tree. They then implant it into the soil and worship the Dal (branch) throughout the festival they drink, dance and sing. In the following morning they take out the branch and visit all the house holds of the community with the branch which they finally immerse in the pond. They continue with their dancing and singing throughout the night.

In October November, each family worship their cowsheds i.e., "Gooal" puja on the day following "Kali puja" of the Hindus. They then offer food and drinks to their neighbours which ultimately ends night-long drinking, dancing and singing.

"Pusna" festivals comes in the month of December-January. In this festival each family prepare lot of sweets in their houses and offer them to their neighbours. This again terminates with drinking, dancing and singing.

"Chaiti", a communal festivals comes in the later part of the month of Chaitra (February-March). The members of the community meet with the head man and decide the exact date and amount of subscription for the festival. Usually it falls on Tuesday or Saturday. During the festival, Goddess "Sitala" and "Lord Shiva" are worship with sacrifice of a goat to the former and a pair of pigeons to the later. The meat is then cooked and whole community shares the food along with drinks and nightlong dancing and singing.

"Bij-bapan" festival i.e., sowing of seeds mainly paddy occurs in the month of June, the whole community enjoys drinks, dancing and singing following sowing.

"Dhan-gara" festival occurs in the month of July and involves transplantation of paddy seedlings in the field. This festival is accompanied by sacrifice of a red and a white hen in the field. This festival also ends up in drinking, dancing and singing.

It may be mentioned that the last two festivals are performed by landowners only and may not be a communal festival.

2.1.24 Marriage :

A person of Oraon community can marry into any clan except his own. All the clans are equal in status. Infant marriage is rather unknown among the tribe. However, few wealthier men, at present and the influence of adjacent cultures (Hindu) practice child marriage for children, even before they attain puberty. Most people, however, marry after they attain puberty. In contrast to Reslay 1891, the Oraons of the Hili block appears to maintain high sexual morality. Sexual intercourse is prohibited among unmarried people. However, if it is detected the female member is tacitly punished by her family. In case of pregnancy of an unmarried girl, the headman of the community is contacted and marriage is arranged between the couple along with a feast which must include pork and drinks. The cost of the feast is borne by the father of the girl as punishment. Marriage of widows is not prohibited but it is uncommon among the Hili block Oraons.

3. Abiotic Factors

Ecology is the science of interactions among individuals, populations, communities and also of ecosystems, - a spatial organizational unit of biosphere which includes living organisms (biotic community) and non-living (abiotic environment) interacting to produce an exchange of materials between the living and non-living parts (Tansley-1935). The functioning of an ecological system is intimately related to the prevailing abiotic and biotic factors. Abiotic factors such as water, 0_2, NaCl, N_2, $C0_2$ etc.and other physical and chemicals influence the regulation of temperature, light, humidity, rainfall, pH etc. As such study of temperature, humidity, rainfall soil(physical and chemical nature) etc. are of much help in understanding the overall functional pattern of an ecosystem.

3.1 Geographical Background and Topography:

The district of West Dinajpur came into existence in 1947 by carving out of portion of Dinajpur of prepartition Bengal. The study block is situated on the eastern part of the district. As such the whole block is encircled by Bangladesh except on the western side lies the Balurghat block of the district. (Fig. No- 3.1). The West Dinajpur district was subsequently divided into two districts viz.- Dakshin Dinajpur and Uttar Dinajpur since 1st April 1992. Dakshin Dinajpur district is bounded by Uttar Dinajpur in the north and Bangladesh in the south and east while the Malda district forms the western boundary(fig.3.2). The geographical area of the district of Dakshin Dinajpur is 2,21,4.80 sq. k.m. with a total population of 1178594. The density of population is 532 per sq. k.m. and the area of the Hili block is 88.10 sq. k.m. with the total population 61806. The total number of S.T. population of this block is 12095, of which 6071 are males and 6024 are females (according to 1991 census). The district lies between $25^0 0' \ 10.55''$ and $26^0 \ 35' \ 15''$, North Latitudes $87^0 \ 48' \ 57''$ and $89^0 0' \ 30''$East Longitudes. It is situated 15 meter above the sea level.

The district is rather peculiar in shape, very much like the blade of a seythe. The flow of rivers show that the lands are flat, sloping gently towards south. Old as well as new alluvium deposits are found on the south and west of the district.

The district is mostly flat with alluvial plains, scrub jungles and stunted trees. The rivers vary from shallow stretches of low and to deeper depressions like old river beds.

The bed rock is metamorphic which is found at a very deep strata in the southern and middle parts of the district but such rocks appear at lesser depths in the northern part. The underground water level is suitable for installation of shallow and deep tube well through out the district.

