust was subjected during the period of sedimentation. The sediments so deposited have been elevated and folded during the last Himalayan systems of up-heavels.

This low range of the Siwalik hills separates the Himalayas from plains. The Siwalik region covers eastern-most area of Rupar and Kharar tahsils and runs like a wall, north-west, south-east, separating the Sirsa valley of Nalagarh tahsil from the plain areas towards the west.

The hills are roughly four to six miles in width. The height ranges between 1250 and 1950 feet in Kharar tahsil and 1250 and 1600 feet in Rupar tahsil. However, the highest point in Kharar tahsil is 1972 feet just north of the place from where Patiala Nadi comes. The maximum height in Rupar tahsil is 1875 feet above sea level, just near the source of Budki Nadi. The slope of the hills is gentler toward the Malwa plain than the side which faces the Sirsa Valley.

The Plain Regions- The constituent materials of the plain are similar to those of the Siwalik hills. The Malwa tract is a part of great Inde-Gangetic plain which is a synclinal basin formed by the elevations of the Himalayas. Eduard Suess, a great Austrian Geologist, holds this area as a fore-deep

MALWA TRACT (PUNJAB)
RELIEF
20 MILES
0
10
20

HEIGHT ABOVE SEA LEVEL
OVER 1300 FEET
1200
1000
800
600
400
200
0

BASED UPON SURVEY OF INDIA SHEETS

Fig. 3
formed in front of the stable Peninsular India at a time when the Tethyan sediments were thrust southwards and compressed against the stable block. According to Sir Sydney Burrard, the Inde-Gangetic plain is the site of a rift valley. However, both the viewpoints lead to the same conclusion. The depression began to be formed in Upper Eocene and reached the maximum during the third up-heave of Himalayas in Mid Eocene. Since then it has been gradually filling up with the sediments.

The rivers of the region indicate that the plain is the result of recent deposition and these very rivers have formed the plain. This is the normal case in all the areas where the rivers deposit their sediments. They raise their beds and banks and then break through them at the time of severe floods to adopt a new course and to restart the process of deposition. Such shifting of courses by the rivers is well exemplified in this area. Within historical times the Sutlej had a very different course from its present one. Same is the case with the Jamuna which once flowed straight into the Arabian Sea.

All the streams, big or small, issuing from the Sivalik hills or Himalayas have deep and narrow channels in their upper courses. As they can easily expand in the open country, their velocity decreases and so also their silt-carrying capacity. Thus the heavier and coarser sediments are deposited immediately out of the hills and only the finer sediments are carried far away. In this way a surface is formed having considerable slope near the hills but diminishing away rapidly. The surface material is coarse and rough near the Sivalik range but goes on becoming finer away from the hills.
The Malwa Plain lies between 600 and 1000 feet above sea-level (Fig. 3). It is higher near the Siwalik hills and it slopes away from them. Rupar and Kharar tahsils are 900 to 1000 feet above sea-level. The tract covering Patiala, Sangrur, and eastern Bhatinda districts ranges between 750 and 950 feet above sea-level while western Bhatinda and Ferozepur districts lie between 590 and 750 feet above sea-level.

The land slopes from east to west. The gradient is much greater in the east than in the west. Immediately near the hills it is more than 100 feet in a mile but only a few miles away from the hills, near Kharar and Kurali, it decreases to 20 feet in a mile. Farther west the slope of the land is less than 5 feet in a mile in Patiala, Ludhiana and Sangrur districts. It diminishes to even less than two feet in a mile in the western tahsils of Bhatinda and Ferozepur districts.

The work of the two important agents of mechanical weathering, wind and running water, is well exemplified in this area. The action of wind in the western side and the action of the running water near the Siwalik range have modified the face of this region and have given the different tracts a contrasting look.

