

PHYSICAL ENVIRONMENT OF AGRICULTURAL PRODUCTIVITY IN NORTH AVADH PLANE OF UTTAR PRADESH

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ABSTRACT

Agriculture is the backbone of the India's economy, it provides direct employment to about 65 percent of working in country, contributes about 29 percent of gross domestic products and contributes about a sizeable share in India's export. It forms the basis of many premier industries of India including the cotton textile, Jute and Sugar and many more. Being the largest source of employment and income to millions of people, it provides a vast market for our industrial products. Thus, it becomes of the paramount significances of agriculture in Indian economy that this sector has been and continuous to be accorded a pride of place in India's plans for the economic development.

This paper studies about physical environment of Agricultural Productivity in North Avadh Plane of Uttar Pradesh which includes physical setting of the area structure, drainage, physical divisions, climate, cultural background population and its distribution, growth and density

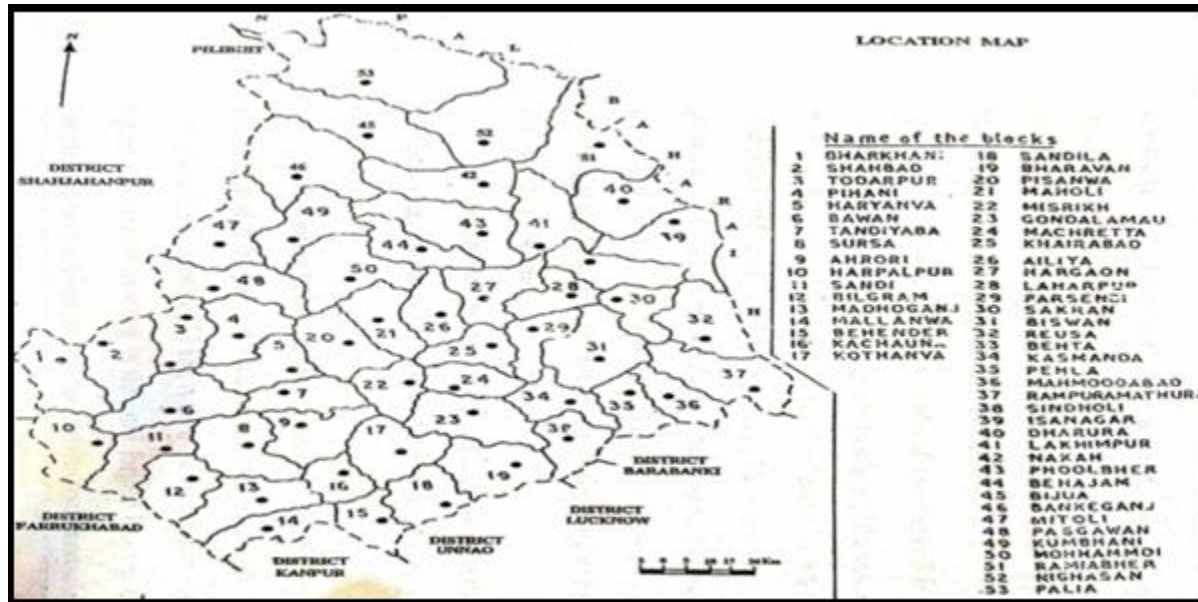
Key Words :- Agriculture, Climate, Population Distribution, Uttar Pradesh.

Physical Environment of Agricultural Productivity in North Avadh Plane of Uttar Pradesh

Physical Distribution of Region:-

The area comprises of the districts kheri, Sitapur and Hardoi of Uttar Pradesh, and stretches from sub-Himalayan tarai of the central plain of Northern India. It occupies a portion of the northern fringe of the Ganga plain which lies between the stable southern peninsula and the recently built Himalayan Chain. The Himalayas' ranges rise steeply from the plains to about 6000 meter above the sea level and the snow-line is clearly visible from the plains. The proximity of the Himalayas, relatively high rainfall, the character of the streams and soil types and high water table, all combine to make the sub-Himalayan tarai a distinct natural region. It extends from 26°-50' to 28° 45' N latitude and 79°-52' to 81°-50' East longitude, covering the area of 19,541 sq.km.

Fig No. 1- Location Map



STRUCTURE AND RELIEF

The Sub-Himalayan tarai region belongs to a part of the Ganga Plain. It is 400 km wide in the broadest part, and is about 2,400 km long. It is estimated to cover an area of about 6, 40,000sq. Km.¹

