Chapter 1

PHYSICAL AND CULTURAL SETTING OF ROHILKHAND

i. Physical Setting

A. Structure and Relief

The Rohilkhand plains lies between latitudes 27°35’ to 29°58’ N and 78°0’ to 80°27’E longitudes. The entire plain comprises the district of Bareilly, Budaun, Shahjahanpur, Pilibhit, Bijnore, Moradabad, Rampur and J.P. Nagar.

An almost imperceptible change in elevation and uniform surface are the two noteworthy features in the physiography of the Rohilkhand. It forms a part of alluvial land which lies between the north Gondwana land of peninsular India in the south and the recently built young folded mountain chains of the Himalayas in the north. The pre-Tertiary river-borne debris form the peninsula latter supplemented rather more vigorously by the upper and post-Tertiary Himalayan debris, yet to undergo intense compaction constitute by and large, the alluvial filling. However, alluvium is one continuous and conformable series of fluviatile and sub-aerial deposits, mainly composed of unconsolidated beds of clay, sand, gravel and their mixture in varying proportion.

The north Indian plain extends to a maximum width of 400 km and about 2400 km in length, consisting of the sedimentary deposits brought down by the great Himalayan rivers through geological times. The detritus brought by the rivers ranges from big boulders to silt and clay. The arrangement of the beds and general from of the surface is due to sedimentation in inclined layers.

The origin of this depression is a much disputed matter among the geologists. The Australian geologist Edward Suis holds, that it is a ‘foredeep’ formed in front of the resistant mass of the peninsula when the Tethyan sediments were thrust southward and compressed against them. The foredeep was gradually filled in by the eroded material from the Himalayan and Gondwana shield from south and this led to the formation of the plain. Burrard, on the basis of geological data, pointed out origin of the depression in a totally different way. He holds the view that the north Indian plain
ROHILKHAND REGION
ADMINISTRATIVE DIVISIONS
2001

- Bijnor
- J. P. Nagar
- Moradabad
- Rampur
- Bareilly
- Budaun
- Shahjahanpur
- Pilibhit

- District Headquarters

Study Area

Fig. 1.1
represents a rift valley bounded by parallel faults on either side with a maximum
down throw of 32 km, however Indian geologists have not accepted this view
because it is not much supported by the geological facts, also not in conformity with
the geophysical observations.

A trend view regenerating the origin of Indo-Gangetic plain is that it is a sag
in the crust formed between the northward drifting of Indian continent and
comparatively soft sediments accumulated in the Tethyan basin when the latter were
crumpled and lifted of into a mountain system.

The depression perhaps began to form in the Upper Eocene and attained its
greatest development during the third Himalayan upheaval in Middle-Miocene. Since
then it was gradually filled up by sediments to form a level plain with a very gentle
seaward slope. Geological and geodetic data appear to support this view of the
northward drift of the Indian continent and is more acceptable.

The presence of characteristics of Gondwana rock on the northern rim of this
alluvial tract indicates that its substratum is an extension of the peninsular rock viz.
Archean gneiss with areas of Vindhyan and Gondwana sediments. Wadia and
Auden are of the view that peninsular rock consisting of the Archean genesis are
continuous inside the plain. Continued loading of this belt by sedimentation, since
the first upheaval of the mountain may have accentuated the sinking of the Archean floor,
but as the process of sedimentation take place with that of depression had led to the
formation of the great plains of India.

Since no boring has reached this Archean floor, it is difficult to ascertain its
configuration. Surface features indicates that the Ganga plain is deepest in the central
portion and gradually sinks towards the west of Delhi and east of Rajmahal hills.
The deepest bore done at Lucknow in Uttar Pradesh has been observed 400 meters
and efforts were unable to touch the rock bottom.

Oldham, estimated the depth of the alluvium between 4,000 and 6,000 meters
and Burrard considered the existence of a fault with 32 km downthrown near the
Himalaya. Later Glennic estimated the thickness at about 2,000 meters. The recent
findings of the aeromagnetic survey of the Ganga valley have thrown much light on
the depth of the alluvium and nature of the trough.
Hayden, confirms to the generally accepted view that the Indo-Gangetic depression is a broad basin, shallow on the sides and sloping gently inwards the Himalayas.\textsuperscript{15} Cowle, while criticizing the above findings postulated even higher figures from the same data.\textsuperscript{16}

**B. Climate of Rohilkhand Plain**

Locational and physiographic factors have greatly influenced the climatic characteristics of India. Though its considerable portion belongs to the sub-tropical zone, as a whole it shares the characteristics of tropical monsoon climate, mainly because of the Himalaya, functioning as an effective metrological barrier.

As to the relative significance of the climatic elements over primary human activities, it may be remarked that temperature seldom presents an impediment to the agricultural economy over any considerable area. Disability to the economy is caused by moisture and precipitation, its uneven spatial and seasonal distribution.\textsuperscript{17} Rohilkhand plain is a sub-humid region within the vast monsoonal regime of the Great plains. Climate is one of the most important factor governing the distribution and types of natural vegetation, flora and fauna, soils and of course activities of man. The climate of Rohilkhand plain is characteristically monsoonal with a rhythm of seasonal changes. The changes occur with respect to climatic elements effectively control the whole agricultural activity and arrangement of the cropping seasons.\textsuperscript{18} The monsoonal climate of the area is characterized by two air currents. One is northeast and another is southwest monsoon current in winter and summer months of the year respectively.\textsuperscript{19}

Table 1.1 gives a brief account of the prevailing minimum and maximum temperature and rainfall conditions in all the districts of Rohilkhand. It is evident from the table 1.1 that all the districts are characterized with extreme winters and summers. Temperature starts decreasing in the last week of October. During the month of November, mean monthly maximum temperature recorded 28.6°C in the district of Bareilly, 29.1°C in the district of Budaun, 28.5°C in the district of Shahjahanpur, 28.7°C in the district of Pilibhit, 31.8°C in the district of Bijnore, 31.6°C in the district of Rampur, 32°C in the districts of Moradabad and J.P. Nagar. Whereas mean monthly minimum temperature recorded 13.6°C in the district of Bareilly, 7°C in the
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Source: Yojuna Bhawan, Lucknow

Based on the observations from 1951 to 1960
Rainfall in mm, temperature in °C.
district of Budaun, 12.6°C in the district of Shahjahanpur, 9.4°C in the district of Pilibhit, 6.4°C in the district of Bijnor, 6.7°C in the district of Moradabad, 6.8°C in the district of Rampur and 6.7°C in the district of J.P. Nagar. Mean monthly maximum and minimum temperature further decreases in the month of December and become lowest in the month of January. During the month of January mean monthly maximum and minimum temperature recorded 22.4°C and 9.6°C in the district of Bareilly, 22.9°C and 5.7°C in the district of Budaun, 23.3°C and 8.1°C in the district of Shahjahanpur, 23.5°C and 8.6°C in the district of Pilibhit, 26.3°C and 5.2°C in the district of Bijnor, 25.0°C and 4.5°C in the district of Moradabad, 25.7°C and 4.9°C in the district of Rampur and 25.0°C and 4.5°C in the district of J.P. Nagar.

