CHAPTER III

THE CASE-STUDY : BACKGROUND INFORMATION

COOCH BEHAR DISTRICT

3.1 General Features

In making empirical investigation of the problem that defines the underlying basis of the present research study, namely, impact of electricity and its absorption on rural development, the region chosen for the sample-study was Cooch Behar district. Two reasons dictated the stress : the district is entirely served by the North Bengal grid of WBSEB, and is a no-industry district where economic activity consists primarily of small & medium agriculture. Urban development is in its nascent stages, rendering the task of economic development in the district subject to heavy rural bias. Essential descriptive information that defines the regional features that envelop questions to be explored by the empirical study are presenting below; these have however been kept to a necessary minimum to avoid widening the focus beyond the issues relevant to the study.

Cooch Behar : Historical & Geographical Background

"Koch Bihar (now, more commonly, Cooch Behar) district in the north-eastern frontier of India is included in the Jalpaiguri division of West Bengal. Until the 28th day of August 1949 Koch Bihar was an Indian State ruled by the Maharaja of Koch Bihar who had been a feudatory prince under the British Government".[1] Following accession to the Dominion Government of India Koch Bihar has been administered as a district of West Bengal since January 1,1950.[2] Historical sources place the territory under the the suzerainty of the former kingdom of Kamrup, earliest mention of which is found in epigraphic records of the Gupta period.[3] In later times, bifurcation of Kamrup led to its western half acquiring the identity of Kamta.[4] The name 'Koch Bihar' is first used in the Shah Jahan Nama in the mid-17th century. The name derives its etymology as the abode of the Koch tribes who are the aboriginal residents of the region.

Following a series of kings of the Danaba, Kirata and Asura [5] dynasties whose lineal antecedents are obscure, power appears to have passed into the hands of local chiefs. Hiuen Tsarig(Yuan Chwang) visited the kingdom in 1639 while the Asura kings were still in ascendance. In later times kingship passed along through the Pala and Khen dynasties. The Narayana dynasty succeeded to the thrown after the period of Muslim conquest that led to the break-up of Kamrup in the late 15th century, and ruled the kingdom till the time accession.

The district of Cooch Behar is located between the geographical coordinates 26°32'46"N and 25°57'56"N,and 89°52'00"E and 88°45'02"E, forming a trapezoidal land area of 3,386km.²"Besides the congregated area included in the boundaries of the district mentioned above, there are enclaves or <u>chhits</u> which are outlying and detached tracts of land situated inside the district of Rangpur in Bangladesh".[6] Similarly, enclaves of Bangladesh territory such as Dahagram,Chhit Kuchlibari and Angar Pota also exists within the district. Mutual access rights to these formed a part of the 'Indira-Mujib Pact' between the Governments of Bangladesh and India in 1974; however the process of implementation has been slow because of numerous impediments.

"With the exception of a few miles at the extreme southern tip of Tufanganj subdivision where the river Raidak forms the boundary and for about five miles(8km) to the north of Mekhliganj thana where the river Jaldhaka forms the boundary, there is no natural boundary of the district. The northern boundary and most parts of the western boundary are formed by the district of Jalpaiguri. From west to east the following thanas of the district of Jalpaiguri abut on the border of Koch Bihar, viz. Jalpaiguri,Maynaguri, Dhupguri, Falakata, Alipur Duars and Kumargram. The southern boundary of the district is very much indented and the following thanas of the district of Rangpur in Bangladesh form the southern boundary, viz. from west to east, Boda, Debiganj, Domar, Dimla, Patgram, Hatibandha, Kaliganj, Lalmonir Hat, Phulbari Nageswari and Bhurungamari. The eastern boundary is formed by the district of Goalpara of Assam".[7]

The entire district "forms a part of the great alluvial plain of the Ganges-Brahmaputra system. The topography in the district gradually slopes southwards, the maximum elevation in the district being 55m above M.S.L.(mean sea level), While the minimum elevation is about 30m above M.S.L. The northern part of district, which in general has a higher elevation, forms the transitional zone between the northern terai zone of the Himalayas and the southern alluvial soil. Apart from the flat, monotonous or gently sloping topography in the district, no other important physiographic features are noticed in any part of district".[8]