**Drainage:** In order to interpret the present drainage system it is desirable first to discuss its evolution. The history of the drainage pattern of the area is not very clear because the valuable evidence of geology, archaeology, history and geography is very poor and the history of the past changes is still a matter of dispute. However, it is certain that in the past the drainage system was not the same as it is at present.
The most reliable proof is the deserted courses of the rivers. Starting from pre-pleistocene times the region seems to be drained by a big river named Indo-Braham or Siwalik which flowed from east to west at the present site of the Siwalik hills. This river came into existence in the mid-tertiary times with the first phase of the Himalayan uplift. In middle pleistocene disturbances, northwestern Punjab was uplifted which dismembered the Siwalik river and gave origin to three independent river systems. The lower part of the former Siwalik river continued to discharge into the Arabian Sea as before; the upper course reversed to the Bay of Bengal, while in the middle a third drainage system - river Ghaggar with the Sutlej and the Jamuna as its important tributaries - came into existence.

During the historic times many changes in the river courses have taken place in the Ghaggar plain as are evidenced by several dry river channels. Some of these rivers seem to have discharged huge amount of water as judged from the width of the deserted channels. All these channels converge near Jakhal and westward from this place a single river course can be traced up to the Arabian Sea with minor obliteration here and there.

It has further been assessed that this area has not gone under any appreciable desiccation and thus dry bed of the river can only be explained by the fact that some perennial river has deserted its course. In the Vedic literature the Sutlej is described as a big river but not a tributary.

6. Siddiqi, S.I. "River Changes in the Ghaggar Plain" Indian Geographical Journal, 19, No.4, 1944, 139-146
of river Indus. Alexander's men have also proved that the Sutlej was not a tributary of Indus. Another proof of this is that in the past, river Indus after meeting its tributaries was known as Panchnad indicating that there were four other rivers and not five. That Sutlej might not be a tributary of Indus in the past is again indicated by the fact that it is constantly shifting its channel towards the west and in recent past the river was flowing through its deserted course which is now known as Budha Nala.

From the above said historical evidences it is clear that the Sutlej was not always a tributary of river Indus but followed a much southern course as a tributary of the river Ghaggar. It can therefore be inferred that in ancient times the lower course of river Ghaggar was not in the same dry conditions as it is now. Sutlej and Jamuna were both its tributaries from west and east respectively. These tributaries gradually shifted their courses westwards and eastwards respectively and Sutlej ultimately became a tributary of Indus and Jamuna of Ganges. Ghaggar, thus, without a snow-fed source became a seasonal river without an outlet to the sea.

Sutlej is the only perennial river of the area and supplies whole of the canal water for irrigation. The river flows along the northern boundary of the region and only few seasonal streams drain in it in the south (Fig. 4). After a long journey in Tibet and Himachal Pradesh the river enters the plain at Bupar. The river then separating the Malwa plain from Bist Jullundur Doab and later making
international boundary between India and Pakistan enters the Pakistan territory a few miles west of Fazilka.

River Sutlej is an antecedent river and has a very uniform slope, not more than 32 feet in a mile in mountains and less than 20 inches in a mile in the plain. The river has a big catchment area in mountains where the rainfall is quite heavy. The rushing rain water during the rainy season erodes the slopes of the mountains very severely. The diminishing velocity in plain reduces the erosive power and the carrying capacity of the river. Consequently, deposition starts as soon as the river enters the plain. Throughout its course in the plain the river flows in interlocking channels enclosing islands and sandbars. The valley walls are well defined on both sides and are many miles apart showing the extent of the floodplain. The volume of the water in the Sutlej varies from season to season. The first rise occurs in April with the melting of snow in the mountains and a further rise in July with the advent of monsoon rainfall. After October the water begins to recede to a minimum in January and February. The absence of major towns and villages on its banks indicates that floods have been very frequent in the past.

'Budha Nala' is the recently deserted channel of the Sutlej which lies roughly along the southern border of the flood plain of the river Sutlej. The land on both sides of Budha Nala is swampy. River Sutlej seems to have deserted this channel a few miles west of Rupar. From there up to Buda (Punjabi) means Old; Nala means Stream; Old Stream.
Chamkaur Sahib, the bed of the river is completely obliterated by the sediments brought down by the Budki and Siswan nadi. The course is, however, clear a few miles west of Chamkaur Sahib. In Ludhiana district it flows roughly parallel to the river Sutlej and passing adjacent to Ludhiana town drains into the river Sutlej near Sidhwan Bet in Jagraon tahsil. Unlike the sub-siwalik streams, Budha Nala is perennial and receives the water from the channels which have been constructed to drain away the percolation water of Sirhind Canal.