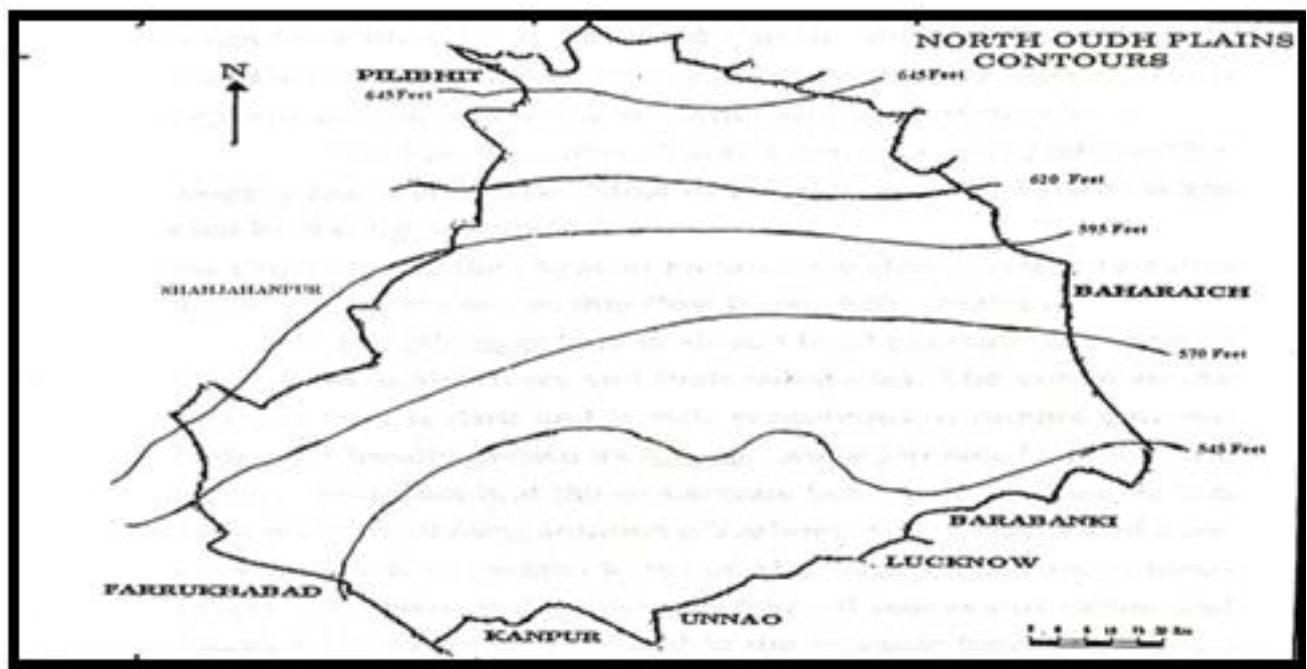
The plain has been filled by the alluvium brought down by the Himalayan Rivers. The alluvial deposits in the tarai consist of sediments, silts and clay with occasional gravel belt and can be divided into classes (1) Newer alluvium known as Khadar and (2) The older alluvium known as Bhangar. The khaddar and Bhangar lands correspond in age to the Pleistocene and the recent periods of geological history respectively.

The origin of the plain is a matter of controversy. Edward suess² holds that is a "Fore-deep formed in front of the resistant mass of the peninsula, when the Tethys sediments were thrust southward and compressed against them". The peninsula is regarded as a rigid stable mass and the central Asia as the moving segment of the crust. The fore deep was gradually filled in by the eroded material from the Himalaya and the old shield of the south, and thus the plain came into existence.

S.G. Burrad³ postulates the origin of the depression similar to that of the Great Rift Valley of America, and probably of the same age.

According to Burred, the plain constitutes a rift valley and is bounded by parallel faults on its two sides with the maximum down-throws of 32 km. A third and more recent view regards this region as a sag in the crust formed between the comparatively soft sediments accumulated and into the mountain system.

Fig No. 2- North Avadh Plains Contours



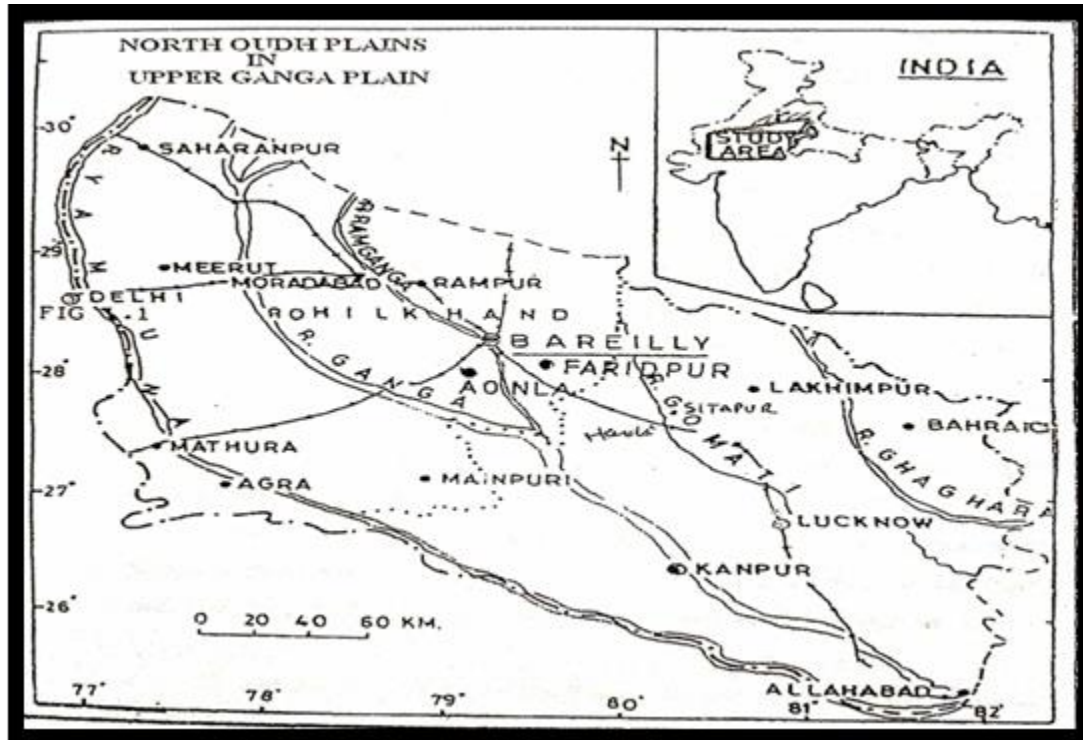
SOURCE: Survey of India Map

As regards the nature of deposits of the plain concerned, it has been universally accepted that the fore deep was filled by materials brought down by the rivers and other agents. These deposits correspond to the silt, mud and sand of the rivers.

The Sub-Himalayan tarai is almost level plain and homogenous in character. Most of the area is a flood plain, occupied by the Khadar and Bhangar and the physical features are characterized to a limited extent by the rivers that flow through this region.

The Bhangar land is almost level plain above the flood level of the main rivers and their tributaries. The color of the bhangar land is dark and is rich in modules of impure calcium carbonate locally known as kankar. Medicate considers they the kankar modules and the calcareous bibs have been deposited from water.