By a reference to the attached maps it can be seen that the district is traversed longitudinally by the south-flowing river systems of Teesta, Jaldhaka(Mansai), Torsa, Kaljani, Raidak and Gadadhara whose innumerable minor tributaries drain the entire district in the south/south-easterly direction before flowing into Bangladesh. All these rivers show meandering trends and are prone to change their course frequently during heavy floods, as is characteristic of typical alluvial plains. All the major rivers are snow-fed and perennial, having their origin in the high Himalayas mostly in Bhutan and, in the case of Teesta and Jaldhaka, in Sikkim. The minor rivers however are seasonal and flow only during the monsoon. The huge amount of boulders, pebbles and soil that forms the stream-land of the perennial rivers is deposited in the northern part of the district after which the topographic decline becomes gentler with their southward progress. Over the geological time-scale this has led to the evolution of the topography of the region.

As such there are no mountain peaks or hills within the district and no-significant forest tract, although at the oscillation areas of the rivers there are a number of waste-lands covered mostly with heavy grass and reed.[9] Along the large number of abundant channels left by the shifting rivers lie bils or marshes, some of which establish a connection with the rivers during the monsoon while others are completely insular accumulations of water. These bils provide catchments for a heavy rainfall in the district and are of economic importance in that they serve as fisheries besides providing water to the cultivators for the steeping of the jute. "The greater part of the district is cultivated and is composed of green fields studded with timber trees and an inferior variety of orange trees".[10]

Administrative divisions within the district are more or less those inherited from the former princely state; these comprise five sub-divisions viz. Cooch Behar Sadar (P.S.Kotwali), Dinhata (P.S. Dinhata and Sitai), Tufanganj (P.S. Tufanganj), Mathabhanga (P.S.

Mathabhanga and Sitalkuchi) and Mekhliganj (P.S. Mekhliganj and Haldibari).

Old land-settlement records dating from the period before accession identify six revenue parganas where Cooch Behar pargana comprised the Kotwali thana and a part of the Tufanganj thana.[11] The District Agricultural Department still retains elements of these in the re-classified Agricultural Sub-divisions for the district which number four [12] and include Tufanganj within Cooch Behar (agricultural) sub-division.

There were originally[13] eleven community development blocks in the district, namely, Cooch Behar I & II, Dinhata I & II, Mathabhanga I & II, Sitai, Sitalkuchi, Mekhliganj, Haldibari & Tufanganj, subsequently increased to twelve with the bifurcation of the last-named block into Tufanganj I & II. The head of district of the administration is the Deputy Commissioner belonging to the Indian Administrative Service who is also appointed District Magistrate under the Criminal Procedure Code. Two Additional Commissioners holding subordinate charge of Estates Acquisition and Land Reforms,and General Administration, respectively, assist him. The sub-divisional administration are headed by Deputy Collectors or Sub-Divisional Officers(SDO) with equivalent rank of Deputy Magistrates, Sub-Deputy Magistrates assist these Officers. The district police administration is in the hands of the Superintendent of Police assisted by an Additional Superintendent of Police, both members of the Indian Police Service. There are also two Deputy Superintendents of Police at headquarters, while each sub-division has an Inspector of Police holding charge. At the block level a Block Development Officer(BDO), generally belonging to the West Bengal Civil Service is in position assisted by other officers holding separate charges of extension community development activities like agricultural extension, social education, panchayat extension etc.[14]

The district has seven towns; of these the two municipal towns are the district headquarters with class II status and the sub-divisional town of Dinhata with class IV status; among the other four municipal towns are Mathabhanga with class IV status, Haldibari with class V status and Mekhliganj & Tufanganj with class VI status. The single non-municipal town of Guriahati has class IV status. Of these towns, Mekhliganj is the smallest urban unit among all statutory towns in West Bengal.[15]

Cooch Behar town is the capital of the former feudatory state and is therefore somewhat of a showpiece among the above towns with well laid-out roads and arboreal covering and a number of large tanks or dighis. There are number of excellently architectured buildings including the Cooch Behar Palace that date from its princely past. However, its present importance is as a center of trade in agricultural produce. The other towns are all urban agglomerates owing their growth to their emergence as independent market/trading centers, except for Guriahati which in reality is an urban outgrowth of Cooch Behar town.