The rivers of the district generally flow from north to south, as a result of gentle slope of land in that direction. Punarbhaba, Tangon, Atrai, Jamuna, Ghagra, and Chiri are the major rivers of the district, out of which only Jamuna, Ghagra and Chiri flow through the study block.(fig. 3.3). The present tribal settlement of this Block is also shown in fig. 3.1.

3.2 Meteorological Condition:-

Meteorological conditions of the study area is mostly similar to the district in general. During winter season, rainfall is associated with the passage of western disturbances traveling eastward and consequent incursion of moisture from the Bay of Bengal. On an average 10 to 30 m.m. rainfall occurs during the whole winter season which lasts only for three months. Nor-wester generally passes over the district in the month of March and April. Rainfall increases slowly and gradually along with the progress of the season. During late March to April occurrence of squalls of cyclonic storms and thunder storms are regular features with rains.

Normally premonsoon shower starts from the late April. As in other parts of the country the southeast monsoon brings the main rainy season in the district, and contributes 70 to 80 percent of the total annual rainfall. Usually, monsoon withdraws by mid-October.

3.3 Temperature, Humidity and Rainfall:

A maximum- minimum thermometer was used to record temperature, while humidity was recorded by a dry-wet bulb thermometer. The thermometer was reset at 4.00 to 5.00 p.m. each day. Dry-wet bulb readings were taken four times a day. i.e., at 5.00 to 6.00 a.m. (morning), 11 a.m. to 12 noon, 4.00 to 5.00 p.m. (afternoon) and 11.00 to 12.00

p.m. (night). Average monthly relative humidity was calculated from daily readings. Maxi. mini. temperature is presented in ^{0}c and humidity

in % by 7 LMT and 14LMT. Rainfall was recorded twice a day i.e., 6.00 to 7.00 a.m. in the morning and 5.00 to 6.00 p.m. in the afternoon with a conventional rain gauge. Rainfall data are shown in mm../month.

The yearly average maxi. mini. temperature prevailing in the study block was 24.66^{0}c and 15.46^{0} for 1996, while the annual average day-night temperature varied from 14^{0}c to 29.5^{0}c and 17.5^{0}c to 33.4^{0}c for the years 1997 and 1998 (table 3.1). January is the coldest month with an average maxi.-mini. temperature around 14.5^{0}c and 7.02^{0}c for 1996; 23.0 and 08.0 for 1997 and 20.50 as maxi. temperature for 1998. The daily maxi-mini. and highest maxi.-mini. temperature are shown in table 3.1 for 1996, 97,98 and 99 respectively. Overall, during the hot summer months, maximum temperature rises up to 39^{o}c and during the peak winter season, i.e, from late December to middle of January minimum temperature falls to even as low as 3.5^{0}c.

The annual average relative humidity is 85% and 58% measured in 7 LMT and 14 LMT respectively for the year 1997, and this value is 82% and 61% for the year1998 (table3.2)

The average monthly rainfall ranged from 1.00 m.m. to 512.3 m.m. The distribution pattern of rainfall is however irregular (Table 3.3) for the years 1996, 97, 98 and 99. Nearly 75% of rainfall occurs during April-October. The months from November-February are rather dry. Although rainfall during March - May is little, it is of considerable importance for the cultivation of paddy, jute and other crops in this area.

Considering the prevailing weather conditions in this region, a year may be divided conveniently into four main seasons: December to February: dry-cold; March to May: warm-moist with premonsoon showers; June to September: Wet-humid summer or hot monsoon; October to November: temperate moist autumn, with little rainfall till mid-October.

* Meteorological data were collected from Hili Govt. agricultural farm and Principal Agricultural Office, Balurghat, Dakshin Dinajpur.