Fig No. 3- North Avadh Plains Upper Ganga Plain



Containing solution of carbonates of lime derived from the older rock of various kinds or else from fragments of limestones contained in the alluvium.⁴ Small patches of saline and alkaline efflorescence is found in the bhangar land. During the period of rains, the water, percolating downward, dissolves the soluble salts which have been accumulated in the sub-soil by percolation and by capillary action it brings them back to the surface during the summer months. Alkaline formations are explained by the fact the dominant constituents of the old alluvium are clay and sodium which reaching with kankar modules, is turned into calcium clay and liberates sodium carbonate⁵.

The khaddar land is confined to the flood plain. It is light in color and is poor in calcareous matter and corresponds in age with upper Pleistocene along the various rivers of the area. The khaddar of the Ghaghara River differs from that of the Rapti in the nature of the deposits. The deposits of the former are predominantly sandy and loam while that of the latter consist of silt clay. The surface of the khaddar along the course of the Ghaghara is recouped by irregular depressions marking the old course of the rivers.

Some of them resemble almost the tributary valleys and others survive as narrow lakes. Very often high floods in the Ghaghara leave coarse sand deposits which are not useful for agricultural

purposes. But the floods in the Sarda River generally prove useful to the cultivators in the low lands, even if it destroys the standing Kharif crops because it deposits a layer of fertile silt which increases the production and also yields of the successive crops.

DRAINAGE

The slope of land reflects the present drainage pattern of the area. Except the rivers Ghaghara and Sarda which flow more or less in a straight course, all the rivers in the area have a tendency to flow in sinuous courses across the plain, forming meanders and axe-bow lakes. The courses of the rivers and their tributaries generally follow the general slope of the area. There are numerous perennial and non-perennial rivers, traversing the region from north-west. All the rivers of the region belong to the Ganges system. The Ganga, the Ghaghara, the Sarda, the Gomti and the Ramganga are the principal rivers of the area. The Ganga, the Ghaghara and the Sarda have their sources in the snowy peaks of the Himalayas while the others rise from the lakes in the plain. The minor stream of the area is seasonal in nature and their discharge varies from almost nothing in the dry season to thousand of cubic feet per second during the rains. Their beds may remain dry for months and then may be flooded for a few days in the years. A study of the activities and behaviors of these rivers is of great importance especially in an area where agriculture forms the mainstay of artificial water supply.

The northern part of the Kheri district is known as the Tarai, where marshes, swamps, lakes, tales, sluggish streams, underground water and the high water table give it a veritable character where one can find numerous difficulties to means of communication. The tarai streams are marked by their meandering courses especially in the upper reaches with numerous channels and ox-bow lakes.

THE GANGA

The Ganga is the greatest rivers of the area forming its south-western boundary. The Ganga rises from the Himalayas and passing through the Siwalik ranges enters the plain from the north-west and flows in a south-east direction. It is a perennial river and contains sufficient water-throughout the year. Flowing over a considerable distance, it is joined by Ram Ganga. From the point, it continues to flow in the same direction for a short distance to Meoroghat where it bends southwards along the borders of Bilgram and Kachhondao, leaving the district in the extreme south of the latter Pargana.

RAM GANGA

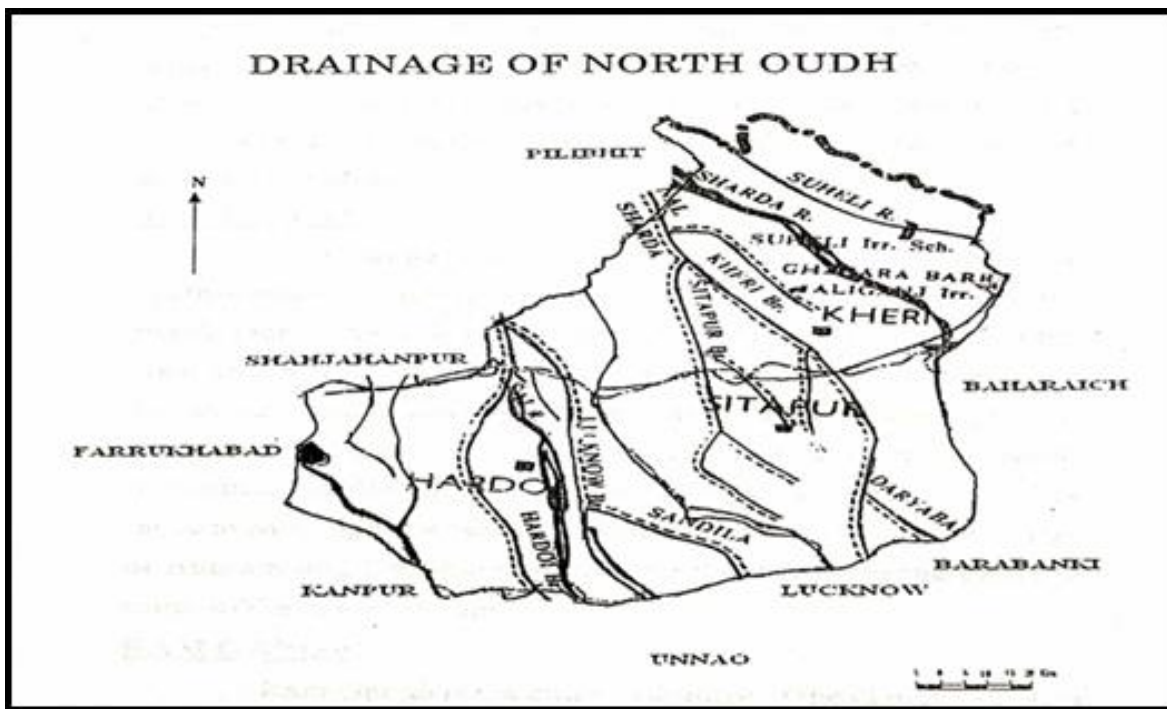
Ram Ganga is the chief tributary of the Ganga which is itself great river. It enters the katiari pareagana in the extreme north from the Farrukhabad district and flows southward in a tortuous

and irregular course through Katiari and Sandi in places forming the boundary between those parganas, near Khairuddinpur, it turns to the south-east and after passing through the south of sandi, it joins the Ganga, having previously received the water from sandha and Garia on its left bank.

