CHAPTER - 3

PHYSICAL PROFILE

Physical profile of an area is manifest in its location, geology, relief, drainage, climate, soil, vegetation etc. All human activities are very much influenced by these elements which constitute an area's geographical environment. This environment sets the limits of and provides the opportunities for the development of an area or a region. In other words, the environment sets the tasks before the inhabitants to make efforts to exploit the opportunities and overcome the obstacles for their well beings. In fact, the utilization of land and man is greatly influenced by the geographical environment. It is imperative, therefore, to have an idea of the geographical personality of the study area by reviewing the elements of environment one by one.

Location :

Geographically, the study area, extends roughly between 25°16' N and 25°27'12" N latitudes and 85°2' E and 85°14' E longitudes. It is bounded in the north by the Punpun Block of Patna district, in

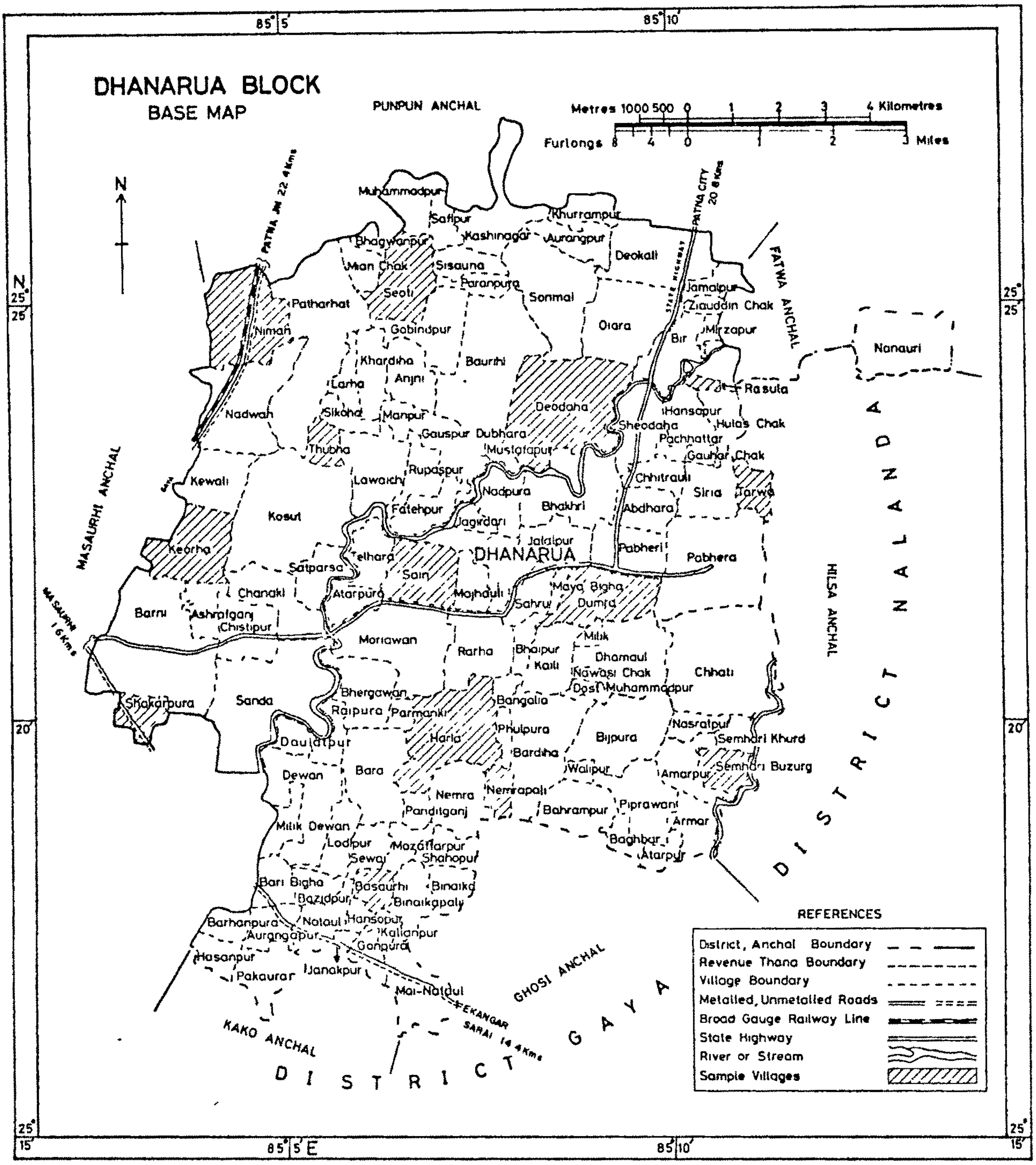
DHANARUA BLOCK
BASE MAP
PUNPUN ANCHAL
Metres 1000 500 0 1 2 3 4 Kilometres
Furlongs 8 4 0 1 2 3 Miles
N
PATNA JN 22 4 Kms
PATNA CITY 20 8 Kms
FATWA ANCHAL
MASAURHI ANCHAL
MASAURHI 1 6 Kms
HILSA ANCHAL
DISTRICT NALANDA
GHOSI ANCHAL
KAKO ANCHAL
DISTRICT GAYA
EKANGAR SARAI 14 4 Kms
DHANARUA
Muhammadpur
Safipur
Khurrampur
Bhagwanpur
Kashinagar
Aurangpur
Deokali
Mian Chak
Sisauna
Seoti
Paranpura
Sonmai
Jamalpur
Ziauddin Chak
Patharhat
Niman
Gobindpur
Oiara
Bir
Mirzapur
Nanauri
Khardiha
Baurthi
Larha
Anjni
Rasula
Nadwah
Sikona
Manpur
Deodaha
Hansapur
Sheodaha
Hulas Chak
Gauspur Dubhara
Pachnattar
Thubha
Mustafapur
Gauhar Chak
Kewali
Rupaspur
Chhitrauli
Lawaich
Nadpura
Siria
Tarwa
Kosut
Fatehpur
Bhakhri
Abdhara
Jagdari
Keorha
Jalalpur
Telhara
Pabheri
Pabhera
Satparsa
Sain
Chanaki
Atarpura
Majhauli
Maya Bigha
Barni
Ashrafganj
Sahru
Dumri
Chistipur
Moriawan
Milik
Rarha
Bhaipur
Dhamaul
Kaili
Nawasi Chak
Chhati
Dost Muhammadpur
Shakarpura
Sanda
Bhergawan
Bangalia
Raipura
Parmanki
Nasratpur
Phulpura
Harla
Bijpura
Semhari Khurd
Daulatpur
Bardiha
Walipur
Amarpur
Semhari Buzurg
Dewan
Bara
Nemra
Nemrapali
Panditganj
Bahrampur
Piprawan
Armar
Milik Dewan
Lodipur
Mozaffarpur
Baghbar
Atarpur
Sewai
Shahopur
Bari Bigha
Basaurhi
Binaika
Bazidpur
Binaikapaly
Barhanpura
Nataul
Hansopur
Aurangapur
Kalianpur
Ganpura
Hasanpur
Pakaurar
Janakpur
Mai-Nataul
REFERENCES
District, Anchal Boundary
Revenue Thana Boundary
Village Boundary
Metalled, Unmetalled Roads
Broad Gauge Railway Line
State Highway
River or Stream
Sample Villages
85°5'
85°10'
85°5'E
25°25'
25°20'
25°15'