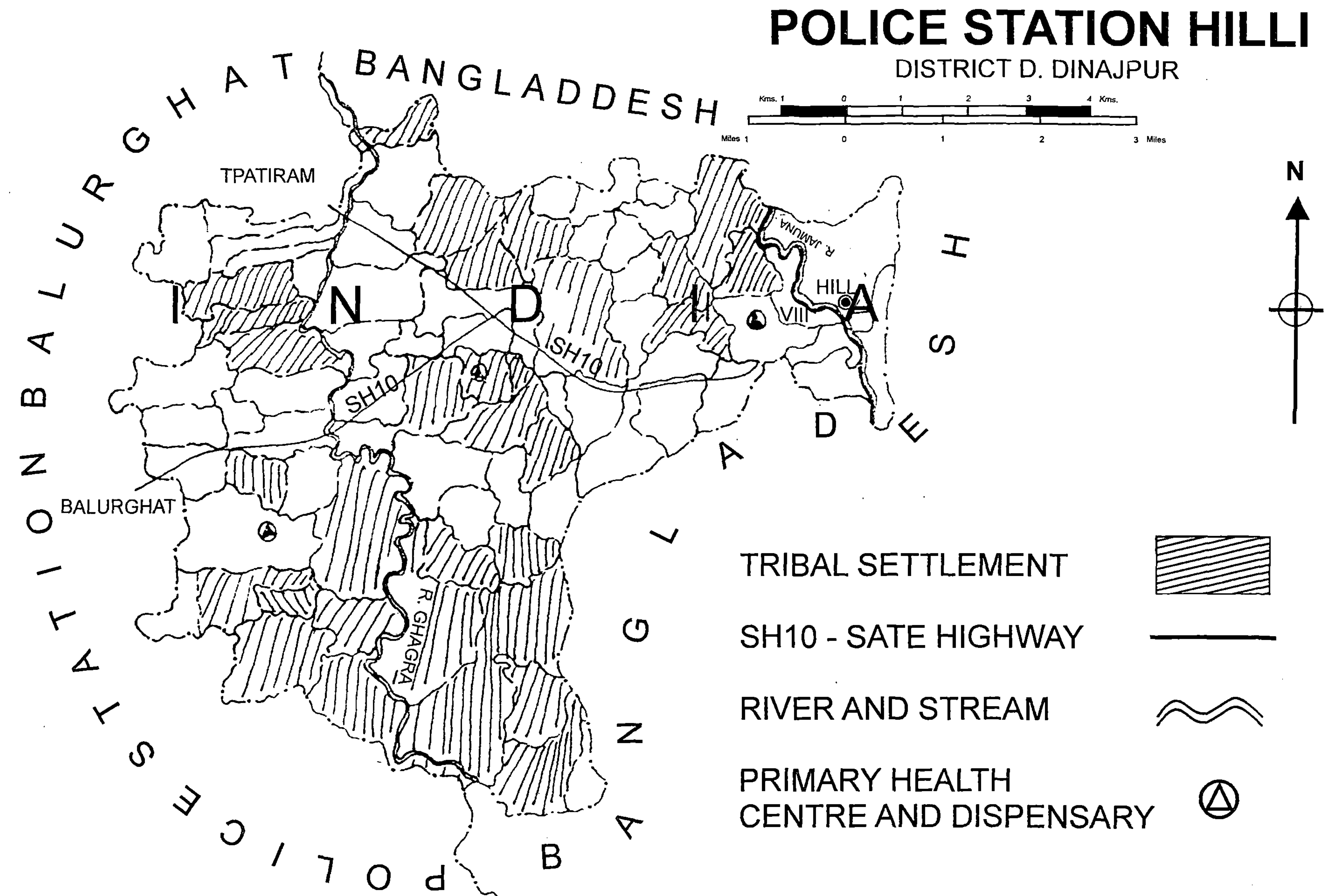

Fig - 3.1 Sketch Map of Hili Block Showing Tribal Settlement.