THE SANDHA RIVER

The Sandha River is a small stream which rises in the Shahjahanpur district and flows along the western border of pachhola and pali separating Hardoi from Farrukhabad district. In the south-west of Pali, it approaches the Ram Ganga, but then turns south-east through Katiari and Sandi. At Kuchla Bijna, it merges into river Garra. At Pali and Pachhola, the channel of the river lies in a low tarai flanked by the tract of sandy soils. The tarai is always liable to floods and cultivation herby uncertain.

Fig No. 4- Drainage of North Avadh Plains



GARRA

Garra is also an important stream. It rises in the lower Himalayas in Kumaun. After passing through Pilibhit and Shahjahanpur, it enters Hardoi at Garhipur in the north of pargana Shahabad and divides that pargana and saromanannagar on the east from pachhola and Pali on the west. It

them passes down the centre of Baswan which separates the uplands from alluvial kachh and after uniting with sendha, it falls into the Ram Ganga close to its confluence with the Ganga.

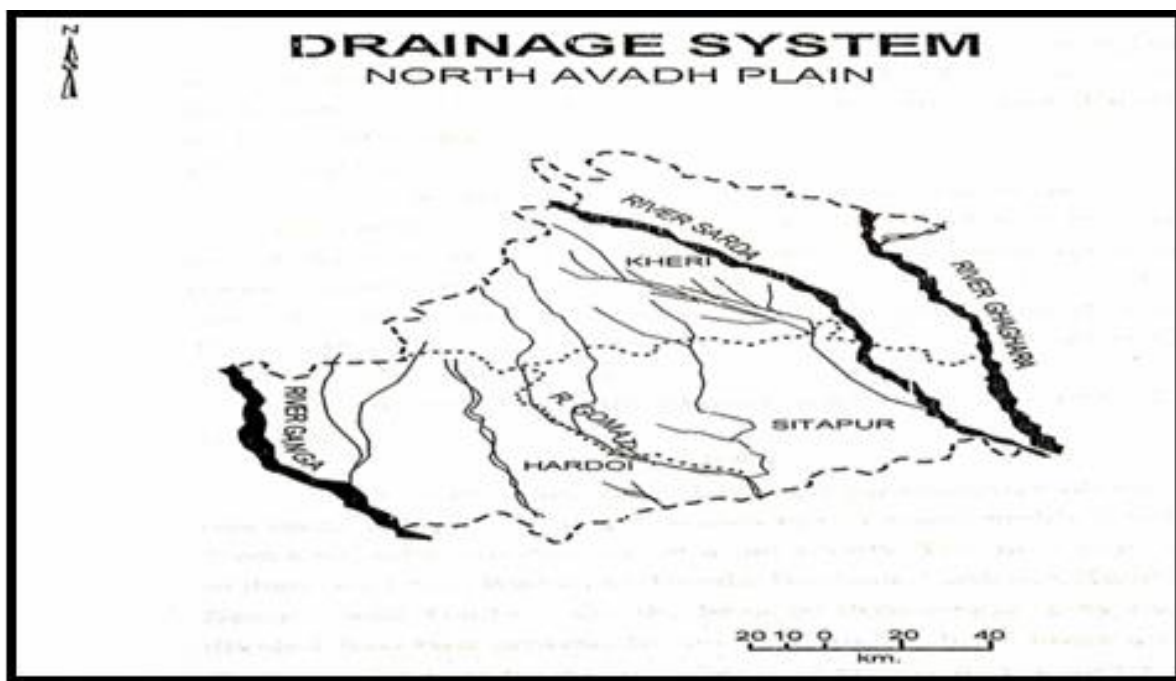
SUKHETA RIVER

The Garra has several effluents the chief of which is the Sukhta. It rises in shahjahanpur and after separating the district from Kheri, enters the Hardoi at the north-west corner of pargana Alamnagar. After covering a distance, forming the boundary between Shahabad on the west and Alamnagar and Sarai north on the east.

THE GHAGHARA

The Ghaghara rises in the Tiverton Mountain where it is known as Karnali. The river in its upper part consists of the two rivers the Kali and the Karnali which join at Beharamghat and have been renamed as Ghaghara in the plain. It flow in a sandy bed cowards south-east and enters the plain with an enormous amount of the coarse material. This accounts for the widespread occurrence of sand bars in its beds. The sand bars divided up the river into a number of channels which, however reunite in the main bed of the stream.

Fig No. 5 Drainage System, North Avadh Plains



SOURCE: Irrigation Department, Govt. Of U.P., 1987

The river flows in a wide and sandy beds and its course is liable to frequent changes. Ghaghara runs near the eastern boundary of Sitapur district, on many places, the river has split into more than one channel. About hundred years back, the river flows along the eastern boundary of the district, but today it has receded five to eight km. eastward into district Bahraich leaving an old firm bank which is visible even today. Owing to its shifting nature, the Ghaghara, when in space, causes great havoc by wiping out village that lie in its course. From time to time, large tract of land is transferred either to the left or the right banks rendering the total area of the district subject to great variations. There has been a diminution of 49.4 sq. Kilometers in the district of Bahraich during period 1951 to 1961. The width of the river fluctuates to a great deal. It changes from three to four kilometres at many places owing to the tendency of the river to change its course from time to time.

The chukka (Sarda) a tributary of the Ghaghara is more important in the eastern part of the district Sitapur. The Kiwanis, a tributary of chukka rises in a jhil in the district Kheri and after a south easterly course through pargana Biswan, joins the Parent Rivers at its right bank in tahsil Sidauli. During the cold and hot season the river is almost dry but in the rainy season it swells to a large volume, something over flowing its banks.