Fig 3 1

the south by the Gaya district, in the west by the Masaurhi block of Patna district and in the east by the Nalanda district. It comprises 122 villages and is a part of Masaurhi subdivision of the Patna district (Fig. 3.1). Dhanarua Block lies in the southern most part of Patna district covering an area of 18,555 hectares (185.55 Km^2) and is situated 20 Km south from Patna city proper (Fig. 3.2).

Dhanarua Block is a small segment of the Magadh Plain, the central section of the Middle Ganga Plain. Magadh Plain stretches from River Sone in the west to River Kiul in the east and from the northern scarp face of the Chhotanagpur plateau in the south to the River Ganga in the north. It is very well connected by the Patna, the State Capital and Gaya, the district headquarter of that name and an imported commercial centre by the road Patna-Gaya State Highway. This highway also links it with north Bihar through the by-pass road connecting it with the Mahatama Gandhi Setu at Guljarbag, Patna. This highway passes through the central part of the Dhanarua Block. It is also connected with the Patna-Gaya branch line of the Eastern Railway.

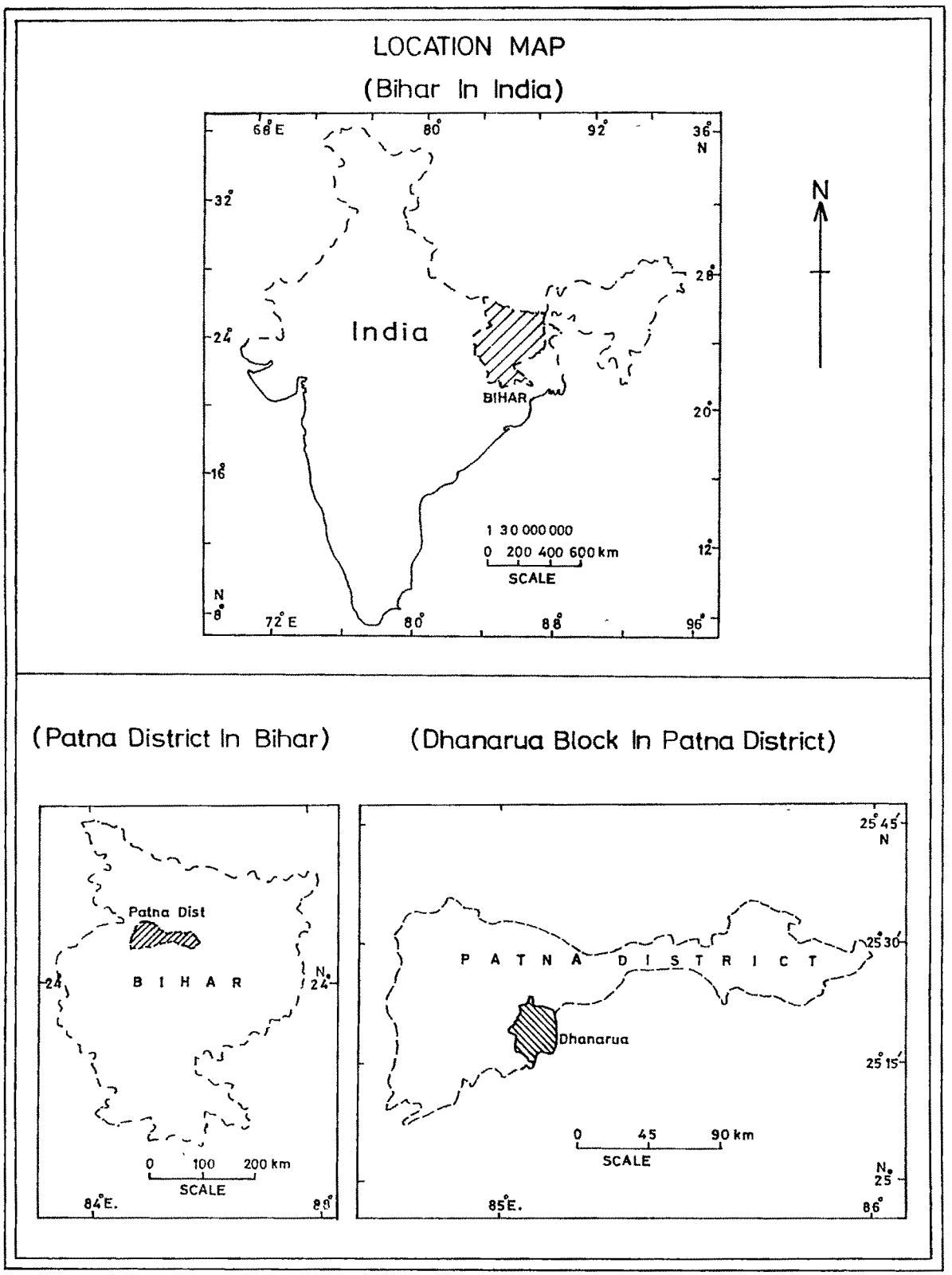
LOCATION MAP
(Bihar In India)
68° E
80°
92°
36° N
32°
28°
24°
India
BIHAR
20°
16°
1 30 000 000
0 200 400 600 km
SCALE
12°
8° N
72° E
80°
88°
96°
N
(Patna District In Bihar)
(Dhanarua Block In Patna District)
Patna Dist
B I H A R
24°
N. 24°
0 100 200 km
SCALE
84° E.
88°
25° 45' N
25° 30'
P A T N A D I S T R I C T
Dhanarua
25° 15'
0 45 90 km
SCALE
N. 25°
85° E.
86°

Fig. 3-2

Dhanarua Block is located in a rich paddy, wheat and lentil dominated agricultural area. This area's transport links with the cities and towns of Patna, Gaya, Jahanabad, Masaurhi, etc., in a favourable position in respect of trade and commercial transactions with the neighbouring areas.