Mean monthly maximum and minimum temperature start increasing slowly in the month of February. The mean monthly maximum temperature remains in between 28°C to 25°C and mean monthly minimum temperature remains in between 11°C to 7°C in all the districts of Rohilkhand during the month of February. During winter months of November, January and February rainfall remains as low as in between 5 to 15 mm. Significant rainfall received only in the month of December through western disturbances. During the month of March and April mean monthly maximum and minimum temperature continue to rise but at slow rate and rainfall remains in between 5 to 10 mm. In the month of May and June sharp rise in temperature has been observed in all the districts of Rohilkhand plain. As it is clear from the table 1.1 that mean monthly maximum and minimum temperature rose to 39.9°C and 23.3°C in the district of Bareilly, 40.8°C and 20.6°C in the district of Budaun, 39.8°C and 25.3°C in the district of Shahjahanpur, 41.7°C and 20.9°C in the district of Pilibhit, 45.5°C and 19.7°C in the district of Bijnor, 45.1°C and 19.5°C in the district of Moradabad, 45.3°C and 19.5°C in the district of Rampur and 45.1°C and 19.5°C in the district of J.P. Nagar.

During the month of May rainfall remains in between 4 to 10 mms in all the districts of Rohilkhand. In the month of June further rise in mean monthly maximum and minimum have been observed in all the districts. During this month rainfall become prominent and 77.1 mm recorded in the district of Bareilly, 170.0 mm in the district of Budaun, 119.2 mm in the district of Shahjahanpur, 122.7 mm in the district of Pilibhit, 58.2 mms in the district of Bijnor, 25.0 mms in the district of Moradabad,
34.0 mm in the district of Rampur and 25.0 mm in the district of J.P. Nagar. During the month of July mean monthly maximum temperature observed in between 40°C to 45°C while mean monthly minimum temperature remains in between 19°C to 25°C in all the districts of Rohilkhand. But during this month all the districts receives maximum rainfall. The districts of Bareilly, Budaun, Shahjahanpur, Pilibhit, Bijnor, Moradabad, Rampur and J.P. Nagar recorded 626.1 mm, 433.4 mm, 404.9 mm, 496.0 mm, 470.6 mm, 556.0 mm, 412.9 mm and 556.0 mm of rainfall respectively.

In the month of August mean monthly maximum and minimum temperature further decreases but amount of rainfall received remains as high as 619.0 mm recorded in the district of Bareilly, 567.6 mm in the district of Budaun, 414.7 mm in the district of Shahjahanpur, 418.5 mm in the district of Pilibhit, 508.9 mm in the district of Bijnor, 491.0 mm in the district of Moradabad, 492.6 mm in the district of Rampur and 491.0 mm in the district of J.P. Nagar.

In the month of September mean monthly maximum and minimum temperature further decreases and it become 37.8°C and 19.0°C in the district of Bareilly, 37.2°C and 18.5°C in the district of Budaun, 36.1°C and 18.2°C in the district of Shahjahanpur, 33.5°C and 20.5°C in the district of Pilibhit, 31.1°C and 19.2°C in the district of Bijnor, 31.5°C and 21.2°C in the district of Moradabad, 32.4°C and 19.1°C in the district of Rampur and 31.5°C and 21.2°C in the district of J.P. Nagar. During this month the district of Bareilly, Budaun, Shahjahanpur, Pilibhit, Bijnor, Moradabad, Rampur and J.P. Nagar receives 119.7 mm, 110.0 mm, 189.01 mm, 75.2 mm, 287.6 mm, 111.0 mm, 66.0 mm and 111.0 mm of rainfall.

In the month of October mean monthly maximum temperature recorded in between 35°C to 38°C whereas mean monthly minimum temperature recorded in between 14°C to 10°C in all the districts of Rohilkhand. During this month very low rainfall recorded in all the districts because of withdrawal of south-west monsoon from this region.

The average weather conditions emerging out of the combined effect of various elements lead to the recognition of four well marked seasons:

(i) The Hot summer
(ii) The Wet summer
(iii) Pre-winter transition

(iv) The Winter

(i) The Hot Summer

The gradual rise in temperature which starts from the month of February, becomes more rapidly increasing by 5°C by the month of March and continues till May/June (maximum temperature over 40°C) unless checked by the incursion of the more humid easterlies, though the precipitation does not materialize by this time. The hot summer season locally known as *kharsa* begins from mid March and continues till mid-June. The maximum temperature in the month of March reaches upto 31°C to 33°C and minimum temperature upto 12°C to 10°C in the Rohilkhand plain. The temperature rises sharply from the month of April and continues till middle of June. The months of May and June are the hottest. But, the Himalaya undoubtedly exerts influence, as the maximum temperatures in the month of May remain well below 40°C at Bareilly. The premonsoon showers are meager (below 4 cm) and the share in the annual rainfall ranges about 1 per cent (at Bareilly) and almost 2 per cent (at Bijnore). Thus the low relative humidity and meager rainfall accentuate the impact of *loo* which at day times is associated with heat waves when temperature shoots upto exceptionally high. The wind (*loo*) below with an average speed of 8 to 9 km/hr during the day time and occasionally at night 4 to 6 km/hr. These winds are comparatively feable at night and active during the day being very forceful in the afternoon generally from 12:00 noon to 4 pm when the humidity reaches as low as 2 to 3 per cent. The occurrence of dust storms locally known as *andhi* form an important feature of this season in the Rohilkhand plain.