THE GOMATI RIVER

Gomati is another important perennial river of this region, which rises in the Pilibhit district and appears in the uplands of the district of Kheri flowing across the Muhammdi tahsil. This river is extra-ordinary tortuous.

The bed of the river is deep and its channel is well defined. But the stream has a low velocity which never exceeds about 7km/hour even in the times of flood due to the gentle slope of the plain. During the rainy season, the width of the stream exceeds five km. On many places along the bank of the river, there may be found narrow strips of alluvial land, but they are of little value for cultivation, as the river brings little silt but much sand during high flood.

The river receiving on its right bank two small tributaries known as the 'Chhuha' and unchuha nalas. To the east of river Gomati flows the river 'Kathna' which rises in the Moti jhil in the Shahjahanpur district and enters the Kheri district near Mailani⁸.

The Gomati enters the district of Sitapur in a zig-zig course over a considerable distance along the western part of the district. The valleys are considerable broad in the north and narrow in the centre in the district of Sitapur. The banks are high, undulating and sandy broken here and there by ravines. In the districts of Sitapur the Gomati receives two tributaries 'Kathna' and 'Sarain'. During the rains, it frequently rises in floods which in their wake leave fertile deposits of silt and clay, which are ideally suited to the cultivator of crops.

THE SARDA

The Sarda River rises in the snow-clad ridges of the Himalayas on the border of Tibet. In its upper reaches, it is known as Chauka River. It has a shallow bed with sandy banks and sometimes it flows approximately at the surface level. From time to time, the river changes its course and is highly unpredictable. The width of the river course fluctuates a great deal and ranges from two to three km. The river has many tributaries of which 'Samli' and 'soti' are important.

LAKES

The entire sub-Himalaya region is studded with numerous lakes and jhils, many of which are of considerable size and form a valuable addition to the water supply. The most important of them are Dhar, Rudaman, Barela, Nasipur, Bakhera, Kandomi, Benipur and Tendwa. On the basis of their origin, they can be divided into two groups. In the first group, those lakes are included which owe their tributaries in changing their courses. The lakes of this group are mainly found in the 'tarai' region. In the second group, those natural depressions in which surface water collects during the rains are included. These are mostly found in the 'uparhar' region. Some-time these lakes represent an ill-defined links of drainage which develop into a stream in years of abnormal rainfall.

PHYSICAL DIVISIONS

Physiographical, the whole area of Kheri, Sitapur and Hardoi district represents almost a level plain and remarkable homogeneous in character. It has a gentle slope towards south-east and is drained by several perennial and non-perennial rivers. The physical features, to a great extent, are controlled by the river topography of the land is mainly associated with the change in the course of these rivers. However, on the basis of the surface drainage and relief features, the region can be divided into following divisions: -

(a) The Tarai (b) The khaddar (c) The low lands (d) The Uplands

(a) The Tarai

The Tarai is a low marshy stretch, infested with reeds, tall grasses and scrub forests and numerous water channels. This region is a continuation of the tarai belt of Nepal. It occupies a belt of about 25 to 30 km wide. The region is moist owing to heavier rainfall and a somewhat imperfect system of drainage. The greater part of the tarai is inundated in most years after heavy rains. Only a few elevated spots on which the villages are built remain visible above the flood. This tract is very much suited to the tract is salty-clay, broken by insignificant patches of loam. The climate of the tract is unhealthy, probably due to its exceptionally mealy nature, the

proximity of forest, high water table, and heavy rainfall and had drainage Malaria is the common disease of this tract.

(b) The khaddar

Along the banks of the rivers Ghaghara, Sarda and Gomati, khaddar tract is formed by the deposits of sand and silt which occupy a tract of varying width. During the rain, a considerable area of the khaddar lands turns into swamps or is actually submerged under water while in the cold dry season, the surface becomes dry but the water can be found by digging a few feet into the ground.

The khaddar soils are light to grey in color and found along the river banks. The deposits in the khaddar of the Sarda valley are similar to those of the Ghaghara valley. The distinguishing feature of the deposits of the Gomati, khaddar is the high moisture content of the soil while the khaddar soil of the Ghaghara and Sarda have less moisture content and generally rabi crops suffer from deficiency of surface moisture. The agricultural economy of the khaddar levels is much influenced by river action. Sometimes a river may claim a piece of fertile land by cutting a channel through it, and at other times it may deposit a layer of fertile silt on what was formerly poor soil.

(c) The low lands

This tract is found along the river bank of Ghaghara. Almost the whole area is liable to be swept by rivers. The general slope of the area is gentle and occurs from north-west to south-east. The tract is intersected by numerous river channels and depression and is flooded during the rains, Kauriala, Chauka, Dharwar are the main rivers of the tract and during the rainy months, Kharif crops are often damaged by the overflowing of the rivers and severe water-logging.

The soil of the tract varies from clayey to clayey loam. The river deposits fresh silt which is used for the cultivation of rice in the lowlands where the water logging is a permanent feature, the soil is pre-dominantly stiff clay.

(d) The Uplands

The comprising are the districts of Kheri, Sitapur and Hardoi is well-marked by uplands which lie to the east of the river Gomati and is locally known as 'Uparhar'. The land lying to the east of the river 'U1' in the Kheri district is known as 'upland' and it is the richest part of the district. In the district of Sitapur the high flying land is found from the bank of the Gomati to the eastern bank of the Sarda River.

A major portion of this area consists of level plain marked by slight undulations of the interfluves. The tract is also devoid of forest and large lakes. A substantial proportion of this tract is productive and under cultivation but along the river banks, it is cut up by ravines. The plain has a gentle slope and is generally from north-west to south-east.

The soil is loam but it varies from clayey loam to sandy loam, on the high flying areas the soil is sandy and sandy loam, while along the rivers, it becomes sandy. Clayey soil occurs in depressions owing to the numerous lakes in the south, the soil is well-irrigated. Alkaline and saline soil occurs in small patches in the west of the central portion of the tract.