Relief :

The study of relief of any area is important not only from the point of view of the analysis of the nature and extent of its physical layout, drainage, soils, vegetation, transportation link, etc., but also from the stand points of utilization of natural endowments (through land utilization) upon which the level of utilization of human resources depends, especially in an agricultural area.

The study area forming a part of the Middle Ganga Plain, its relief is very simple. There are no hills or hillocks, monadnocks or bedrocks etc. It is entirely featureless and level plain. Yet the differences of slopes or levels are obvious which require detailed study. Such differences break the physiographic monotony of the area. The variation in slope might have been brought about by the differential deposition of

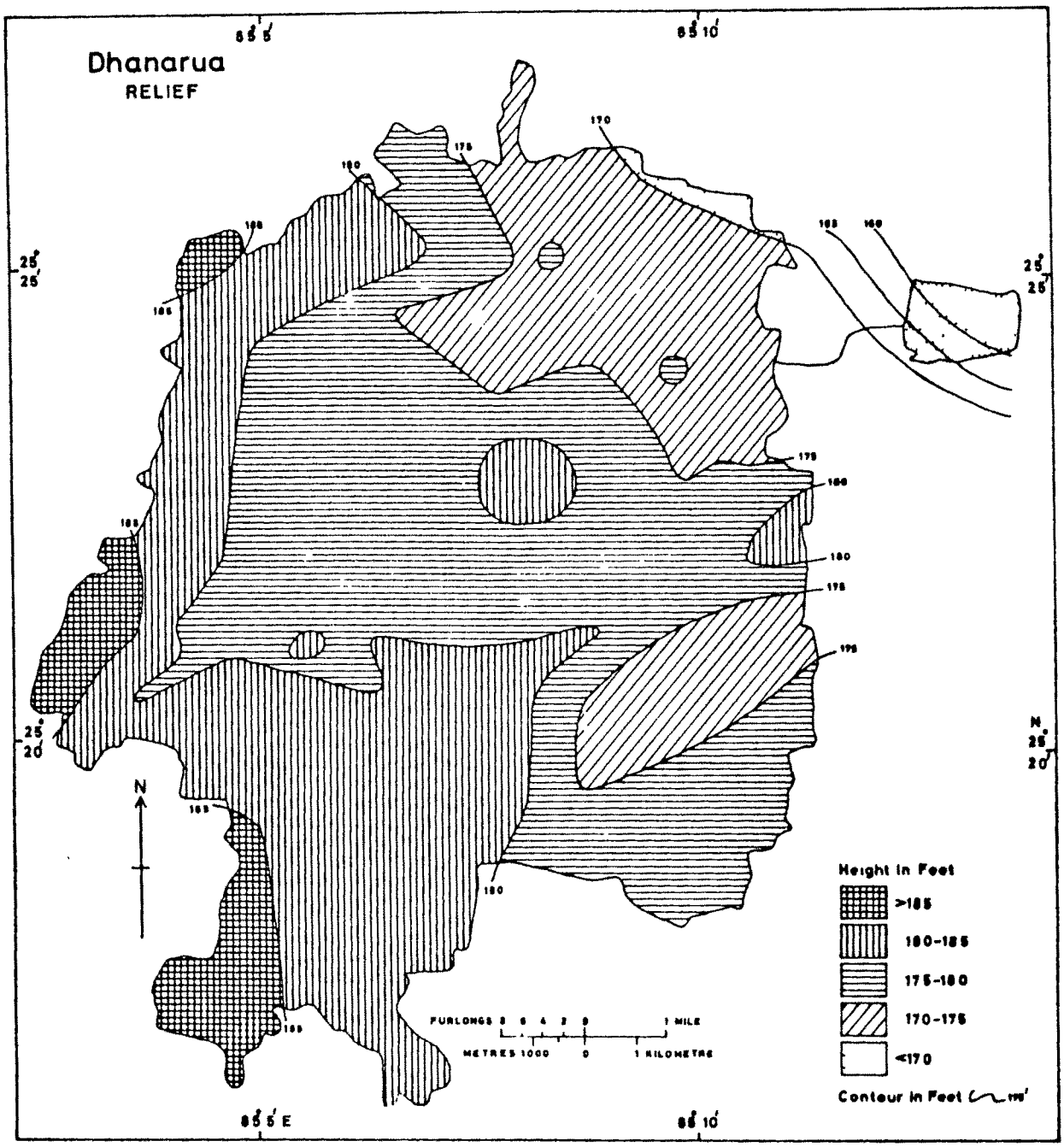
Dhanarua
RELIEF
85° 5'
85° 10'
25° 25'
25° 20'
N
170
175
180
185
>185
180-185
175-180
170-175
<170
Height in Feet
Contour in Feet
FURLONGS 8 6 4 2 0 1 MILE
METRES 1000 0 1 KILOMETRE
85° 5' E
85° 10'

Fig 3 3.

detritus by the rivers during their recurrent floodings.

The relief map of the area (Fig. 3.3) shows a five - fold division based on form lines drawn with the help of spot - heights shown on the topographical maps.

1. Very high level land above 185' above mean sea level.
2. High level land between 180' and 185' .
3. Intermediate level land between 175' and 180'.
4. Low level land between 170' and 175'.
5. Very low level land below 170'.