(ii) The Wet Summer or Rainy Season

It is known as *chomasa* in the Rohilkhand plain. The rainy season commences in the latter half of the month of June at different dates which are too uncertain to be predicted. On account of the excessive heat of the summer months a low pressure area is developed in the northwestern India. By the second or third of June humid oceanic current spread over the region resulting a fall in temperature and air becomes cool and pleasant. It brings relief to the people by lowering down the temperatures gradually which ranges between 30°C and 40°C during the months of June-October. The relative
humidity remains over 70 per cent throughout the rainy season except for the month of June when it averages below 50 per cent.

The rainy months account for over 70 per cent of the total annual rainfall. The monsoon rainfall as also the annual rainfall decreases westward as well as southward of the Rohilkhand plain. The season occasionally assumes sultry condition which is more continued to the northern and eastern sections. There is dominance of Bay of Bengal currents. Occasionally the dying Bay depressions are revitalized by the Arabian Dea currents in the western part of the region. The agricultural activities are much dependent on the onset, withdrawal, breaks and nature of the downpours. The late withdrawal of rainfall hampers the timely sowing of the rabi crops, while the late start, the sowing of the kharif. From Table 1.1, it is clear that most of the rainfall is received during the months of July, August and September after this harvesting season starts in the region.

(iii) Pre-Winter Transition or Retreating of Monsoon

The rainy season comes to an end by the month of October with a sudden fall in the temperature (over 4°C) and amount of rainfall does not exceed 10 cm in October throughout the region. By the end of October the humid currents of the southwest monsoon are replaced by the dry continental winds. The two transitional months (October-November) are characterized by the second minima of relative humidity, somewhat unstable atmospheric conditions and often fair weather.

(IV) The Winter : It is also popularly known as mohasa in local terminology. In the month of November a high pressure belt extends over the northwestern India and the prevailing direction of the wind remains from west to east. This is partially determined by the trend of Himalayan relief. Soon after the winter conditions settle which are marked by a fall in temperature and prevalence of dry and chilly westerlies. The maximum and minimum temperatures in the month of December remains between 23° to 28°C and 10° to 5°C in Rohilkhand plain, though January is the coldest month of the year in the region. Diurnal range of temperature remains fairly high in the plain, as days are relatively warm while nights are cold. The western depressions are associated with welcome rain and the cold waves registering temperatures below 4°C at several places. The average temperature is lowest in January (below 20°C) which spatially decreases west and northward. The incidence of winter rains is
relatively high as it receives about 5 per cent of the total amount of precipitation. Even this meager rainfall, associated with the dumpwell of atmosphere (relative humidity between 55 and 75 per cent) and lower potential evapotranspiration due to low temperature, becomes more effective and beneficial to the ‘rabi’ crops. It has been observed that some of these depressions originate in the Mediterranean area, a few coming as far distant as the Atlantic. The cyclonic rainfall is preceded by a warm cyclone weather with light southerly or easterly winds and is followed by a considerable fall of temperature and strong and cool westerly winds. The velocity of wind is least in the month of November but increases with the advancement of the season.

The winter season is marked by heavy mist or fog locally known as kohra often occurs at night and lasted till the morning hours. Frost, however is not a regular feature of the winter months of the area. There are no definite records of its frequency or of the exact area affected by frost, but it generally occurs in the last days of December and whole month of January. The cold weather depressions are sometime accompanied by hail storms which causes the little damage to the standing crops.

C. Drainage Pattern

The Rohilkhand plain in general is a part of the well-integrated drainage system of the Ganga although the Ramganga collects most of the drainage of the Rohilkhand plain. Almost all the streams flow a NW-SE course. The extremely gentle gradient almost all over the region restricts the degradational activities of the streams resulting in the near parallel courses and the acute angle junctions of the tributaries with their master streams at most levels, the confluences of the Ganga with the Ramganga and that of Ramganga with the Ganga are typical examples. This feature imparts the region apinnate drainage, on extreme case of the dendritic pattern on macro level braidings, especially of the Ganga and the Ramganga, the sandy shools often liable to inundation during monsoons, and the frequent meanderings are also the common features. The minor topographic diversities have led to the spatial variations in the channel frequencies and the tendural patterns. Wide flood plains and high banks are the common features in the course of the Ganga and the Ramganga along with silt and clay deposits.
ROHILKHAND REGION
DRAINAGE

Source: Survey of India Map
Fig. 1.2
The important rivers and their tributaries which forms the drainage pattern of Rohilkhand plain are as follows:

**The Ganga**: It is the largest river of the Rohilkhand and forms the western boundary. It first touches the district of Bijnor in the north close to its point of origin from the hills above Haridwar. As it flows southward the volume of water is greatly reduced due to the Ganga Canal which takes off at Nayapur. It become sandy and the channel is comparatively shallow and the river is not navigable. The Ganga bends southward again at Barthwala in Pargana Mandwar. The Ganga enters in Moradabad district about 4 km west of village Papsari in Hasanpur then flows in southerly direction along the western boundary of the Moradabad district for nearly 65 km (which is also the entire length of Hasanpur form north to south) and separate the district from those of Meerut and Bulandshahr. In the Moradabad district it has only two significant tributaries namely, the Baia and the Mutwali. The former joins it near the village of Kharajpur and latter near that of village Dhoria in Budaun district.

**Tributaries of Ganga**

**The Baha**: This small stream enters the district of Bijnor near the village of Papsari in Hasanpur on the northern border of the district. It flows southward for about 2 km and then takes a southwesterly turn at Mukanampur from where it flows in a south-easterly direction until it merges in a broad semi-circular lagoon known as Jaithal Dhab.

**The Krishni**: This small stream originates near the village of Paharpur Inayatpur in Hasanpur and separate it from district Bijnor for about 3 km. It merges in the Jaithal Dhab near the village of Azampur.

**The Baia**: Emerges from the Jaithal Dhab and flows in southerly course thrown the Ganga khaddar for about 20 km and join the Ganga near the village of Tigri.

**The Matwali**: This stream emerges from a swamp near the village of Chakanwala in Hassanpur and flows southward parallel to the Ganga upto Pattipora. It takes an easterly course for about 2 km and then again flows southward and join the Ganga near the village of Dharia.