The Ghaggar runs along the southern limit of the Malwa plain. It has its source in the Sirmur hills of Himachal Pradesh. Flowing through the Siwalik hills the river enters the Plain near Mubarakpur. From here it takes a southwestern direction. Passing a few miles south of Patiala the river separates the Sangrur and Jind tahsils and then passing along the southern border of Bhatinda district enters the Sirsa tahsil of Hisar district. The river loses itself in the sands of the desert of Rajasthan near Hannumangarh about 300 miles away from its source. Many seasonal streams meet the river in its upper course, however, from the western side there are only two. Sukhna nadi meets the river a few miles southwest of Chandigarh while the Patiala nadi a few miles southeast of Samana town. The catchment area of the river is roughly one-third that of river Sutlej. As the river has not its source in the snow-fed mountain, the amount of water in the

** Small seasonal streams.
SUB-SIWALIK TRACT
DRAINAGE
BASED UPON SURVEY OF INDIA SHEET

4 2 0 4 MILES
channel is not only small but also seasonal. Whatever amount of water is available in its upper course during the dry months is diverted into small channels, 'kuls', for irrigation in the sub-siwalik areas.

The most striking characteristic of the area is the seasonal streams in the sub-siwalik tract. Fig. 5 indicates how numerous these streams are. They take their rise in the western slopes of the Siwalik hills. Proceeding away from the hills the streams begin to unite themselves and take either a northwestern or southwestern course in order to discharge their water in the Sutlej and in Ghaggar. Only one stream (Jayanti) has an independent course until it loses itself in the sand dunes near Sunam in Sangrur district. The channels of the streams are narrow in the hills but expand to the maximum within a few miles of the Siwalik hills. In the hills the beds are covered with boulders and sand but in the plain the beds are covered with sand alone. The streams are completely dry except for few months of rainy season when they pour a formidable amount of water. In rainy season the bare soft rocks of the Siwalik hills and the soils of the adjoining plain are severely eroded by the rushing water.

LANDFORM REGIONS.

Considering the relief, drainage, surface material and their dimensions and arrangement, it is clear that the area lacks homogeneity and can be divided into six regions on the basis of the above features (Fig. 6). The boundaries of some of the regions are well-defined as in the case of flood plain

and the hilly area. However, it is difficult to differentiate between some other regions along a well marked line because there is no abrupt change of terrain character and the features of one merge into the other very gradually. Thus the boundaries between the dissected plain, partially dissected plain and the plain with sand dunes are not sharply defineable and defensible but are somewhat arbitrary.

1. The Hilly Region: The Hilly Region covers eastern-most part of Rupar and Kharar tahsils and extends from the river Ghaggar to the Sutlej. The region is 4 to 6 miles wide and is roughly 1250 feet to 1950 feet in height. The area is somewhat high and wide in Kharar tahsil and low and narrow in Rupar tahsil.

   As the major constituent of the Siwalik hills is sand and because of the steep and bare slopes, soil erosion is a serious problem. There are numerous narrow and deep channels of the seasonal streams. On the whole the relief has become very complex due to constant gully erosion.

2. The Dissected Rolling Plain: Immediately to the west and parallel to the Siwalik hills is the dissected plain the western limit of which roughly corresponds to the contour of 1000 feet. The region is a sub-mountainous plain, 4 to 10 miles in width, narrow in the north but wide in the south. The slope of the land is considerable, more than 100 feet in a mile near the hills but nowhere less than 40 feet. The face of the land is severely term by the seasonal streams. The beds of these streams are narrow near the hills but expand to the maximum (sometimes more than a mile) within a few miles of the Siwalik range. Due to
frequent floods in the streams during the rainy season, high inclination of the land and torrential rains, soil erosion is a serious problem in this area. Soils are generally coarse and poor; small pebbles are widely scattered in the fields along the Siwalik range. The region is locally known as "Ghar".