CLIMATE

The Sub-Himalayan tarai region experiences a subtropical monsoon type of climate which is characterized by a seasonal rhythm produced by the south-west and north-east monsoon. The term 'monsoon' designates the seasonal surface air currents, reversed from summer to winter⁹.

On the basis of the characteristic of monsoon, the Indian Meteorological Department has divided the year into the following seasons:

(A) The season of the North-East monsoon.

- (1) Cold-weather of the north-east (January & February)
- (2) Hot-weather of the north-east (March & Mid June)

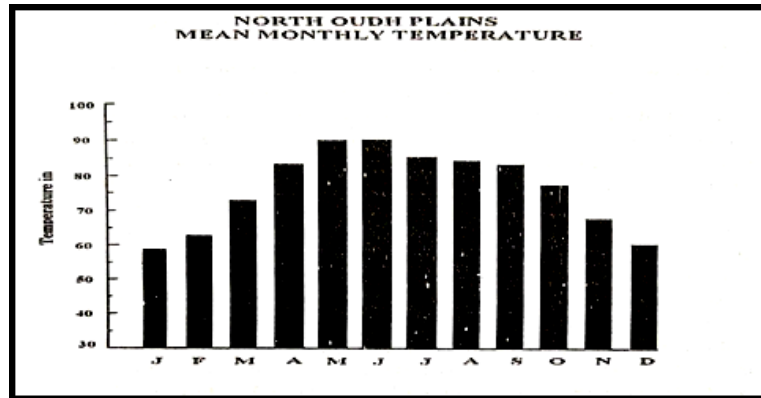
(B) The season of the South-West monsoon

- (1) Season of general rains (Mid June to Mid September)
- (2) Season of retreating monsoon (Mid September to Dec.)

But a more convenient division of the year is into the following three seasons which correspond to the cropping seasons in the area.

- (1) The cold weather season from November to February corresponds to 'rabi' season.
- (2) The hot weather season from March to mid June corresponds to 'zaid' crops.
- (3) The season of general rains from mid June to October correspond to 'Kharif' season.

Fig No. 6- Mean Monthly Temperature in North Avadh Plain

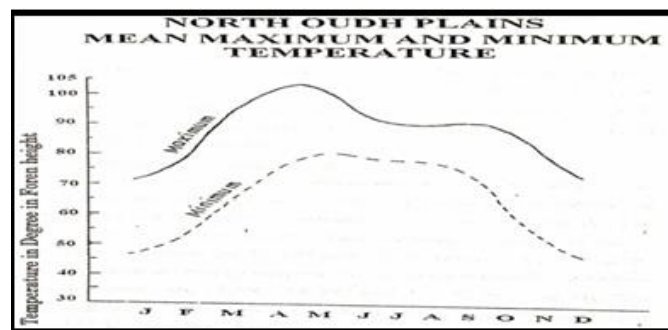


SOURCE: Data from the memoirs of the Indian meteorological department

1. The Cold Weather Season

After the retreat of south-west monsoon the region comes gradually under a high pressure belt which develops over the plain due to low temperatures. During the day clear sky permits free isolation while at night there is rapid radiation with the result that the nights are cool where-as the days are comparatively warm. The mean monthly temperatures are 21.5⁰c, 20.5⁰c and 21⁰c at Hardoi, Sitapur and Kheri respectively. The mean maximum temperatures in November at the above mentioned station are 10.5⁰c, 9.5⁰c and 10⁰c respectively. In December, the temperatures for the decrease by about 4 to 5⁰c and the days become less warm where-as the nights become colder. The month of January records the lowest temperatures of the year and, therefore, it is the coldest month. The mean monthly temperature in January 16.5⁰c at Hardoi and 16.0⁰c to 15.5⁰c at Sitapur and Kheri respectively. During these months, heavy mist or bog locally known as ‘Kohra’ often occurs at night and lasts until the early morning hours.

Fig No. 7- Mean Maximum and Minimum Temperature in North Avadh Plains



SOURCE: Data from the memoirs of the Indian meteorological department

The month of February registers a slight increase in the temperature but the nights are still cool and the days are comparatively warm. The mean monthly temperatures at Hardoi, Sitapur and Lakhimpur are 20.5⁰c, 19.5⁰c and 20⁰c respectively.

The rainfall during the cold weather season is small, irregular and sporadic. It is locally heavy where the thunder storms are associated with disturbances. The average rainfall in January at Hardoi, Sitapur and Kheri are 16.4, 15.3 and 17.8 mm while in the month of February for the same station are 20.8, 19.6 and 19.1 mm respectively. The winter rainfall is highly beneficial for rabi crops.

2. The Hot Weather Season

The hot weather season commence from March and continues till the middle of June. In this season the area is dominated by a low pressure system. The temperatures begin to rise sharply. The mean maximum monthly temperatures in March at Hardoi, Sitapur and Kheri are 33.5⁰c, and 35.5⁰c respectively, while the mean minimum monthly temperature for the same month at the aforesaid stations are 15.5⁰c, 16.5⁰c and 17.5⁰c respectively. During range of temperature is fairly high e.g. 16.2⁰c at Hardoi and 17.1⁰c at Kheri. As a result, the days are warm but the nights are cool and pleasant.

In the summer months, hot dry wind locally known as 'loo' is regular phenomena and their variable intensity is greater in May and June. The most characteristic features of hot winds are their intense dryness and excessive temperature. Their velocity increases in the afternoon and they blow with violent force till 4p.m. in the evening when their force is retorted to such an extent that they practically disappear from the scene. The humidity on such occasion's some-times falls to as low as 2percent from noon to 4 p.m. such conditions till the middle of June prior to the onset of the south west monsoon.