**The Monawa**: This is the largest tributary of Ganga. The course of Mahawa for most of the length is parallel to Ganga. The Mahawa originates about 3 km to the north of
Bachharoon town of Moradabad. It receives water from numerous seasonal small streams. The Mohawa is nearest to the Ganga at Nariaoli and passes through the Ganga khadar. It passes through Rajpura, Sahaswan and joins the Ganga at the middle of the length of the Budaun district. There are various lakes along the river Mahawa. In the rainy season when it is over flooded it flows into two distinct channels. One is the rain channel of the river Mohawa and another is seasonally flowing in the northwest of Sahaswan at a distance of about 5 km from the Mohawa.

The Tikta: This is also known as eastern Bajad nadi rising in the district of Moradabad and flows in a southeasterly course. It forms the district boundary of Moradabad. It receives water from the Anderia and other small seasonal channels and form the district boundary of Budaun for 6 km and then it joins the river Mohawa on its eastern bank.

The Sot or Yariwafadar: Yariwafadar name was given to this by Mahammad Shah. It flows in southeastern direction through Sambhal. It has a well defined and fairly broad valley and considerable depth. It is a perennial stream and has sufficient volume of water throughout the year. The Chhaya joins it on the right bank of Dhakia. The presence of a number of ox-bow lakes close to the left bank of the river indicates the fact that in the past the river was flowing 2 to 3 km left of the present course. The river enters in the Shahjahanpur districts where it receives a number of small streams.

The Ban: This stream rises in the Bijnor district and enters the Moradabad district near the village of Kalapur (Kalampur). In the northeast of the town of Amroha it joins the river Ganga on its right bank at the village of Sirra Manihar.

The Burdmar: It is also known as Singli nadi and originates 5 km northwest of Rajpura village. It assumes a strong seasonal river as it flows eastward and renamed as Burdwar nadi, and it finally joins the Mohawa at its right bank.

The Chhoiya: It originates with a broken and undefined course in the Sambhal town and take a course from northwest to southeast. It is a seasonal stream and the area where it flows is a low lying marsh land.

The Bhainsaur: It flows in a southeasterly direction having a meandering course until it joins the Sota nadi. After receiving a small stream known as Kamra it flows 2 km and fall into the Sota nadi.
The Ramganga: Rising from the snow covered ranges of the Himalaya and travelling through the district of Bijnor and Moradabad it enters in the district Rampur and flows in the northwest parts of Rampur and Bareilly districts. During its course Ramganga flows in a shifting and uncertain bed and in rainy season the river attains very large dimension over the *khadar* land it carves out fresh channels through the soft alluvial land in most capricious manner. To the west of Bareilly city there are two alternative channels several kilometers apart and the river is constantly shifting from one channel to other. There are several ox-bow lakes in the low lying areas which represent old channels abounded in the past. As it flows in the low land areas there is a little use of water of Ramganga for irrigation purposes.

**Tributaries of Ramganga**

**The Kurka**: This stream starts as a nullah close to Thakundwara town and flows in a southerly direction up to the village Sultanpur. Taking almost a westerly course from here a small tributary namely, the Lapakha joins it on the right bank.

The Lapakna rises in the *tarai* region and enters in Moradabad district near the village of Ragholwala.

**The Dhela**: This stream rises from the hills of Nainital and enters the Moradabad district near the village of Kalyanpur. It is led by the Damdama near the village of Bhagalpur Rasan before it joins the Ramganga.

**The Rajhera**: This stream has its origin in the depressions of the rice land near the village of Samdha Ramsahi. This river is led by several small water tanks, the chief one is the Kachia. Its bed is characterized by clayish sand and its banks have poor and brown soils.

**The Dojora**: It is formed at the junction of two streams namely the Kohia and the western Bohaul. The banks of the Dojora are high and of permanent nature.

**The Sankha**: This river flows in well defined channels. At several kilometers away west of Bareilly city it joins the Ramganga.

**The Deorian**: It rises in the *tarai* region just north of the Bareilly district and has beds of alluvial salt with raised banks. It joins the Ramganga near Bareilly district.
The Nakatia: In the upper course this stream receives water from the Baghul leading to frequent flood conditions. There is an abundance of kankars on the banks of the Nakatia.

The Baghul: The perennial river originates in the tarai of Nainital district and after crossing the district of Bareilly in the northwest of Jalalpur village it forms the district boundary of Bareilly and Shahjahanpur. It receives several seasonal streams like andhi which joins it on the right bank. It has several ox-bow lakes in its lower course.

In 1969, in order to obtain a swamp in the tarai and to provide more water for irrigation the Sukhi river was connected with the Baghul which lead to the massive flood during the rainy season.  

The Pangalli: It originates in the Pilibhit district. It is a small and perennial stream led by numerous small nadi. The Pangalli river joins the Absana river before joining the Bahgul.

The Absara: Rising in the tarai it enters into the district of Pilibhit from its northwestern corner. After flowing in a southerly direction for about 48 km, it joins Pangalli in the Bareilly district and falls into the Ramganga.

The Aril River: It originates in tehsil Bilari of Moradabad district. It is a large tributary of the Ramganga. It attains the large size, spread in the adjoining low land and become very forceful during the rainy season. In the upper part the slope is gentle and the land consists of loamy soil but in its lower course it has a moderate slope and create water logging conditions in the village of Sisarka. It forms a boundary for a distance of about 2 km between the district of Moradabad and Budaun. It falls into the Ramganga on its righ bank on the northwest of village Chitri.

The chhaiya Nala – Tributary of Aril: It emerges near the village of Roza (Bilari tehsil) and flows in a southeasterly direction along the eastern boundary of Bilari tehsil forming the natural dividing line between the tehsil of Bilari and Rampur. Flowing towards south it is led by a water body emerges from a lake lying to the east of the village of Deorakhas.

The Garra or Deoha: This perennial river comes from tarai region of Nainital district and crossing the district of Pilibhit in a north to south direction. It receives
numerous seasonal rivers on its both sides of which the Khanaut is most important originating from a lake near village Palia Dasobast 6 km south of Khudaganj.

The Kanta nadi is another tributary of the Garra forming the inter district boundary between the districts of Pilibhit and Shahjahanpur.

**The Khakra**: Deoha receives numerous tributaries on its left bank, Khakra is one of them. It is a large stream and enters into the district of Pilibhit to the east of village Alampur. Maintaining a south westerly direction it turns towards west and joins the Deoha.

**The Mala**: Its source is in a series of swamps on the northern border of the district Pilibhit. The Mala is known as Katna in the southern part of Pilibhit district and assumes a narrow stream. The Mala is extensively used for irrigation as its water held by temporary dams.