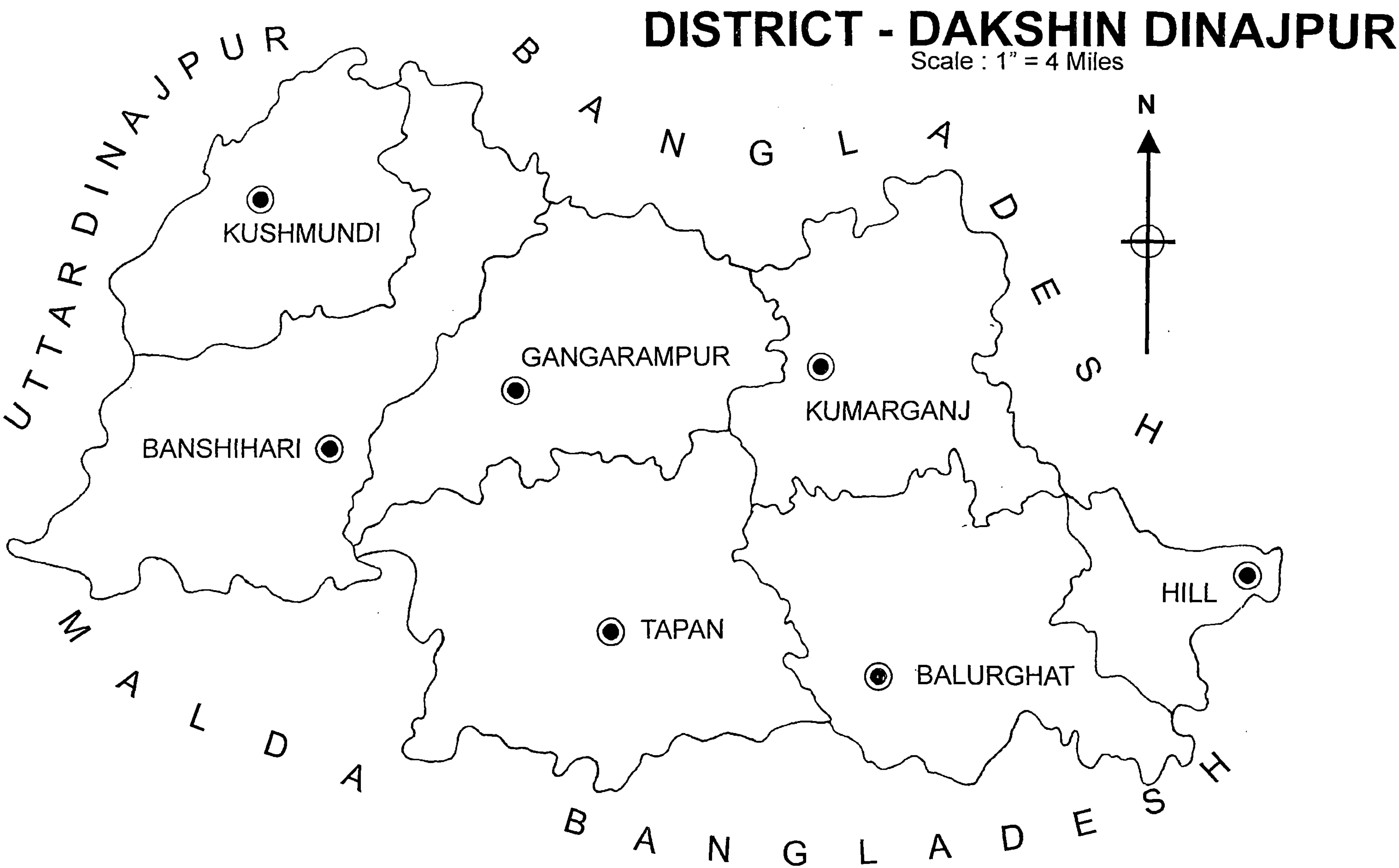

Fig - 3.2 Map of Dakshin Dinajpur District Showing The Position of Hili Block.