1. Very High Level Land :- It lies separated into three patches along the south western, western and north western margine of the area. The highest point (187') lies in the south - western corner and the second highest point (186') lies in the north-western corner of the area. This very high level land covers an area of about 1108 hectares which is about 5.95 % of the total geographical area. Out of this only 866 hectares of land were under agricultural use which accounted for only 5.73 % of the total cultivated land in the block.

It comprises only 6.55 % of the total utilized manpower of the area. An average density of population per village in this part was 840 persons/Km^2. This section of the area does not come under the influence of normal floods. Its general slope is from south - west to north - east draining adequately through the rivers Dardha and Morhar.

2. High Level Land :- It lies just to the east of the very high level land. Three isolated patches of this elevation are also found in the central portion (182') on the eastern margine (181') of the intermediate level land (Fig. 3.4). It covers an area of 6118 hectares (32.96 %) of the total geographical area of the Block, out of this 4888 hectares land were under agricultural use which accounted for 32.32 % of the total cultivated land in the Block. This comprises 30.95 % of the total utilized manpower of the block. An average density of population was 650 persons per Km^2. This part also slopes from south-west to north-east discharging the rain water through river Dardha, a tributary of river Punpun. This level land merges gradually into the intermediate level land on the one hand and very high level land on the other.

3. Intermediate level Land :- It occupies mostly the central portion and partly the south-eastern and north-western portion of the area. Other two small isolated petches of this land form in enclaves low level plain, standing at heights of approximate 178' and 176' respectively (Fig. 3.4). This land also slopes in the north-eastern direction. The rain water is drained through rivers Dardha, Saima, Baldaha, Bhutahi and Kararuwa. This land spreads over an area of 7129 hectares forming 38.42 % of the total geographical area, out of this 5920 hectares land were under agricultural use which accounted for 39.15 % of the total cultivated land of the Block. There were 14417 or 40.29 % of the total manpower engaged in various economic activities. An average density of population in this part was 610 persons per Km^2. This is the largest part of the study area. It merges gradually into high and low level lands.

4. Low Level Land :- It lies in the north-eastern corner of the area. One isolated patch of this is also found in the south-east corner projecting towards high level land and it is surrounded on three sides by the intermediate level land. It slopes from south-west to north and north-east. The rivers Saima,

Baldaha and Bhuthai pass through this isolated part of the low level land. The bigger portion of this land at this level spreads in the north-eastern corner, which also contains the lowest point(171') of this category. The rivers Dardha and Kararuwa drain the area towards the north-eastern direction. The river Morhar forms its northern boundary and discharges the rainy water into the river Punpun. This low level land frequently comes under the influence of floods during the rainy season with normal sourth-west monsoon rains. The crop yields in this area are quite good. During the rainy season some patches of this land become water logged and the rabi crops are sown only after they recover from it.

This level land covers an area of 3920 hectares that is 21.13 % of the total geographical area of which 3210 hectares (21.09 %) is devoted to agriculture. 7204 (20.07 %) of the total manpower was engaged in various economic activities. An average density of population in this part was 337 persons/Km^2.

5. Very Low Level Land :- It covers only one village of this Block which is an inclave in the neighbouring Block, Hilsa. This village stands below the 170'elevation,

the lowest point of the area discending to 156' in the northern part of the village. This land covers an area of 280 hectares forming 1.51 % of the total geographical area, out of this 239 hectares land were under agricultural use which accounted for 1.57 % of the total cultivated land of the Block. 2.04 % of the total manpower of the Block was engaged in various encomomic activities.

Now, let us see if there is any relationship between the micro-relief of the area on the one hand and cultivated land and manpower utilization on the other. For this the Contingency Coefficient Correlation method has been used. This method is used when each of two or more variables under study has been classified into two or more categories. This method provides a measure of correlation between the variables used.

The table -3·1 shows the computation of C (correlation) in a 4 x 2 fold classification and gives the joint distribution of land under cultivation and manpower utilized in agricultural activities with respect to micro-relief (elevation) of the area.

Table - 3.1

Influence of Micro-Relief on the Utilization of Land and Manpower.

The Coefficient of Contingency, C.

Height in Feet (X)	Cultivated Land in ha. (Y)	Agricultural Manpower (Y)	Total
More than 185'	124 (131.25)	276 (268.75)	400
180' - 185'	119 (112.55)	224 (230.45)	343
175' - 180'	118 (119.44)	246 (244.56)	364
170' - 175' + Less than 170'	144 (141.75)	288 (290.25)	432
Total	505	1034	1539

Source. : Census Report of 1981.

Ref:- Figures unbracketed in the cells are called observed frequencieswhich are average figure of the villages of each micro-relief category, based on the data of the Dist.Census Handbook-1981. Bracketed figures are called expected frequencies.

The formulae for calculating Coefficient of Contingency, C, is as follows :

$$C = \sqrt{\frac{S - N}{S}}$$

where, S is the sum of the quotients or

$$S = \frac{(\text{Observed frequency})^2}{\text{Expected frequency}}$$; N is the totals of all categories (1539) and Expected frequency (E)

$$E = \frac{\text{Row Totals x Column Totals}}{\text{Grand Totals}}$$

$$\therefore\ C = \sqrt{\frac{S - N}{S}}$$

$$= \sqrt{\frac{1543.24 - 1539}{1543.24}}$$

$$= \sqrt{\frac{4.24}{1543.24}} = \sqrt{.003} = .05$$

Now, $C = \sqrt{\frac{X^2}{N + X^2}}$ (in context of X^2(chi square)).

After solving or simplifying this formulae we get,

$$C^2N + C^2X^2 = X^2$$

$$\therefore \quad X^2 = \frac{C^2 N}{X^2 - C^2}$$

$$= \frac{4.617}{0.997} = 4.63$$

Conclusion :- After finding out the value of C and its relation to X^2 it can be stated that the influence of micro-relief, where there is no remarkable contrast, is positive but negligible due to very poor C of 0.003 and X^2 of 4.63 which for 3 degree of freedom is not significant at the .01 and .05 levels.

Drainage :

Relief and slope determined by geological structure and its history act as dominating factors shaping the drainage pattern in any area. These not only account for the amount and flow of water in streams but also control the direction and density etc.