3. The Partially Dissected Plains: The region lies west of the Ghar plain and extends westwards roughly to the contour of 900 feet. The region is 10 to 15 miles in width and lies parallel to Ghar plain covering most of Kharar and parts of Rupar and Rajpura tahsils. The region has all the characteristics of the Ghar plain which lies its due east. The characteristics are, however, in much moderate form. The region is dissected by the streams which are less numerous than those in the Ghar plain yet they are definitely more numerous than in the region which lies to its western side. The slope of the land is considerable, but it is smaller as compared to that in Ghar plain, much more than that in the region to its west. Some soil erosion does take place, but it is less intense than that in the area which lies along the foot of the Siwalik hills.

4. The Flat Plains: This region lies next to the partially dissected plain and covers most of Patiala district together with Samrala tahsil and central parts of Ludhiana, Jagraon and Zira tahsils. In addition, there are two other small tracts with the same character of terrain. One is the southern Mansa tahsil and the other covers the extreme western parts of Fazilka tahsil. The general character of the land in this region is homogenous. The land slopes very gently. There is no noteworthy stream except Patiala nadi and Janti Rao. Soil erosion by water and
MALWA TRACT (PUNJAB)

DRAINAGE

Fig. 4

BASED UPON SURVEY OF INDIA SHEET
sand accumulation by wind are almost absent, the region is thus free from sand dunes and gully erosion.

5. The Plain with Sand Dunes: This region covers large parts of Bhatinda, Sangrur and Ferozepur districts and southwestern parts of Ludhiana district. Sand dunes of varying intensity and magnitude are the main features of the region. Roughly speaking, the dunes are larger in number and are of greater height in the south than in the north. At certain places the local relief is as high as 40 feet but generally the dunes are 10 to 20 feet in height over most of the region. Leaving aside this contiguous region, there are some other scattered patches of sand dunes. The most important one lies along the southern border of the flood plain of the Sutlej. The dunes of this plain at some places are low and are ploughed. However, most important tract of this chain is between Ludhiana and Dharamkot, the width of which is maximum between Jagraon and Sidhwan. The second area of the same very chain is between Samrala and Machhiwara. There is still another narrow and small chain of dunes which lies south of Samrala and stretches between Deraha and Khamanon.

Wind action is responsible for giving this area a separate identity. During the monsoon period, in the western part of Punjab, i.e., in Hissar, Bhatinda, and Ferozepur districts, the prevailing winds come from south-west. These are deficient in moisture but transport huge clouds of sand from the Thar desert. This blown up sand is piled up into heaps and ridges wherever these winds meet some obstruction. Some of the dunes are of shifting nature while the others are
stationery and are ploughed. The sand dunes along the southern boundary of the flood plain of the Sutlej are the result of the sand which has been blown away from the dry old bed of the river.

6. The Flood Plain of the Sutlej: This region is locally known as 'Bet' and is the flood plain of the Sutlej river. The region commences right from the point where the Sutlej enters the Rupar tahsil and stretches up to Fazilka where the river leaves the Ferozepur district. The southern boundary of flood plain is well-marked by a chain of sand dunes which run like a wall parallel to the Sutlej but at a few miles south of the present channel of the river. The flood plain varies in width from area to area. It is narrow to the north of Rupar but expands westwards. To the west of Ludhiana it shrinks to the minimum but expands again to reach the maximum in Zira tahsil. West of Zira the width is again about six to ten miles. The 'Bet' plain is thoroughly flat and one can witness nothing along the longitudinal section of the plain except some field boundaries. There is no sand dune, no ups and no depression. The only feature is the various interlocking channels of the river, over-flowing during rainy season but dry during other months. Overflowing water during the rainy season turns the 'bet plain' into a swamp and renders the communications very difficult. The flood plain has very fertile soils because of the silt deposited by the river during the floods. However, sometimes many fields are ruined by the accumulation of sand.

The problem of water-logging is becoming very serious in this plain because of the rise of water-table. The problem is already acute in Rupar and Samrala tahsils due to the percolation of water from the Sirhind Canal.