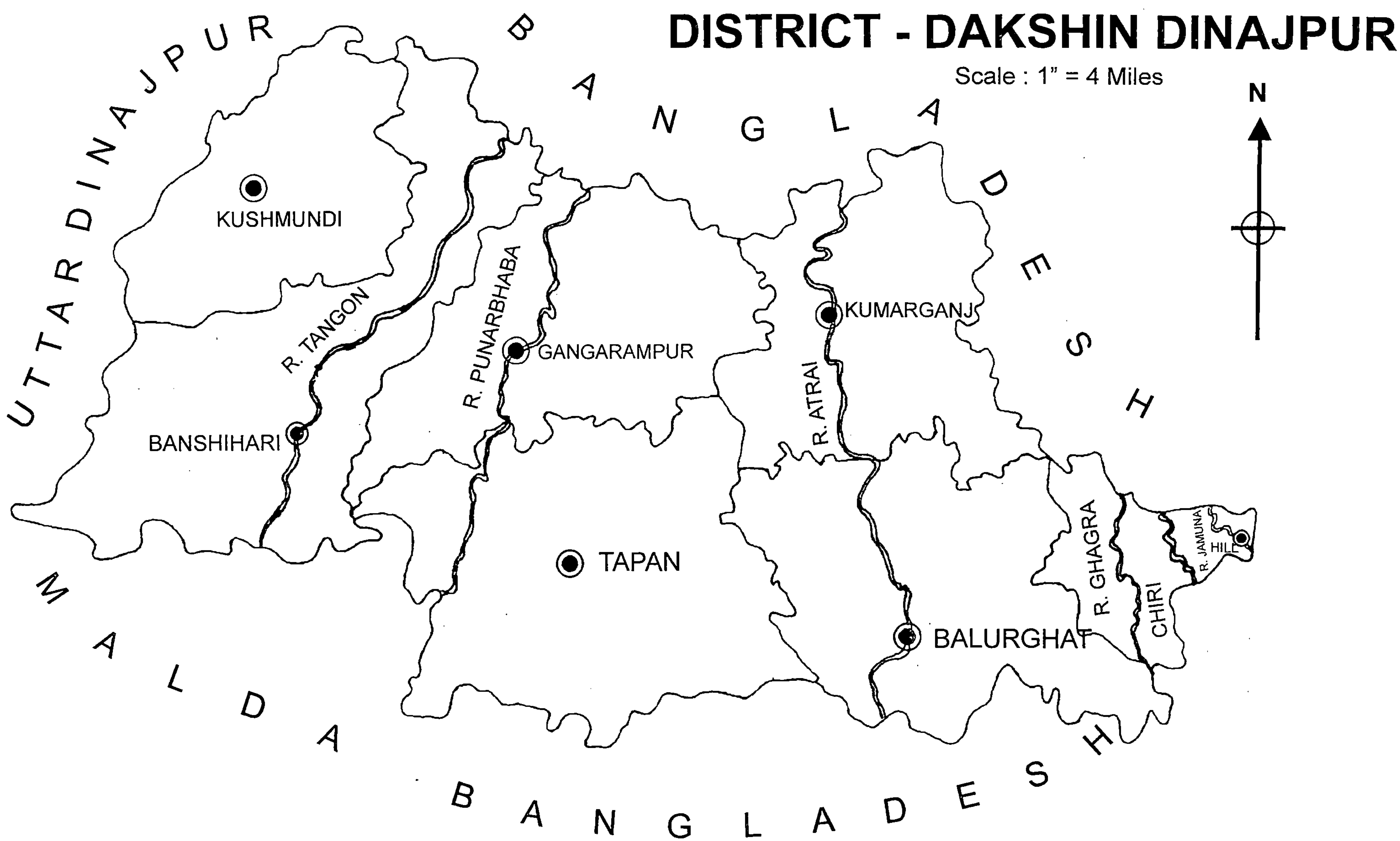

Fig - 3.3 Map of Dakshin Dinajpur District Showing Rivers of This District.

Table-(3.1) : Maximum- Minimum temperature in ^{0}c for 1996 and 1997 in Hili Block

Month	1996		1997 Means		1997	
	Max.	Min.	Daily Max.	Daily Min.	Highest Max.	Lowest Min.
January	14.50	7.02	23.00	8.00	25.20	4.60
February	16.50	8.66	24.70	9.70	27.80	5.80
March	21.94	14.88	31.00	15.80	34.40	11.00
April	25.76	17.64	30.10	17.80	34.40	13.80
May	34.02	20.06	34.20	20.80	38.20	17.00
June	27.15	18.40	33.50	22.80	38.40	19.40
July	28.10	22.60	31.80	24.10	33.60	22.40
August	28.02	22.54	31.70	24.10	35.40	22.40
September	28.89	22.10	30.70	-	33.00	-
October	26.85	14.48	30.40	-	32.60	-
November	25.05	9.43	28.60	-	31.50	-
December	19.08	7.65	22.90	-	27.80	-
Yearly Average	24.66	15.46	29.40	17.90	32.70	14.60

* - means not available.

Cont. Table(3.1) : Maximum - Minimum temperature in ^{0} c for 1998 and 1999 in Hili Block.

	1998	Means	1998	Extreme	1999	
Month	Daily Max.	Daily Min.	Height Max.	Lowest Min.	Max.	Min.
January	20.50	-	25.40	-	15.61	-
February	26.40	-	29.60	-	20.32	-
March	28.70	15.90	31.80	12.00	27.84	-
April	31.30	20.80	37.20	16.00	30.00	-
May	33.30	24.30	38.40	20.40	26.72	-
June	34.10	26.40	40.40	22.00	29.50	-
July	31.50	25.90	34.00	24.20	28.25	-
August	31.10	25.90	34.00	23.80		-
September	31.30	25.30	34.50	22.50		
October	31.20	23.30	34.20	19.20		
November	29.30	17.50	30.80	12.80		
December	26.20	11.90	28.60	8.60		
Yearly Average	29.50	21.70	33.20	18.15		

* - means not available.

Table (3.2) : Relative humidity in % for 1997 and 1998 in Hili Block

Month	Means of 1997		Means of 1998	
	7-LMT	14-LMT	7-LMT	14-LMT
January	91	43	90	56
February	87	40	77	41
March	72	43	73	40
April	82	54	76	51
May	80	52	79	64
June	86	65	84	67
July	87	75	88	77
August	83	77	88	80
September	88	79	86	77
October	84	63	85	71
November	85	52	78	55
December	91	58	80	49
Yearly Average	85	58	82	61