3.2 Population

Cooch Behar District had a total population of 17.71 lakhs vide the 1981 Census, which stands at 21.58(1991 Census [16])lakhs a decade later. Density of population over the district is 523 persons/km^2 and 637 persons/km,[217] respectively. Blockwise and police-stationwise distribution of this population is available in the tables below.

Table 3.1

Blockwise Distribution of Population in Cooch Behar District (1981 Census)

Name of Blocks	Total Population	Density of Population (per km²)
Cooch Behar I	202759	546
Cooch Behar II	202142	543
Tufanganj I	161631	484
Tufanganj II	121833	na
Dinhata I	186726	648
Dinhata II	151637	566
Sitai	69395	443
Mathabhanga I	139050	431
Mathabhanga II	138206	440
Sitalkuchi	125633	480
Mekhliganj	98656	338
Haldibari	73993	369

Source: i) Technical Report, Series D No.33, Central Ground Water Board,1983,pp.6.
ii) District Block Profile, Cooch Behar 1989-90,Bureau of Applied Economics & Statistics, Government of West Bengal.

Table 3.2

Police Station-wise Distribution of Population in Cooch Behar District (1981 Census)

Name of P.S.	Total Population	Rural Population	Urban Population	Number of Villages	Number of Towns
Haldibari	73975	66845	7130	62	1
Mekliganj	103268	98734	4534	152	1
Mathabhanga	290380	279327	11053	195	1
SitalKuchi	125710	125710	...	70	...
Cooch Behar	467419	387318	80101	260	2
Tufanganj	288370	283464	4906	127	1
Dinhata	353149	338613	14536	249	1
Sitai	69372	69372	...	53	...
Total	1771643	1649383	122260	1168	7

Source : District Census Handbook, Cooch Behar, 1981,pp.9.

From the tables it is seen that Cooch Behar is a predominantly rural district and that 93.10% of its population live villages with highest concentration of rural population under Cooch Behar P.S. The urban population in the district is as low as 6.90% as against 26.47% for West Bengal State.[18] Literacy rates were 30.10%(total), 40.09% (males) and 19.43% (females), all of which are a good ten percentage points below the corresponding State figures. The population composition is heavily dominated by the Scheduled Castes with their percentage standing at 49.84% against 21.99% for West Bengal.

The two principal communities in the district are Hindus and Muslims with a percentage ratio of around 80:20. The high percentage of Scheduled Castes is dominated by the Rajbanshis believed to be of Koch tribal origin who were eventually Hinduised, although scholars seem to have been divided in their opinions as to this.[19] The other SC segments comprise Namasudra and other SC communities. Scheduled Tribes are negligible at 0.57%[20] comprising vestigial groups of Rabhas, Oraons etc.

A separate table, below, shows decennial growth of population since 1901:

Table 3.3

Decadal Variation of Population in
Cooch Behar District (1901-1991)

Year	Population	Decadal Variation	% Decadal Variation
1901	565116	na	na
1911	591012	25896	4.58
1921	590599	-413	-0.07
1931	589053	-1546	-0.26
1941	683703	94650	8.43
1951	668949	-14754	-2.15
1961	1019806	3350857	52.45
1971	1414183	394377	38.67
1981	1771643	357460	25.27
1991(p)	2158169	386526	21.81

Source: i) Technical Report, Series D No.33,Central Ground Water Board,1983,pp.7.
ii) District Census Handbook, Koch Bihar, 1981,pp.xiii.
iii) Census, 1991: Provisional data in Demographic Diversity of India, Ashish Bose,pp.379.

High percentages of inter-decadal variations during the 50s & 60s partly reflect population transfers in the post-partition period; Cooch Behar which shares its southern border with what is now Bangladesh received a large proportion of this.