**The Sarda and its tributary**: The river enters into the district of Pilibhit about 32 km. east of Alampur and flows in a southeasterly direction. It has low velocity and beds consists of sand and mud. There are no rapids, and banks are soft so that stream do not face any difficulty in removing obstruction for fresh channels. During the flood period Sarda change its course to a remarkable extent and forms numerous abounded channels and bank water.

**The Chauka**: It is a perennial stream that flows in the line of old high bank. It has a course of some 40 km. in Pilibhit district before it joins the Sarda.

**The Kosi and its tributaries**: This is also known as Kausilya river in the district of Almora, passes through the districts of Nainital and Rampur and near the village of Khabaria Bhur, it is led by the Bahalla or Beh. It passes through the western part of Rampur district and fallow a southerly course for about 2 km and then enters the Moradabad district near the village of Dhapea. This river is most extensively used for irrigation purposes in Rampur and Moradabad districts.

**The Bahalla**: This stream is also known as Boh rises in the tarai and touches the Moradabad tehsil boundary in the east, before joining the Kosi near the village of Khabaria Bhur. This stream is fed by the Narhua which rises a few km south of Koshipur in Nainital district.
The **Gangan**: It is a tributary of the Bahalla rising in the north of the district of Bijnor and enters in Moradabad district near the village of Kaimukhia and forms the boundary of the district in the north for a short distance. It flows in a southeast direction for about 5 km and then moves southwest for about 2 km east the village of Isapur.

The **Gomati and its tributaries**: The word Gomati has been derived from the local word *Ghoomti* meaning thereby carving or meandering. It originates near the village of Sobalpur in Pilibhit district. After receiving the stream of Jakani, 7 km north of tehsil Puranpur it becomes a big river and after traveling few km it also receives the Barua nadi.

After traveling a distance of few km Gomati receives another seasonal stream known as the Bhainsi on its right bank. In its upper part the Bhaisi is a seasonal channel upto 6 km, after which it generally contains water throughout the year.

The **Kathna**: Originating from a small lake north of the village Bansupur this stream commands a seasonal channel upto an extensive lake situated on the inter-district boundary of Shahjahanpur and Lakhimpur. After which it attains a large course flowing toward the south where it gets a well defined course.

The **U.I. river**: this river flows in a broad coarse from northwest to southeast. It originates in the reserved forest area some 4 km northwest of Kamalpur village.

**D. Soils of Rohilkhand Plain**

The Indian soils have developed under hot and humid climate over the bedrocks of complex nature, predominantly under the process of laterization, though Podzolisation is not unrepresented in the country.³¹ The fints, chemical composition, texture, structure, reaction and plant food contents, bear large scale as well as local variations according to environments. Even at village level these are well marked. The human settlement too is responsible for concerting even poor quality level around it into richer one with respect to humus, and texture etc.

Soil is a natural body developed by natural forces acting on surface materials. It is usually differentiated into different horizons of minerals and organic constituents of variable depth which differ from the parent materials below in morphology, physical properties and constitution, chemical properties, composition and biological
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- Alluvial
- Bhabar
- Tarai

Source: Based on Map of State Survey Organization Kanpur Fig. 1.3
characteristics.\textsuperscript{32} Soil is a natural medium for plant growth which provides nutrients for plant growth and plant manufacture feeds for animals, and food and fibre for man.

Soil is a priceless measure from which we obtained food, clothing, shelter and other necessities of life. Soil undoubtedly is a greatest assets of nation. It is the basis of economic stability and the source of national strength. With a fast growing population, rapid industrialization and urbanization, land use changes over land is deteriorating and shrinking day by day. Therefore, conservation of soil and its fertility is of prime importance to keep our economy sound and increase productivity for a strong nation building.\textsuperscript{33}

Indian soils like all tropical soils are deficient in organic matter and nitrogen content. The phosphate deficiency is comparatively less marked while potash deficiency is rare.\textsuperscript{34}

The affect of the parent rock and climatic conditions are very prominent on the soil formation of a particular area. Wadia (1935) and others have marked an outline study of the influence of geology on India soils. There are five principle factors of soil formation viz., parent material, climate, vegetation and forest act upon the parent materials. The action of these factors is conditioned by local relief and topography.\textsuperscript{35}

In Rohilkhand region with almost uniform topography and lithology the soils are by and large homogeneous. The alluvial soils with the variants the \textit{usar} and \textit{bhur} depending on the drainage conditions, mechanical and chemical constituents and the climatic characteristics are observed in different parts. In addition, there are minor variations in certain properties. The two common types – the \textit{khadar} and \textit{bhangar} with different local names, sometimes stand for minute variations in properties, are quite widespread. The \textit{khadar} soils, relatively rich in plant nutrients occupy the narrow frequent siltation tracts in the flood plains of the rivers. Neutral to alkaline in reaction (pH 6-8) these are deficient in organic materials specially phosphorus and are sandy to loamy in texture.

Locally as observed by Agarwal and Malhotra\textsuperscript{36} the Ganga \textit{khadar} soils have immature profiles with sandy to silty loam texture, lack of concretion, fair proportion of lime and other soluble salts and are alkaline in reaction (pH 8) with imperfect drainage. Whereas the Yamuna \textit{kahdar} soils have sub-mature profile with
predominance of clay and concretion and very high lime and other soluble salt contents under the poor drainage conditions. A consideration of all the factors in identifying the zones on macro level will certainly be an impracticable it not an impossible task. The climate and lithology together, therefore have been taken into account to achieve a reasonable classification of the soils of Rohilkhand plain. Broadly speaking the soils of Rohilkhand plain can be divided into: (i) bhabar and tarai soil – slightly different from the khadar and the bhangar is the sub-montane soil where two physiographic units the bhabar and tarai are bedded with texturally different soils. This sub-montane soil is found in the extreme north of Rohilkhand plain.

The bhabar soil is sandy to gravelly, highly porous and aerated and has lower moisture retaining capacity while the tarai zone is provided with rich clayey soil, with some proportion of fine sand, moisture and rich humus. The two zones are thickly forested. Deforestation in tarai is bringing considerable changes in the soil texture, humus content etc.