* - means not available

Table – (3.3) : Average rainfall (in m.m.) for 1996 and 1997

Month	1996	1997			
	Mean Monthly	Actual	Normal	% Departure	No. of Rainy Day
January	4.00	13.00	06.00	+116%	1
February	3.00	19.00	07.00	+171%	2
March	0.00	02.00	17.00	-88%	NIL
April	22.80	82.00	68.00	+21%	5
May	92.60	66.00	184.00	-64%	5
June	304.40	262.00	261.00	NIL	8
July	305.00	462.00	408.00	+13%	16
August	341.00	421.00	314.00	+34%	13
September	512.30	247.00	290.00	-15%	13
October	100.00	06.00	121.00	-95%	1
November	0.00	50.00	07.00	-29%	NIL
December	0.00	290.00	07.00	+314%	2
Total	1685.10	1726.00	1690.00	+2%	66

Cont.Table-(3.3) : Average Rainfall (in m.m) for1998 & 1999

Month	1998				1999
	Actual	Normal	%Departure	No. of RainyDays	Mean monthly
January	01.00	06.00	-83%	1	0.00
February	23.00	07.00	+200%	2	0.00
March	31.00	17.00	+82%	2	12.50
April	126.00	68.00	+85%	5	127.80
May	120.00	184.00	-34%	5	241.40
June	120.00	261.00	-54%	8	229.00
July	426.00	408.00	+4%	20	399.80
August	473.00	314.00	+50%	16	
September	506.00	290.00	+174%	12	
October	327.00	121.00	+270%	9	
November	01.00	07.00	+85%	1	
December	00.00	07.00	-100%	NIL	
Total	2154.00	1690.00	27.5%	81	

3.4 METHODS OF SOIL ANALYSIS :

3.4.1 Soil Samples:

Soil samples were collected randomly to a depth of 8-10cm.from different land types such as agricultural, fallow and grassland etc. Each sample consisted of soil drawn from eight to ten holes dug within an area of approximately 0.12 ha. About 800-1000gm.soil was taken from this pool and air dried under shed. Samples collected were grouped into land categories; labelled and packed accordingly into cloth bags. Parts of each samples were send for quantitative determination of available potassium, phosphorus and calcium, of the soil testing laboratory at Raiganj (Udaypur), Uttar Dinajpur. While quantitative estimination of soil temperature, moisture content, pH, total soluble salts (TSS) and percent organic carbon were done by the author following standard methods with the remaining part.

3.4.2 Determination of Sand, Silt and Clay percentage in soil :

Percent sand, silt and clay in soil was determined by the method proposed by Bouyoucos (1926). This method involves use of a hydrometer in the sample suspension to indicate the stages of settlement. In most cases, the results obtained by this method were in agreement with those obtained by the pipette method. In case of soils with high soluble organic salts breaking of some of the organic matter before dispersion was done. An initial digestion with hydrogen peroxide (H_2O_2) is generally adequate to break up any coagulating agents and this improves the dispersion of the finer particles. 10ml of 5% sodium hexametaphosphate was taken in a litre measuring cylinder and made up to 1(one) litre with distilled water. The suspension was thoroughly shaken and brought to room temperature, then a hydrometer was dropped in the suspension and the reading was determined as RL (callibration correction).

Three soil samples of about 35-40 gms. each were taken. All the samples were taken in separate beakers and 20 ml of distilled water and 5 ml of 30 % H_2O_2 were added. Then the beakers were covered with a watch glass and placed on a hot plate until most of the H_2O_2 decomposed. It was then allowed to cool. The process was repeated till the colour of the suspension become lighter and frothing stopped (More H_2O_2 will be required if the soil contained high organic matter). Following last addition of H_2O_2 the beakers were kept on a hot plate for at least two hours and then allowed to cool again. The solutions were then transferred in dispersing cups. 200 ml of distilled water and 10 ml of 5% sodium hexametaphosphate soln.was then added and the soil samples were allowed to soak for at least 15 minutes. The solutions were stirred with the help of a electric stirrer for 10 minutes.The whole suspension was then poured in a litre measuring cylinder and the volume was made up to 1(one) litre with distilled water. The mouth of the cylinder was closed with a rubber stopper and shaked for one minute. The cylinder was then placed on a table and time was recorded. First hydrometer reading was taken at the 4th (fourth) minute when particles larger than 0.02 m.m.will settle down. Following the first reading the suspension was allowed to remain undisturbed and again hydrometer reading was taken at the end of 5 hours from the starting time when particles larger than 0.002 m.m. will settle down. The hydrometer was callibrated at 67^0F(28.6^0c). Therefore, if work is performed at any other temperature, the temperature corrections are required. The temperature correction is equal to (X^0F-67^0F) x 0.2 or ($X^0C-28.6^0C$) x 2; where x is the room temperature.

The percentage of dispersed materials, remaining in suspension at any time is calculated by:

$$P = \frac{(R-RL.r)\times 100}{W}$$

Where, R = Hydrometer reading.

r = Temperature correction.

W = Dry (air-dry) Weight of soil sample

RL = Callibration correction.