The whole study area is drained by the rivers Dardha, Morhar, Kararuwa, Saima, Baldaha and Bhutahi (Fig. 3.4). Among them river Saima, Baldaha, Bhutahi and Kararuwa take their birth from River Phalgu. River Saima and Baldaha combine into one river at a place in south-eastern corner of the area from where

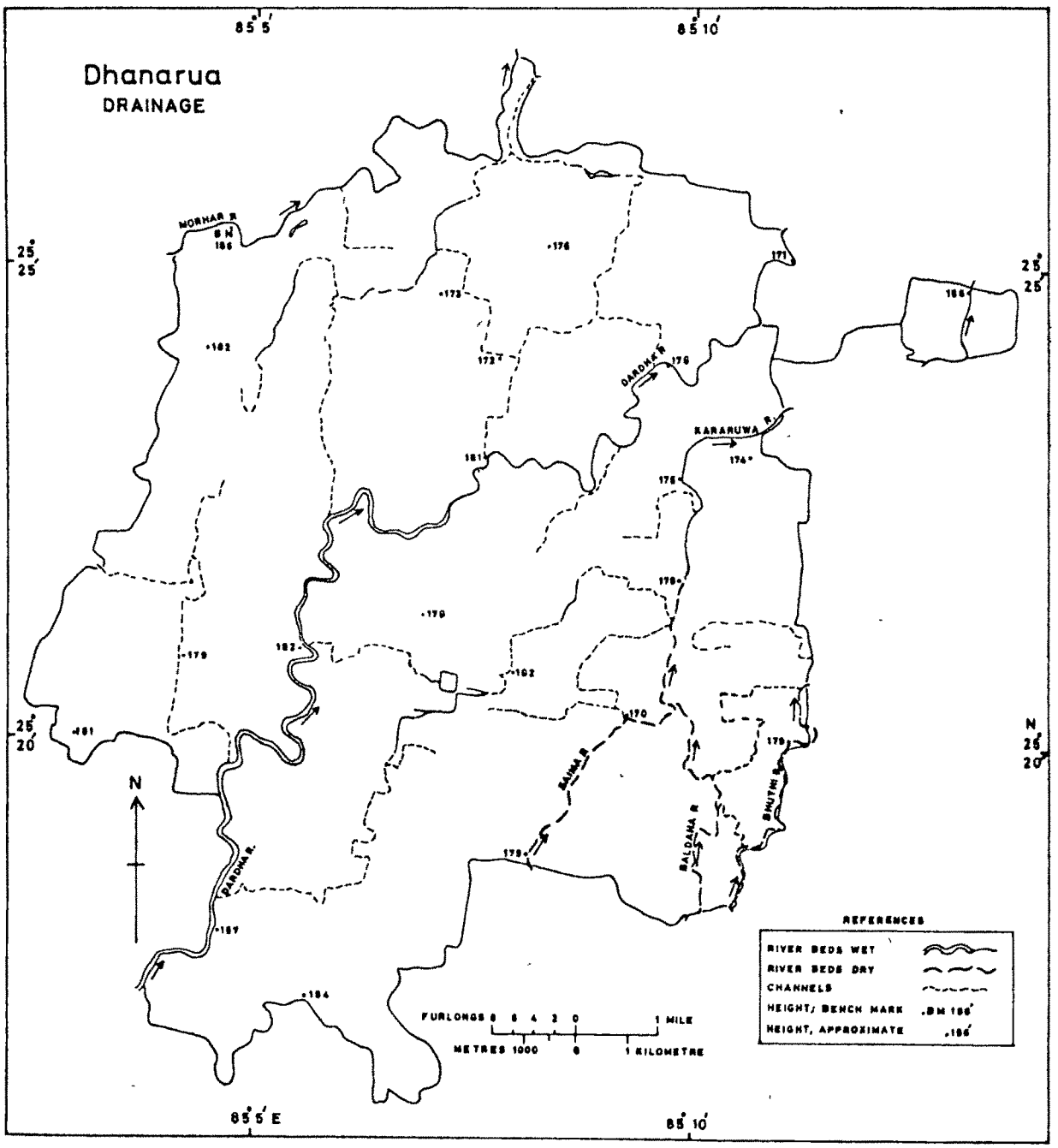
Dhanarua
DRAINAGE
85° 5'
85° 10'
25° 25'
25° 20'
N
MORHAR R
BM 186
DARDHA R
KARARUWA R
RAMA R
BHUTHI R
BALDAMA R
REFERENCES
RIVER BEDS WET
RIVER BEDS DRY
CHANNELS
HEIGHT, BENCH MARK
HEIGHT, APPROXIMATE
FURLONGS 6 5 4 3 2 0 1 MILE
METRES 1000 0 1 KILOMETRE
85° 5' E
85° 10'

Fig 3 4

it is known as Kararuwa which flows through the eastern part of the area.

Dardha is the main river of this area and flows through the central part from the south-west to the north-east. It takes its birth from river Jamunaiya on the south Bihar Plateau and drains into river Punpun. It divides the whole area almost into two equal parts.

The river Morhar determines the northern half boundary of the study area and flows from west to east and north-east and ends into river Punpun.

All these rivers have been classified into two categories on the basis of their beds. In Fig. 3.4 'wet' river beds and 'dry' river beds are shown. On this basis river Dardha, Kararuwa and Morhar are called the wet beds rivers and the remaining rivers are dry beds rivers. All these are rainfeed rivers. During rainy seasons these rivers spill over their banks and flood the adjoining areas.

The broken thin line (Fig. 3.4) shows the channels through which water of the rivers spreads in the study area. It seems that no part of the area

remains untouched by the channels.

The study of the influence of these rivers on the utilization of land is essential because the rate of utilization of manpower depends primarily on the rate of land utilization in this area. As these rivers are not perennial, their usefulness in respect of land utilization is somewhat limited. Agriculture in the area greatly depends upon monsoon rainfall. But during pausity of rains, sometimes earthen dams are put across the rivers to make up stream water force through channels leading to the fields. Or river water is lifted by centrifugal pumps or indigenous methods of Karing or Latha-kunri. With the latter method land on the river banks can be irrigated through out the year to grow a variety of crops. Besides, the flood water bring with its fertile silts which serves as natural fertilizer. But with very heavy and sudden rain in the upper catchment areas of these rivers bring floods in a major part of the area. The slope being very gentle and sometimes imperceptible the floods water recede very slowly particularly in the eastern and north -eastern portion of the area which harm the standing paddy crops. During the year of severe floods the utilization of manpower is hampered in the area which

causes movement of manpower (particularly agricultural labourers) to urban areas or to other agricultural areas within or outside the state in search of work.