Newer alluvium or khadar land

The new alluvium of the Ganga plain called khadar is the deposition of the recent geological past comprises of silt and sand brought by the rivers and thus found along the river banks. The khadar is light coloured sandy soil which is poor in calcareous matter. The khadar soil in Rohilkhand plain is found along the banks of the Ganga, Ramganga, Gomti, Deoha, Kosi, Sarah and their tributaries. Away from the river banks sandy loam and sandy soil is replaced by fine silt which is locally known as parga is most fertile which is deposited by river after flood water has receded. The sand and gravel imperceptibly converted into recent alluvium also has good reservoirs of underground water.

Khadar lands own their origin to the bangar lands through the erosional activities of the rivers. The bangar lands are subjected to erosion by the change in the direction of the meandering river channels. The amount of nitrogen and organic matter is khadar soils is derived from the silts of the flooded water which are renewed every year through floods.
The Old Alluvium or the bangar land

The bangar lands occupy the higher grounds and are not flooded by the rivers during rainy season. The material of bangar alluvium consists of nodular kankar of carbonate and lime. The bangar land is characterized with the patches of saline and alkaline which are the result of gentle slope of land. In bangar clay and sodium clay is dominant kankar also found which liberates carbonate and turned into calcium clay. Mediam and Blanford are of the opinion that the kankar nodules and the calcareous beds have been deposited due to water containing a solution of carbonate and lime derived from the older rocks of various types of bangar soil, which texturally be classified into three types:

(i) Clay, (ii) Loam, and (iii) Clayey loam

(i) Clay: It is the mixture of silica and alumina in varying proportion which is fit only for brick making. This soil has great moisture retaining capacity. Clay soils are mostly fund in the northern part of the districts of Bareilly, Bijnor, Moradabad. Being clayey in nature, these soils are rich in resqioxides and iron content, magnesia is less than lime, the soluble salt concentration is average and salts are mostly compounds of bicarbonates and chlorides. The colour of these soils is generally gray to dark gray.

(ii) Loam: The loam is the predominant soil of the Rohilkhand region and occupies considerable percentage of soils in all the districts of Rohilkhand. This is fertile soil and useful in the production of wheat, and sugarcane, though the fertility of the soil depends upon the availability of the water and manure. In this soil lime contain is low to average and magnesia is much higher than the lime. Soluble salt is little bit high but harmful carbonates are almost absent. The pH value is between 6 and 7. The soil is moderately firm but porous through which the rain filters easily. Locally the soil is known as domat or dores.

(iii) Clayey loam: They generally occurs in the northern part of the Rohilkhand plain in the vicinity of tarai region and have been deposited by a number of rivers. The colour of soil is generally brown though at some places it is of yellowish colour having high moisture retaining capacity. A variety of crops can be grown on these lands but they are best suited for the cultivation of rice.
E. Natural Vegetation

Originally the Rohilkhand plain was covered with thick forest. Many fragmentary references throw sufficient light on the predominance of human occupancy in the region gradual clearing of the natural vegetation for cultivation has continued. Today there exist a few small patches of woodland in the whole Rohilkhand plain. The present per capita forest area (0.001 hectare) in the region is bound to go down if the district of Pilibhit is excluded as it has a large forest reserve area. Even this meager acreage is quite unevenly distributed. The total forest area in the district of Bareilly was only 0.055 per cent (much below then the state average of 6.98 per cent) while total forest area in the district of Budaun, Shahjahanpur, Pilibhit, Bijnor, Moradabad, Rampur and J.P. Nagar was 1.33 per cent, 2.29 per cent, 22.44 per cent, 9.43 per cent, 0.06 per cent, 2.80 per cent and 5.45 per cent respectively. Even the existing forest covers in the Rohilkhand plain are of poor quality and are considered to be uneconomic. The forest of Rohilkhand plain can be grouped as tropical moist deciduous, tropical wet and sub tropical dry. Tropical moist deciduous forests are confined to the tarai areas. The available species of the tarai forest is sal, but is poorer in quality as compared to the bhabar sal. The second group of the forests is a little more open and mixed with semal. The tarai is also known for tall grasses, like the elephant grass, khans, munj etc. Shisham, babul, khair and semal are the main species seldom occurring in larger patches of all the districts of Rohilkhand plain.

F. Ground water

The Rohilkhand plain is potentially quite rich in ground water resources, both free and confined. There are few studies carried out mostly by the Irrigation Department. The confined aquifer generally strikes between 60 and 90 meters depth, while the temporary water table depth is less than 35 meters with wide spatial and seasonal variations. The informations regarding the general occurrence are quite inadequate to explain the actual conditions. The free aquifer bears significant relationship with the relief, geological structure and existing water channels as riverain khadar tracts show, in general, lower water table which probably owes to seepage, while the heavy clay belts of the bhangar have higher water table. The canals, however are the exceptions which add considerably in bringing the water table higher up as for example, in Punjab plain area.
A work in this field was carried out by R.N. Mathur in the Meerut district, where about 20 per cent of the observation wells show less than 3.3 m depth of the water table and over 70 per cent between 3.3 and 10 meters. The zones of high and low water table are highly localized as most of the first category wells are in the vicinity of the canals and those with lower water table are near the rivers, the Ganga, the Yamuna and the Hindan. Seasonal variations are well marked as also in the other parts.

ii. Cultural Setting of Rohilkhand

A. Historical Background

It is in the 8 century A.D. the region has been mention with the name of katehr. This name continued to be applied to this area till the middle of the 18th century when it was replaced with the new name to be known as Rohilkhand.

Medieval Katehr comprised the region now covered by the present Rohilkhand division of the state of Uttar Pradesh. The area of Katehr (Rohilkhand) has been important during both medieval and modern periods of Indian history. However, it may briefly be stated that during the period of Mughals and after the death of Aurangzeb, for sometimes the affairs of Katehr remained unsettled, but very soon rohillas were able to successfully control the region. Rohillas were reputedly good administrators and benevolent rulers. Rohilkhand also played a prominent role in freedom struggle and in the Revolt of 1857 and latter.