3.4.3 Determination of moisture content :

About 75-100 gms. of Soil sample was collected from the site. The soil was then taken into a sample can and the lid was closed quickly. The cans were weighed to obtain fresh weight of soil. The oven dried samples at 80^0c to constant weight indicate the final dry weight. Percent moisture

content is given by the following relation:

$$\frac{\text{Loss of weight on drying}}{\text{Dry weight of soil}} \times 100$$

3.4.4 Determination of soil pH :

In the present study a digital pH meter (ECL p^H 5651) and a soil suspension by neutral pH water were used.5 gms.of fresh soil was taken and 10 ml. of neutral pH water was added. The mixture was stirred gently with a stirrer machine for a few minutes and allowed to stand for 15 minutes. The glass electrode was then immerged in the soil sample and pH was recorded to one decimal place.

3.4.5 Determination of total soluble salt (TSS) OR Conductivity of soil :

The conductance of the soil solution gives an idea of the total soluble salts of soil. Total soluble salts of soil were determined by the electric conductivity meter. The principle of determination of soluble salts by the measurement of electrical conductivity is based upon the fact that ions are the carriers of electricity and higher the amount of soluble salts greater would be the electrical conductivity of the system.

15 - 20 gms. of soil was taken in a 250 ml. conical flask and 50 - 65 ml. of distilled water was added to it. The mixture was then allowed to settle for a maximum of 30 minutes. The supernatant liquid was then decanted in a beaker and the electrode bulb was immersed into the solution. The conductivity of soil sample was recorded. The average of three sets of readings were considered as result.

3.4.6 Determination of soil organic matter :

Organic matter was determined from the organic carbon multiplied by a factor of 1.724 and is based on the assumption that the soil organic matter contains 58% carbon (Russel and Engel 1928). Organic carbon of soil was determined by the method developed by Walkley and Black (1934), in which chromic acid was used for oxidation. In this process, soil carbon was at first digest and then oxidised to CO_2 by nascent oxygen produced by the reaction of $K_2cr_2O_7$ and H_2SO_4 . CO_2 thus produced is liberated in the atmosphere as gas.

1 gm. $K_2cr_2O_7$ is equal to 0.003 gm. carbon. The requirement of $K_2cr_2O_7$ is determined indirectly by titration with ammonium sulphate (Mohrs. solution).

1 gm. soil sample was taken in 500 ml flask and then 10 ml of 1(N) $K_2cr_2O_7$ solution and 20 ml. conc. H_2SO_4 (containing Ag_2SO_4)was added and mixed thoroughly. The solution was then allowed to stand reaction from 30minutes.The mixture was diluted by adding 200 ml water and 10 ml of phosphoric acid. Then 10 ml of NAF solution and 2 ml of diphenyl amine (indicator) was added. The solution was then titrated with standard ferrous ammonium sulphate solution to brilliant green colour, diphenyl amine showed green colour in iron solution and purple in $K_2cr_2O_7$ solution. A blank (chemical without soil) titration was also performed. The average of three sets of readings was considered as result.

Percentage of carbon was determined by the following formula :

$$C (\%) = 10(1- T/s) \times 0.003 \times 100/\text{wt. of soil sample}$$

Where, T = ml. of ammonium of ferrous sulphate solution taken for titration.

S = ml. of ammonium of ferrous sulphate solution required to titrate the blank.

3.5 Results :

3.5.1 Soil texture : Soil particles ranging from 2.00-0.20 and 0.20-0.02 m.m. diameter are described as coarse and fine respectively. Where as 0.02-0.002 and below 0.002 m.m. diameter are silt and clay respectively. Amount of silt and clay particles determine the water holding capacity and nutrient availability of the soil. Table 3.4 shows the physical characteristics of the soil and its percentage. Table 3.5 shows the nature of the soil of cultivated land i.e., sandy (380ha.), sandy loam (4285ha.), loam (1060 ha.), clay loam (1075 ha.) and clay (700 ha.). Table 3.6 shows the percent sandy loam (57.13%) is more in the cultivated loam which is probably due to continuous crop practice. Less percentage of sandy loam (11.53%), loam (3.11%), clay loam (5.16%) and clay (6.89%) is found in the riverine soil, probably due to seasonal wash out of clay and silt particles to the river. According to the nature of the soil texture, the soil of Hili Block may be described as loamy in general.

3.5.2 Seasonal variation of soil moisture :

Table 3.7 shows the monthly variation of soil moisture percentage among different types of land at the study area. The water content of soil depends primarily upon the soil texture and topography. Percent moisture is more during the wet months and less in the dry ones in the cultivated and fallow lands mainly due to their soil texture and topography.