The flood water also saturates the soil to keep it moist for the following rabi crops, which to a considerable extent compensates for the loss of crops and work during the Kharif season. But again, if the flood water stagnates, even the rabi sowing is prevented, which starts an out migration of agricultural labourer on a mass scale dislocating the entire economic and social balance.

In the year 1974, the utilization of land and agricultural human resources was completely disrupted by the flood during the rainy season, and Kharif crops could not be taken from most part of the area. In the year 1984 also almost the same situation prevailed, but only half of the area, that lies in the Intermediate level, low level and very low level land (Fig. 3.3), was badly affected and the Kharif crops were destroyed in the fields.

The measures to control floods or to meet the situation during the floods may give employment to the available manpower in the area, for example, construction of river embankments, drainage channels,

and check-dams etc. Measures may also be taken to minimize the hardship of the labour force to check their migration to other areas, specially outsides the state.

Climate and Irrigation :

Every aspect of human activity is influenced by the nature of climate. Better climate favours the development of better human resources. The physical and mental capacity to sustained work depends upon the favourable climatic conditions. Land utilization is also very much influenced by the climate of the region. The changes and variation in the utilization of land and man are also the result of the changes and variation of climatic conditions.

Therefore, it is essential to study the climatic conditions of the area concerned. Dhanarua block does not have a meteorological station. Only rainfall record is maintained at the block office. The temperature figures for Patna (25 Km to the north) has been considered fairly representive of the area's temperature.

The mean annual temperature of this area goes above 20°C and the mean daily temperature is about

25.7°C. The mean daily temperature in January the coldest month has been recorded varying between 15°C to 20°C. The mean daily temperature of April goes above 30°C, while it is 25°C to 30°C in July and above 25°C in the month of October.

Table - 3·2

Seasonal Percentage Variation of Rainfall From 1975-84.

Year	Winter % *	Summer %	Rainy %	Total Rainfall in mm
1975		1.34	98.66	896
1976	2.30	3.09	94.60	1393
1977	17.10	5.34	77.56	1552
1978	11.26	9.90	78.83	1020
1979	14.53	6.49	82.23	647
1980	2.55	1.77	94.73	1100
1981	7.34	5.02	87.64	817
1982	8.07	23.92	67.95	508
1983	9.86	9.77	80.27	522
1984	3.42	3.63	92.95	702
AVERAGE	7.64	7.27	85.09	875.7

Source : Office of the B.D.O. Dhanarua.

* Percentage to Total Rainfall of the Respective years.

SEASONAL PERCENTAGE VARIATION OF RAINFALL

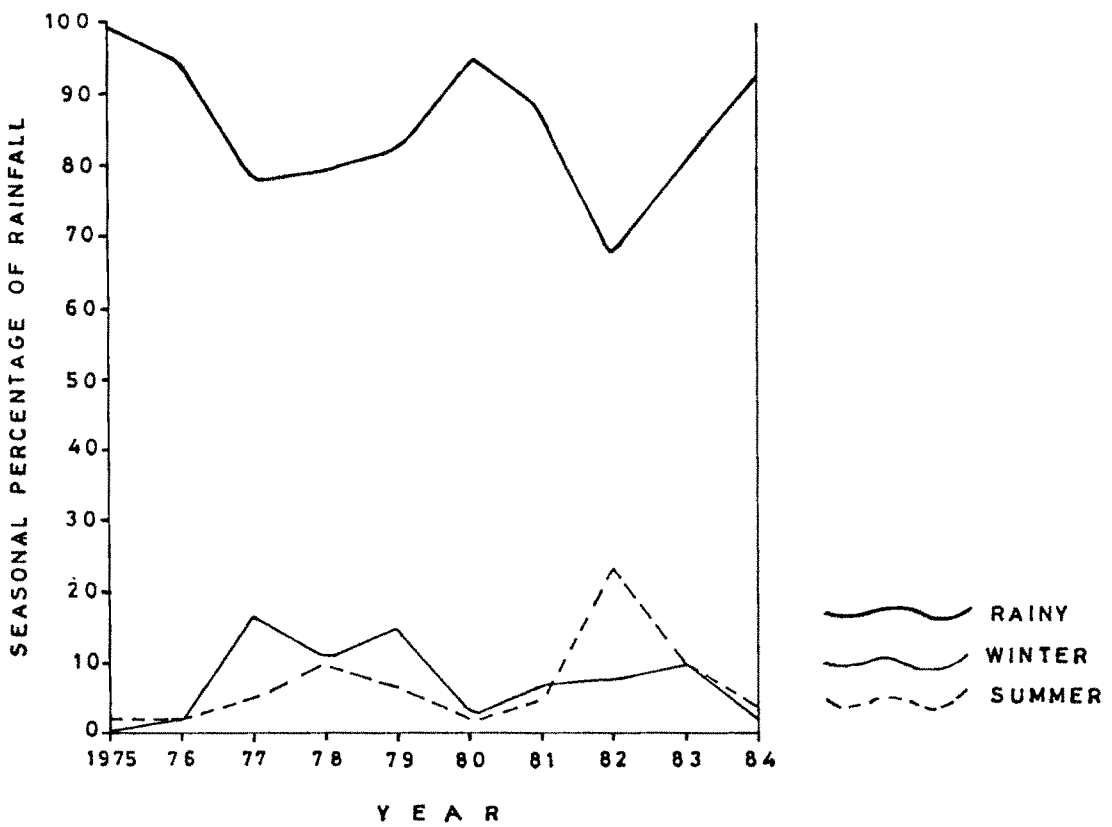

Fig. 3.5

Above table shows the distribution of percentage variation of rainfall in winter, summer and rainy seasons and the diagram (Fig. 3.5) shows the percentage trend of rainfall during the same seasons from 1975-1984.

It is observed that within a period of ten years the variation in rainfall ranges between 500 mm (minimum 1982) and 1400 mm (maximum 1976) with the mean of 876 mm. Average percentages of ten years show that 7.64 %, 7.27 % and 85.09 % of rain fell during the winter, summer and rainy seasons respectively.