Certain regions have played an important role in the history of medieval India. Katehr was one of the tumultuous and turbulent region of India. This was often a source of anxiety to rulers at Delhi due proximity of the region to the capital. The rebellious activities of the Katehriyas started soon after the death of Qutbuddin Aibak. The rebellious activities of the Katehriyas reached alarming proportions during the reagus of Balban Eizor Shah Tughlaq and the Saiyyad rulers, Khirz Khan and Mubarak Shah. Frequent disturbances in the region adversely affected its prosperity. Subsequently there was comparative peace and tranquility during the Mughal period as the Katehriyas has been thoroughly cruUed. This favoured the social and economic development of the area. The Bareilly, Moradabad and Shahjahanpur developed as
new urban centers and consequently trade and commerce flourished. The region has its own cultural significance. Despite the political upheavals it developed as a center of Muslim culture. Numerous mosques, madrasas and khanqahs were built. Eminent scholars, poets and mystics from India and abroad settled there. During the early period when the Mongols had uprooted many Muslim families who sought shelter in India turned to this region. A town named Budaun became famous center of learning and culture. Medieval rulers and nobles have left their mark on Katehr in the form of buildings and inscriptions. The territory is rich in monuments and epitaphs.

(i) Katehr under the Mughals

The Katehriyas were thoroughly crushed by Sultan Mubarak Shah Saiyyad. They were completely shattered, yet a few of them could survive the vicissitudes of time, and by the time of establishment of Mughal rule in India they regained their footing. However, they could not become as powerful as they were before. At their own they were not in position to offer the Mughal emperor on their usables posted in the region. Therefore, they changed their strategy. Whenever some other powers viz. Afghans or some nobles, were rebellion they joined, otherwise they indulged in their old profession – marauding, looting and highway robbing.

(ii) Agriculture as a Source of Revenue

Nothing can be said about the extent of situation in Katehr and policies laid down by the Sultans regarding collection of revenue in the region during the period of early Turkish Sultans.

Barani is of course the first historian of early Medieval India who makes valuable remarks on socio-economic conditions of the people, agriculture and revenue in the Katehr. Ibn-I-Battuta and Abul Fazl are others to review the subject.

Alauddin Khilji’s fiscal and revenue policies were not based on any communal consideration but were the outcome of his analysis of socio-economic, agricultural and political situation then operating in the country. Since the region was watered by the Ganga, the Ramganga and their tributaries, the land particularly the northwestern part was very fertile. Proper care was taken for the progress of agriculture, assessment and realization of revenue was the main source of income of the state. The land was measured with a view for assessing the revenue.
The first statistical information with regard to the measured area under cultivation and the number of villages, parganas and sarkars of this region comes from Ain-i-Akbari. The statistics given in this book belong to the year 1595, the fortieth year of Akbar’s reign.

By the reign of Aurangzeb all villages were brought under measurement and the area recorded had grown by nearly a third over the Ain-i-Akbari’s figures. This extension of cultivated land was done at the cost of forests. The forests were cleaned off and the local chiefs were suppressed and cultivation was extended to a large extent. Though exact measured area is not known, it seems that 1/5 of the area was under cultivation.

Abul Fazl tells us that the crops which were grown in this region include wheat, Kabul and Indian vetches barley, poppy, mustard seeds, peas, carrots, onions, muskmelons, Persian and Indian rice, ajwain, sugarcane, mush, cotton, moth, indigo, hina, hemp, pan, singhara, lobia, jaar, Europian radish, sesame, seeds, mung and turmeric. The grapes and mango were also cropped in Hasanpur and Sambhal respectively.

By 18th century Moradabad had become famous for wheat production and used to export foodgrains as far west as Lahore. For instance thousand maund of wheat from Moradabad are said to have been received at Shahadrah grain market.

The cultivation of tobacco also started in this region during 17th century.

(iii) Transformation of Katehr into Rohilkhand

Few words may be added here about the transformation of Katehr into Rohilkhand.

The process of Afghan colonization in Katehr was carried out during the reign of Shahjahan. Bahadur Khan who founded Shahjahanpur persuaded the Afghan clans to migrate and settle in the newly founded city of Shahjahanpur.

Consequently a caravan of nine thousand Afghans belonging to different tribes arrived at Shahjahanpur under the leadership of Nekhan Khan and Yusuf Khan. At the same time, a subordinate officer of Diler Khan laid the foundation of another Afghan colony named Lodipur.
It may be pointed out that the Katehriyas reacted to Afghan colonization. At a very early stage Kutehriyas chief Mifna Sen gave shelter to Bairam Khan against Sher Shah Suri. The process of Afghan colonization continued during the reign of Aurangzeb.

After the death of Aurangzeb, the region was in a state of complete anarchy. The state of utter confusion continued till the establishment of the rohillas: Nizamul Mulk was appointed *faujdar* of Moradabad and was dispatched to quell the disturbances in the Katehr. He was, however, recalled in 1718 after he had chastised the rebels and restored peace and security.

After some time the name of Moradabad chawked to Ruknabad and it was conferred upon Rukhuddaulah Itiqab Khan. This Itiqab Khan, was, however, a nominal governor leaving the palace to Delhi. Itiqad Khan’s successor was Azmatullah who in 1726 AD in a single attack dispersed Rohillas.

Though the rohillas were dispersed their strength was not depleted. It was a timely success of the Mughal governor. The Rohillas had accumulated in thousands in the region and Ali Mohammad had established himself as their leader.

Ali Mohammad seized Aonla having first assassinated the Katehr chieftain. He was then joined by Hafiz Rahmat Khan another Rohilla to whom he made a small grant of land in Bareilly in 1741 AD. Ali Mohammad defeated to Raja Harmanand Khattri. After the victory, Ali Mohammad possessed himself to Shambal, Amroha, Moradabad and Bareilly.

Now Ali Mohammad acquired part of Budaun, Rampur, Shahjahanpur, Moradabad and great portion of Bareilly. Shortly after this Ali Mohammad acquired Pilibhit from the Banjaras. It was about this time that the countries occupied by Afghans began to be known as Rohilkhand. Thus the region of Katehr was transformed into Rohilkhand.

**B. Population**

During 2001 census the total population of Rohilkhand was 212,47,000 persons spreading over an area of 30,257 sq.km. Rohilkhand plain is one of the most densely populated (density 711 persons/km²) part of India. The regional distribution of population and its growth have been mainly related to the agricultural economy and
public health conditions in various part of the region. The growth rate and density of population have been generally higher in bhangar tracts of comparatively greater agricultural prosperity. In the khaddar and bhur tracts which are agriculturally less suitable, the growth and density has been rather low. This relation of population and agriculture has been more pronounced in the earlier decades. Later the factor of health and urbanization assumed greater significance and have influenced the distribution and density of population.