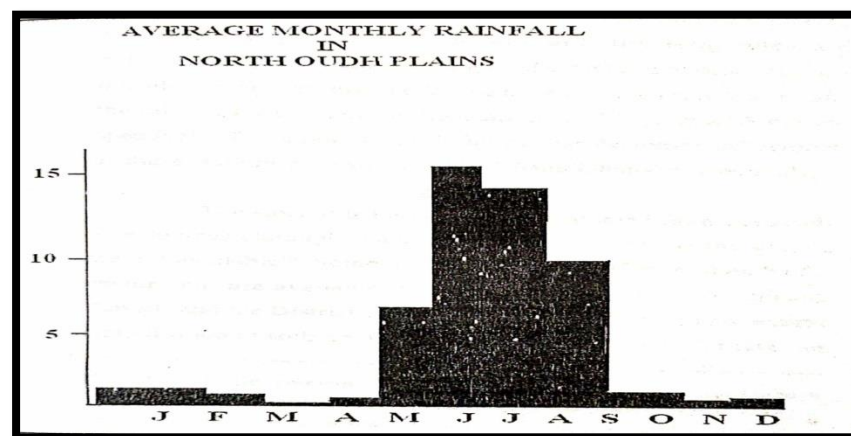
The occurrence of dust storms locally known as 'andhi' is another phenomenon of this season. These dust storms last for a short time and give peculiar reddish yellow glare to the sun light, more especially in the afternoon and some-times bring about a small about of rainfall. Some-times they accompanied by thunderstorms which do a lot of damage to the buildings and trees.

The rainfall during this season is sporadic, short-lined, subject to local variation and frequently acetated about the some hour's day for many days in succession. The rainfall during this month at Hardoi, Sitapur and Kheri are 14.3, 16.1 and 15.9 cm respectively. The rainfall of the hot intensity of the heat and makes the weather pleasure often for a day of couple of days. After the rainfall, the air becomes cool and the circulation of the dust particles in the atmosphere is reduced to the minimum. The humidity slightly increases for some time, but again decreases gradually during the dry time when there is no rainfall, and the heat again becomes unbearable.

3. The Season of General Rain

Due to excessive heat during the hot weather season, a low pressure area is developed in the north western part of India and by the middle of June, it brings a number of sudden changes not only in the direction of winds but also in the entire weather, with the arrival of new air-mass. With the arrival of the humid oceanic currents, temperature falls and the air becomes cool and pleasant. The mean monthly temperatures in July at Hardoi, Sitapur and Kheri 17⁰c, 16.5⁰c and 16⁰c respectively. Relative humidity increases from 50 percent in May to 80 percent in July. The sky becomes over-cast for days to-get her and rainfall in downpours, some-times accompanied by thunder and lighting. The commencement of the monsoon rain varies from last week if May to first week of July in the region, but generally it sets in during the second or third week of June and continues till the end of October. Agriculturally it is the most important season of the year in which almost 90 percent of the rainfall is recorded.

Fig No. 8- Average Monthly Rainfall in North Avadh Plains



SOURCE: Indian Metrological Department

The distribution of rainfall is not uniform throughout the season. Generally the rainfall starts by the second or third week of June, remains steady in July and August and decreases in amount by September. The months of July and August receive maximum rainfall during the year. During these months, the rainfall at Hardoi, Sitapur and Kheri and 57.5cm, 58.1cm and 63.5 cm respectively. The low cloud amount, the long intervals between the rains, high humidity and temperature and calm atmosphere make the month of September sultry. During this month the rainfall for the same stations are 24.2, 24.7 and 22.8 cm respectively. The amount of rainfall further decreases in October as these stations receive only 4.9, 5.9 and 5.9 cm respectively.

SOILS

The soil of the area has been studied from the available sources although scientific data and records on the subject are not available¹⁰. Some published records of more than half a century old are available, however, in the form of settlements reports and the district gazetteers. Both of which give a textural classification of soils arrived at by empirical methods for revenue assessment purposes¹¹. These are the oldest source of information available. However, these sources contain valuable information regarding the soils of this area. The soil maps of India, even that of Uttar Pradesh prepared from time to time by various authorities give only a generalized picture of the soil of this area, usually the area under study is included into the broad belt of alluvium soil without any further subclassification¹². Each type of the soil has been given local names such as domat, belua, dhankhar and matiyar and these local usually from district. The alluvial deposits of the region may be classified into two divisions. (1) Khadar of new alluvium of sandy composition, generally light in color and (2) Bhangar or old alluvium of more clayey in composition and generally dark in color.

1. Khadar Deposits

This type of soil is found adjacent to the river banks. It varies in texture and along the Ghaghara, it contains a high proportion of coarse sand while along the Gomati, the soil is either sandy silt or contains a high proportion of silt. As one moves away from the banks, the soil improves in texture and shows an increase in the percentage of silt. It becomes almost dry in times of low rainfall and is heavily leached when the rainfall is heavy. The water table in the Khadar lands is high and in the rainy season it comes close to the surface. Agriculture in this area is not free from danger due to water-logging and floods. The sandy soil is utilized for the cultivation of maize, pulses and broadcast rice in the Kharif season while the sandy silt is used for the production of millets. Barley and gram occupy the largest area during the rabi season.

2. Bhangar Soil

Bhangar soil may be divided into

(a) Sandy loam (b) Loam (c) Clayey loam (d) Clayey soil.

(a) Sandy loam

The soil occurs to the west of the loamy tract. Texturally, it varies from sandy loam to loam and is brown to reddish brown in color. The soil gradually changes from sandy loam to loam as one move from west to east. Owing to its water holding capacity, it becomes almost by in periods of low rainfall. It is generally deficient in organic matter and plant nutrients. A patch of saline and alkali soils also occur in the south-west of this tract. At several places these are incrustation of salt efflorescence.

This type of soil is given to ground-nut cultivation. It grows a variety of crops when it is well-mannered and irrigated. Maize, arhar (pulse) and broad-east rice are the chief crops cultivated in the Kharif season while wheat, barley and grams occupy the largest area during the rabi season.