3.5.3 Chemical nature of soil :

Fertility status (Chemical nature) of soils of different land types of Hili Block is shown in the table 3.8 . Soil in the cultivated land is on the average acidic in nature while in the fallow and riverine lands are neutral. Conductivity of soil ranged from 0.01 to 1.7 m.m. hos./cm. which is conducive to plant growth. High conductivity at riverine land of down area (0.03 - 3.0) is critical for germination. This is probably due to lack of humus and more sandy nature of soil texture. Present organic carbon in different types of land at the study area ranged from 0.5 - 0.06 to 0.05 - 0.97. Soil rich in organic matter are generally rich in nitrates. Nitrate production is very rapid when soils submerged for long get exposed as a dried up pool. Very high percentage of organic carbon was recorded in the jute field and fallow land is probably due to dung manuaring, blockage of water and decaying of organic matter i.e., straw, leaves etc. Available phosphorus and potassium ranged from 0.05-100 to 4-125 kg/ha. and 30 -50 to 60 - 450 kg/ ha. respectivily. Low content of phosphorus and potassium are found only in the sandy riverine area.

Table – 3.4 : Physical characteristics of soils and groups :

Name of the Block	Area available for cultivation	Soil Groups			
		Predominant Group	% of total area	Other groups	0 % of total area
Hilli	7500	Alluvium	60	Alluvium	40

Table – 3.5 : Soil types (Texture) in cultivable area in ha :

Name of the Block	Sandy	Sandy Loam	Loam	Clay loam	Clay
Hili	380	4285	1060	1075	700

Table – 3.6 : Physical characteristics of soils in different land types at Hili Block in % :

Types of land	Soil Texture				
	Sandy (%)	Sandy loam (%)	Loam (%)	Clay loam (%)	Clay (%)
Cultivated land	5.07	57.13	14.13	14.33	9.33
Fallow land	10.18	50.25	14.15	15.05	10.37
Riverine grass land	73.31	11.53	3.11	5.16	6.89

Table – 3.7 : Percent moisture content in soil samples from different land types at Hili Block :

Month	Types	of	land
	Riverine grass land	Fallow land	Cultivated
January	11.01	10.12	9.99
February	12.53	10.98	11.10
March	14.03	12.00	11.25
April	14.80	12.70	11.68
May	18.73	19.55	18.98
June	20.00	20.14	20.73
July	21.89	21.97	23.81
August	22.71	22.89	24.35
September	21.05	22.10	21.04
October	20.16	19.15	17.06
November	18.03	16.10	15.45
December	13.15	12.11	12.43

Table- 3.8 : Fertility status of soil samples from different land types :

Types	0. C %	Range of	Nutrient Status	and P^H	m.m hos. E.C. basis
		Av. P_2O_5 kg./ha.	Av. K_2O kg./ha.	P^H	
Cultivated land	0.05-0.08	2-125	40-500	5.50 -7.00	0.01 – 1.40
Land under paddy cultivation	0.05-0.07	2-200	50-500	5.60 -7.50	0.02 – 1.60
Land under jute cultivation	0.05-0.92	4-125	60-450	5.70 - 8.00	0.02 – 1.70
Fallow land	0.05-0.97	1-250	59-450	6.90 – 8.60	0.03 – 1.90
Riverine sandy grass land	0.05-0.06	0.05-100	30-50	6.00 – 7.01	6.00 – 3.00

Table – 3.9 : Effect of traditional manuring of fertility status of soil in cultivated lands with reference to time after manuaring :

History	Chemical Nature					
	pH	TSS	C %	A.V.P.	A.V.K.	Cal %
Before manuring	5.80	0.07	0.80	36.12	105.00	0.450
After 15 days of manuring	5.40	0.22	1.71	26.50	80.90	0.141
After 30 days of manuring	5.70	0.21	1.60	32.10	158.10	0.117

Table 3.9 shows the chamical nature of soil in reference to their traditional manuaring practices.Usually the tribals (Santals, Mundas and oraons) are not prone to use chemical fertilizer in their agricultural fields. Usually the tribals dig a pit of varying size close to their hut and dump all kinds of organic waste materials such as: cow dung, kitchen garbage, domestic wastes, out - rooted woods etc.through out the year. Before cultivation they pick up the decomposed organic wastes from the pits and apply in the cultivation fields as a manuare approximately 10 - 15 days prior to ploughing.

Soil samples were collected for this study in three stages i.e., before manuring and on the 15th and 30th day after manuring. Percent organic carbon increased considerably in comparison to other nutrients such as Phosphorus, Potash and calcium. pH of the soil also remained almost unchanged. Influence of rainfall and other environmental factors on manuring were not considered.