During the past decades the migration of the rural population to urban areas within the region or outside to industrial areas of Mumbai, Calcutta, Delhi, Kanpur and Lucknow seem to have attracted more immigrants. Within the region the cities of Moradabad, Budaun and Bareilly have exerted a pull over their respective umlands.

The sex-ratio of the region varies from 800 to 900 barring some local exceptions, as for instance tahsil Milak (Rampur district) and Jalalabad (Shahjahanpur district) have 1,047 and 791 sex-ratios respectively. A relatively more balanced (850 to 950) sex-ratio is particularly worked in the northern part of the plain covering the districts of Rampur, Moradabad and Pilibhit. The sex-ratio of urban areas (a little over 800) is lower than that of rural areas (over 900). Literacy rate of all the districts of Rohilkhand is below the national average. It varies 48 per cent in the districts of Bareilly, 39 per cent in Budaun, 49 per cent in Shahjahanpur, 50.87 per cent in Pilibhit, 59.37 per cent in Bijnor, 45.75 in Moradabad, 39 per cent in Rampur and 50.21 per cent in J.P. Nagar.

The region is predominantly of rural character with 76 per cent of the total population living in villages of various sizes. In Rohilkhand tarai the percentage of population living in small size villages is highest (40.9 per cent) followed by Rohilkhand west (28.9 per cent) and East (28.4 per cent). The distributional pattern of rural settlement and their types in the region are intimately related to its dominantly alluvial morphology and the predominantly agrarian economy. The nature of terrain, type of soils, facilities of water supply and means of transport also play an important role in the development of settlements. In tarai area of Rohilkhand region the settlements are unevenly distributed due to high percentage of forests, marshy tracts and seasonal floods, and the villages are located on relatively higher grounds.
In the Rohilkhand region, the villages are large in size in the bhangar lands. In general, every large village has small hamlets, situated at a distance of hardly a few hundred metres.

**C. Agricultural Economy**

The economy of Rohilkhand region is dominated by agriculture which together with the allied activities forms the most important source of employment and revenue.\(^6\) Though, in general, the proportion of the net sown area to the total area is high, being over 65 per cent, there is wide range of regional variation which gets sharper at tehsil and district levels. This rank varies from 61.3 per cent (Bijnor) to 80 per cent (Budaun).\(^6\) Pilibhit district has only 53.8 per cent net sown area which attributed to its high forest cover (30 per cent). The upper Ganga plain is one of the highly irrigated agricultural regions of India and irrigation has played a dominant role in boosting its agricultural prosperity\(^7\), particularly during the last one hundred years. About 30 per cent of the net sown area of upper Ganga plain is irrigated. There is, however, a wide sub-regional variation in the irrigated percentages. The districts of Muzaffarnagar (59.1 per cent), Meerut (68.6 per cent), Bulandshahr (61.2 per cent) in the Upper Doab record the highest percentages. But in the Rohilkhand plain, range of irrigated land varies between very poor and average which is partly explained by their lesser irrigational needs. District Bijnor has less than 45 per cent irrigated area of total net sown area, while it is highest in the districts of Moradabad (65 per cent) and Budaun (50 per cent). The tarai districts of Rohilkhand plain, which characterize with higher rainfall, lower temperature and evapotranspiration have lower water needs than that of the districts of bhangar.\(^7\)

The Rohilkhand region is one of the diversified regions of the country as far as cropping pattern is concerned. There is very high concentration of food crops, and over 75 per cent of the total cropped area is devoted to these crops in the region.\(^7\) But after the Green Revolution wheat, rice and sugarcane have become the dominant crops of the region. About 20 per cent of the entire cropped land is devoted to sugarcane, a crop which has almost replaced cotton in many districts. Oilseeds come next to sugarcane as cash crops, and are of increasing importance in some tracts. The Rohilkhand plain, though industries are not very important but in some districts like Rampur, Moradabad, Bareilly have higher proportion of industrial workers then the
other districts. Household industries have a greater importance in all the districts of Rohilkhand, except the districts of Rampur and Bareilly where 70 per cent and 61 per cent of the total industrial workers are engaged in manufacturing other than household industry respectively. Though the present system of the regional transport comprising roads, railways, airways is the product of last hundred years, some crude and rather unbridged roads, cart-tracks and river routes have been ancienly instrumental in the process of regional occupations and resource use. During the late medieval period a number of roads were constructed and used for military and goods movement. National Highway from Delhi to Rohilkhand serves the whole Rohilkhand plain.\textsuperscript{73} A network of roads of Rohilkhand plain connect the region with different parts of the country and even the coastal ports.
References


9. Ibid., p. 529.


25. Ibid., p. 8.


32. Ibid., p. 101.


35. Ibid., p. 102.


43. Ibid.


47. Spate and Learmonth write between Gayga-Yamuna Doab and Awadh lies Rohilkhand, so named from the Rohilla Afghans who were dominant here in the post Mughal anarchy Rampur State (New Part of Rohilkhand) was a survival of their power. Indian and Pakistan, Suffolk, Great Britain, 1967, p. 546.


49. According to Barani it was famous as Balahakpur i.e. place rebellions Tarikh Firoz shahi, Ed. Shaikh Rashid, Vol. 1, p. 96.


53. Ain-i-Akbari records figures in bigha-i-Illahi. The sources for the reign of Shahjahan and Aurangzeb mention the area figures in bigha-idaffari. Bigha-daftari was two third of bigha-i-Illahi.

54. According to the calculation of Irfan Habib, the measured area (i.e. Arazi which included the cultivated, uncultivated and waste land) of the Sarkars of Budaun and Sambhal was 5628 and 5585 sq.miles respectively and the revenue rates in the dastar circles of Budaun and Sambhal were 50 and 55 dams respectively.


60. Ibid., p. 483.

61. Sabihuddin Khalil, Tarikh-I-Shahjahanpur, p. 12.


63. Abbas Sarwani, F. 82 ab.


65. Ibid., p. 469.


67. Rohillas were the Afghans of various tribes who had came to India from Roh (Mountain) in Afghanistan in search of service. During the troublous days of the later Mughal empire, they settled in large numbers in Katehr being generally engaged as mercurise in the service of local Cheiftains Ali
Mohammad attracted thousands of free booters of his standard and has become a person of much prominence.