(b) Loamy Soil

It occupies a considerable area of the Bhangar land. Texturally it is sandy loam and gradually changes to salty clays. Where the land is low-lying and is liable to water-logging, the soil becomes clayey. The surface soil is light yellow to brown in color. It is rich inorganic matter. It has usually a high water-holding capacity and is capable of producing good crops if irrigation facilities are available.

The soil is generally very fertile and produces a variety of crops. Generally transplanted and broadcast rice, maze, millets, sugarcane and Kharif pulses are grown in the Kharif season, whereas wheat, barley, peas and gram are the dominant crops of the rabi season.

(c) Clayey Loam

Clayey loam occupies the eastern portion of the bhangar land. It has a relatively high water retaining capacity as compared to the loam. The proportion of clay increases from west to east and at some elevated places, even loamy soils may be encountered. In shallow depression the soil becomes clayey because the fine particles from the elevated are washed out and gets redeposit in these depressions. Such soils are devoted to the cultivation of transplanted rice. It is a stiff soil with a loam to clayey loam texture, having a zone of kankar formation at shallow high. A kankar pan is found in the lower profile of the soils. The soil below kankar is generally sandy and does not contain as much clay as the horizon having kankar pan. The solvable salt contents are high and in extreme cases, they may accumulate in the sub-soil but these do not exert any pronounced Salinization effect on crops cultivation.

The soil is brownish to yellowish-gray color. The more brownish sub-type locally known as 'matiyar' which although is stiff loam of heavy texture, does not exhibit highly restricted drainage and show greater depth of the alluvial in the profiles. At places, the soil is so tenacious that it can only be worked where well-soaked, and in the dry state, hardens to a very high consistency. The water table is high so that the irrigation facilities are adequate. The important crops grown in the kharif season are rice, sugarcane, maize and arhar ((pulse), whereas in the rabi, wheat, barley and peas occupy the largest area.

Cultural Background Population

With a total population of north avadh plain was 11,550,276 (2011) on area of 19409 sq km or 5.72 percent of state (2011). North avadh plain is one of the moderate population areas of the

state. The density of total rural and urban population account for 630(Sitapur), 568(Hardoi) and 592 (Kheri) persons per sq km respectively which is high in the central region of the state.

Population Distribution

The distribution of population is uneven throughout the region. The higher fertile grounds comprise the maximum concentration of population. Whereas the lover and is undated areas have fewer people. Drab region and margin of the old and new alluvium are highly populated but the southern bangers a region of sparsely distributed population.

Population growth

The population of the region has been increasing continuously except the decades 1901 – 1911 when there was decline of 5.56 percent and 1911 – 1921. When is declined by 1.72 percent due to the havoc and other types of fatal diseases. But even since the rising as will be clear from table.

Table 1.1 North Avadh Plain: Decennial Variation of Population 1901-2011

Decade	Person	Decennial Variation	Percentage of Decennial Variation
1901	3,161,067	-	-
1911	2,985,395	-175,672	-5.56
1921	2,934,159	-51,236	-1.72
1931	3,091,106	+156,943	+5.35
1941	3,601,066	+509,964	+16.50
1951	4,278,854	+677,788	+18.82
1961	4,792,971	+514,117	+12.02
1971	5,662,226	+869,255	+18.14
1981	6,920,112	+635,388	+11.22
1991	8,021,025	+1,100,913	+15.90
2001	9,625,230	+1,321,095.6	+19.08
2011	11,550,276	+1,585,314.72	+22.896

Source – Data compiled from District census handbook pt. XII B Hardoi, Sitapur and Lakhimpur 2011.

Population Density

The density of population varies from place to place is the north avadh. The highest density of population is in sitapur district (630) people per sq km followed by kheri (592 person per sq km) and by hardoi 568 person per sq km. To throw light on the normal concentration of population;

only rural population density is adopted; as block wise. Rural density is given is given in the following tables.

It is evident from the above table that Khairabad block of Sitapur district accounts for maximum population density (512 people per sq km) while 247 people per sq km of Bijou is minimum density of Kheri district. In Sitapur the density per sp km is much higher than Kheri and Hardoi.

Table 1.2 ,Block wise distribution of density of rural population 2011

District	Block	Density
Lakhimpur Kheri		
1.	Palia	273
2.	Nighasan	263
3.	Ramia Behar	264
4.	Kumbhi Gola	430
5.	Bijua	247
6.	BankeGanj	402
7.	Mohammdi	341
8.	Mitoli	396
9.	Pasgawan	346
10.	Behjam	428
11.	Lakhimpur	490
12.	Phoolbhar	327
13.	Nakaha	349
14.	Dhauarahara	297
15.	Isanagar	334
Hardoi		
16.	Baharkhani	329
17.	Shahabad	388
18.	Tonderpur	397
19.	Pihani	405
20.	Baabn	421
21.	Hariyawa	411
22.	Tandiawa	404
23.	Sursa	460
24.	Ahirohi	427
25.	Harpalpur	362
26.	Sandi	369
27.	Bilagram	389
28.	Madhovganj	418
29.	Mallawa	415

30.	Kathwa	411
31.	Kachauna	438
32.	Behdar	466
33.	Sandila	446
34.	Bharavna	432
Sitapur		
35.	Pisawan	370
36.	Maholi	490
37.	Mishrikh	410
38.	Gondlamau	428
39.	Machrehta	485
40.	Khairabad	529
41.	Ealliya	486
42.	Hargaon	402
43.	Laharpur	495
44.	Parsendi	480
45.	Sakaran	401
46.	Biswan	506
47.	Reusa	376
48.	Behta	364
49.	Kasmenda	478
50.	Pahala	444
51.	Mahmudabad	455
52.	Rampur Mathura	361
53.	Sidhauri	515

Source – District censuses handbook XII B Lakhimpur Kheri, Hardoi and Sitapur.

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