The diagram (Fig. 3.5) clearly shows that during winter season the maximum amount of rainfall was in 1977 and minimum in 1976 and there was no rainfall at all in 1975. During summer the maximum rainfall was in 1982 and minimum in 1975. It is to be noted that the minimum rainfall both in winter and summer was in 1975 and on the basis of this it may be assumed that there would have been need of irrigation for rabi and garma crops. During rainy season the maximum amount of rainfall occurred in 1975 and minimum in 1982. It is observed that generally the cyclic increase and decrease occur at an interval of two years. This characteristic may be similar to that of other parts of the state.

This variation indicates the possibility of fluctuation in the nature and amount of the utilization of land and manpower resources since they very much depend upon the amount of rainfall. The amount of rainfall received during different seasons has led to the division of the year into four agricultural seasons, namely Bhadai, Aghani, Rabi and Garma (or Zaid).

During these agricultural seasons the requirement of manpower also varies. Even during the same agricultural season the demand varies with the agricultural operation. While ploughing the fields and sowing the seeds the manpower demand is heavy, during harvesting the demand is heaviest. The success of these agricultural seasons very much dependents upon the amount of and regularity of rainfall received.

It has, therefore, been observed that the area frequently experiences both the conditions of floods and draughts which act as the major factors in the variation of the utilization of agricultural land and agricultural manpower. This variation is called seasonal variation of manpower utilization. This phenomenon is responsible for surplus manpower in one season and dificit in another.

The unreliability and irregularity of rainfall makes irrigation essential of the area. With efficient and adequate irrigation facilities manpower may be kept employed throughout the year. But the situation is far from satisfactory. The following table gives an idea of irrigation by various means in the area.

Table - 3·3

Means of Irrigation

Non-Electrified Wells %	Electrified Wells %	Rivers %	Ahar and Pynes %	Unirrigated %
29.27*	24.44	3.27	28.27	14.25

Source : Census Report of 1981.
* percentage to total cultivated lands.

The most reliable source of irrigation are supposed to be wells and other electrified wells which operate through electric motors. They are supposed to irrigate 24.44 % of the agricultural area but owing to inefficient, and intermittents and irregular supply of electricity their full potential is not realised and much less land is actually irrigated. In contrast, non-electrified wells fitted with centrifugal

pumps operated by diesel oil are more reliable, provided diesel is made available in time and in adequate quantity, which is also not the case. The wells equipped with Persian wheels are rather more reliable, though their capacity is limited. These wells (pumping set and Persian wheel equipped) account for the irrigation of about 29.27 % of the agricultural land . Rivers provide water for lifting by centrifugal pumps or indigenous means of Karing or Latha Kundi and irrigate 3.27 % of agricultural land along the river and their immediate vicinity. Other means of irrigation are Ahars and Pynes which together with the rivers are dependent on adequacy of rainfall and therefore not reliable for irrigation during draught or deficient rain when irrigation is most needed.

Though the area unirrigated appears to be only 14.25 % of the agricultural land, the above discussion shows that the actual area not irrigated is much larger. Therefore, the need is to make the supply of electricity and diesel oil regular and adequate so that agricultural operations may be carried out all the year round. Thus providing employment for the rural manpower throughout the year.

Soils and Vegetation :

Soil is a natural body developed by natural forces acting on natural materials. It is the natural medium for plant growth and is a very significant element of land resources. In spatial context it is either deep or shallow, rich or poor, but everywhere it consists of minerals, organic materials, water and air, etc. Its physical and chemical properties determine the distribution and selection of crops as well as use capacity and carrying capability of land.

The soil of the area is fertile and suitable particularly for paddy and wheat crops. It is also suitable for sugarcane cultivation. Other crops like maize, gram, lentil, khesari (pulses) and oil seeds also grow well in the soil of the area.

Since the study area falls in the geographical region of Middle Ganga Plain which is characterised by the recent alluvium. This area is also covered by the same soil. It has been classified into two groups on the basis of texture. They are locally known as loam (Domat) and clay (Kewal).

The sandy loam soil covers comparatively a smaller part of the area and is localized along the banks of the river in linear belts. It is suitable mainly for Bhadai and Rabi crops and the irrigation need is met by the river water. Maize, wheat, spices, oil seeds etc. grow well in this type of soil.

The most fertile and important soil of the area is the clay loam. It is suitable for the growth of both Kharif (paddy) and Rabi (Wheat , masur, oil seeds) crops because it has the capacity to retain moisture for a longer period. In this soil deep cracks develop during the dry summer season which promotes aeration and helps fertility.

There is no significant natural vegetation any where in the area except in Madhuban which also has been almost cleared for the rehabilitation of land less labourers. Only planted trees are found here and there. There are some mango groves and orchards in the area. Palm trees stand prominently along the some tracks and embankments.

During the rainy season some aquatic grasses grow in water - logged areas. These grasses are

locally known as Motha, Arraiya, Kakana, etc.

Evidently, there is no impact of natural vegetation on the utilization of land and manpower resources.

Transport Links :

Transport is one of the most important infrastructures for the development of a region. It is not less important than agriculture or industry. Unlike natural resources that are given by nature, transport is the product of man's effort and consequently it is known as a cultural resource. This is considered as an economy's capital upon which development of a region depends equally as upon other infrastructure of the development. Transport links are in the nature of a facilitative structure that promotes general economic activities. Transport links facilitate movement of labour, raw materials, fuels, different tools from place to place. They help to broaden the markets for goods. It does not matter, whether the area under study is very large or small, the transport links affect equally in the development of an economy.

The map of transport links (Fig. 3.6)

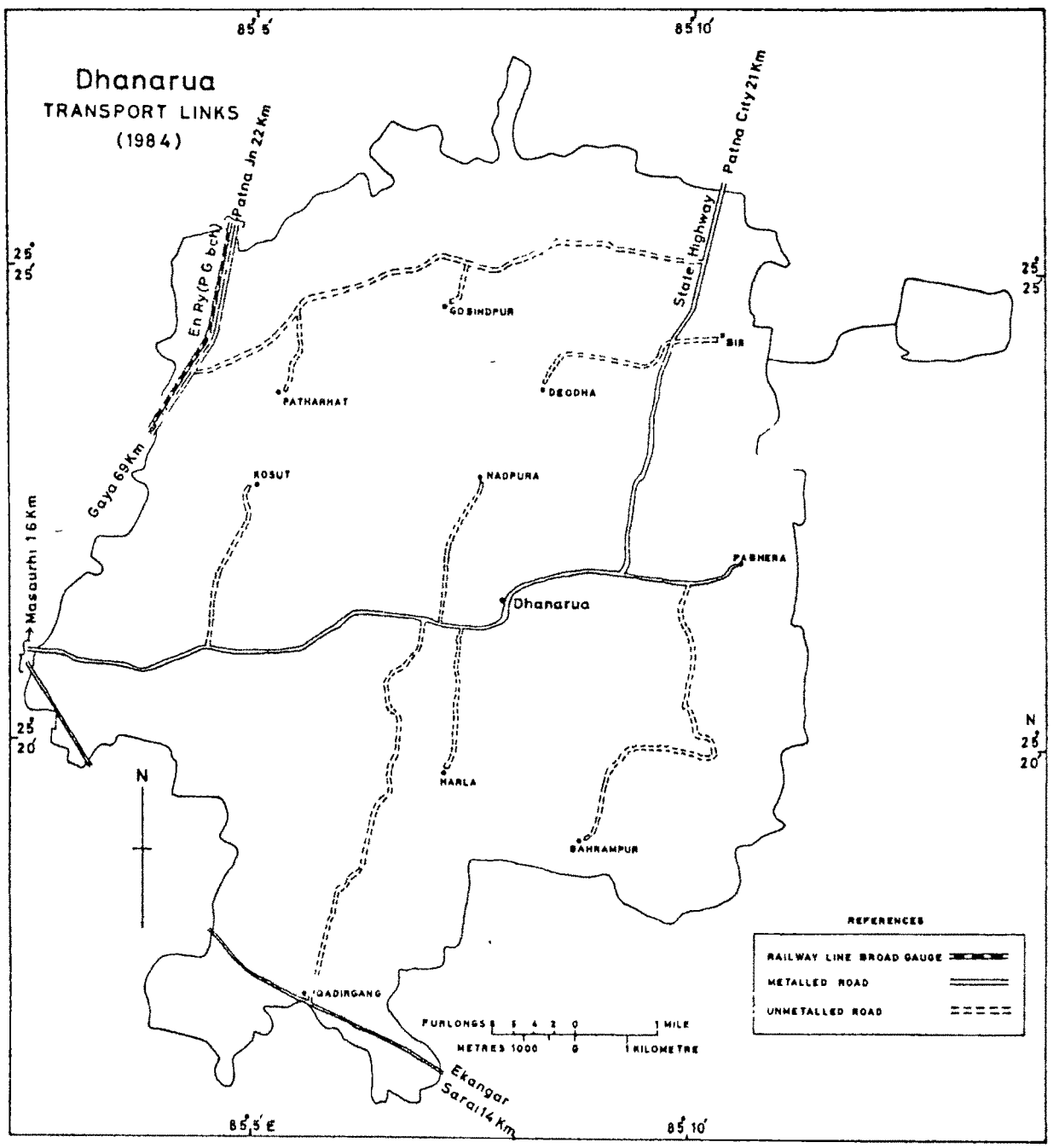
Dhanarua
TRANSPORT LINKS
(1984)
85°5'
85°10'
25°25'
25°20'
Patna Jn 22 Km
E.n Ry (P G bch)
Patna City 21 Km
State Highway
GOBINDPUR
BIR
PATHARHAT
DEODHA
Gaya 69 Km
ROSUT
NADPURA
Masaurhi 16 Km
PARSHERA
Dhanarua
HARLA
BAHRAMPUR
N
QADIRGANG
Ekangar Sarai 14 Km
FURLONGS 5 4 3 2 0 1 MILE
METRES 1000 0 1 KILOMETRE
REFERENCES
RAILWAY LINE BROAD GAUGE
METALLED ROAD
UNMETALLED ROAD

Fig 3 6

shows clearly that the whole study area is served by only two types of transport links, railway line and road - links.

A broad guage line of the Eastern Railway known as Patna - Gaya branch crosses through the north - western portion of the study area. This is the shortest route connecting the South Ganga Plain with South Bihar Plateau. Though it covers a very small portion of the area, it greatly facilitates the movement of passengers and goods to Delhi and Calcutta through its link with Patna in the north and to Gaya and the Chhotangpur Plateau in the south. Till four years back this was the only means of transport in the area. But now road links have emerged as one of the easiest means of transport and have rather greater impact on the economic activities of the area.

Almost all the big villages of the area are linked by unmetalled roads but these do not facilitate the economic activities throughout the year. These are by and large effective only during the summer, and winter seasons, during the rainy season they are rendered unnegotiable.

The main artery of road transport, however, is the State Highway which starts from the

crossing point of Mahatama Gandhi Setu road and Patna Fatwa by-pass road (National Highway - 30) at Guljarbagh, Patna. It heads towards Gaya passing through the central part of the study area. Very recently, this road has become very busy in carrying the passengers and goods of the area. The market towns like Patna Masaurhi, Jahanabad, Gaya have been brought nearer which is bound to give fillip to the economic activities of the area.

Another metalled road linking Masaurhi town with Ekangar Sarai passes through the sourthern portion of the study area. This is economically not so effecting as the State Highway but facilitates important east-west movement.

The third metalled road runs parallel to the railway line between Patna and Masaurhi. This road has been metalled this year only. But there is still a gap in this road on river Punpun, where a bridge is still to be constructed. This road has been particularly constructed to increase the each and frequency of transport between Patna and Gaya because train frequency is not adequate. Once the Punpun road bridge is completed, this road will carry the heaviest traffic in the area.

The rivers of the area are not nevigable, though they serve as transport links for small distances during the rainy season. During the rest of the year they are reduced to intermittent pools of water. These transport links play a very significant role in the development of the area and would play progressively better role in future by facilitating the establishment of small agro - based and cottage industries which will provide jobs for the manpower Thus a more effective utilization of human resources would be possible.