Table 3.4

Occupational Categories in the Population
of Cooch Behar & West Bengal

(percentage to Total Population)

	Total		Males		Females	
	West Bengal	Cooch Behar	West Bengal	Cooch Behar	West Bengal	Cooch Behar
Main Workers	28.26	28.99	48.72	52.96	5.81	3.36
Marginal Workers	1.91	0.81	1.58	0.67	2.26	0.96
Non-Workers	69.83	70.20	49.70	46.36	91.93	95.68

Source: District Census Handbook, Koch Bihar, 1981,pp.xiii.

Table 3.5

Break-up of Main Workers by Activities on Cooch Behar

	Total		Male		Female	
	West Bengal	Cooch Behar	West Bengal	Cooch Behar	West Bengal	Cooch Behar
Cultivetor	29.76	52.02	31.40	54.29	14.67	13.72
Agricultural Labourers	25.23	27.24	23.69	26.58	39.43	38.37
Household Industries	3.52	2.01	3.09	1.43	7.58	11.78
Other Workers	41.49	18.72	41.82	17.68	38.40	36.10

Source: District Census Handbook, Koch Bihar, 1981,pp.xiv.

The second table above provides indication of the occupational distribution in the district; the agricultural segment dominates the distribution. Percentage figures for the occupational distribution of main-workers for the State are also tabulated for comparative purposes. Insofar as the economic segments of the district's population are concerned, the percentage distribution between all workers and all non-workers is in the ratio 29.80:70.20 (total); 53.63:46.36 (males) and 4.32:95.68 (females). Of the total workers, marginal workers account for negligible percentages of 0.81% (total), 0.67% (males) and 0.96% (females). It is thus seen, that in reference to the State of West Bengal the worker:nonworker ratio is better for males and worse for females. Moreover, fewer male workers in the district fall into the category of marginal workers and more into the category of main workers than in the State. Cooch Behar "did not have a class of landless agricultural labour as in other districts. Each cultivating family had at least some land for itself and in addition served on the lands of the nearby jotedar or bigger cultivator. With the influx of a large number of migrants since 1950-51 a small class of agricultural labour has grown up".[21]

For females the opposite picture prevails over all categories. The underlying reason is obviously that with the rural-oriented district economy, more absorption opportunities exists for males in agricultural occupations. Furthermore, the cultivator class of main workers is much higher for the district than for the State in percentage terms and thus rural employment is in general higher, at least for males. Because of the lack of industry in the district, this occupational pattern remains more or less stable, with little growth of employment opportunities outside. Lower literacy rates compared to the State are also a factor.

3.3 Pedology & Climate

With its riverine topography and lack of high elevations, Cooch Behar presents a more homogeneous soil profile than is usual for an area of its magnitude. "Soils in the district are mostly alluvial soils ranging from sandy soil to a clayey loam, the sandy loam being prevalent in the district. In the north eastern corner of the district, i.e., in Tufanganj block, brown forest soils are found to occur in the higher altitudes.

The alluvial soils in the district are relatively shallow in depth, light texture and highly porous. With leaching of the bases brought about by heavy rainfall, these soils are acidic (ph4.2-6.2) and organic matter is not properly decomposed. The status of organic matter, available phosphate and potash is medium to high. The acidity in the soil is removed by the addition of measured quantities of dolomite/limestone, which is locally called 'soil-conditioner'. The Brown Forest soils have high fertility status, but crop yield in them is poor due to low soil depth, high acidity and low temperature".[22]

Soil depths are normally "low ranging from 15-100cm, super-imposed on deep beds of sand. The base is igneous and/or metamorphic rocks lying at depth of 1000-1500 meters. The moisture retentive capacity of land in higher situations is low with much less fertility. The lower situations are more fertile while in the middle-order land, multiple cropping has gained popularity. With assured irrigation facility these lands can be better utilised for crop production. Out of the total cultivated land 5.7% is low land 15% high land' and the rest medium land".[23]

"Unlike the adjoining district of Jalpaiguri, Koch Bihar district has only about 5,321.6 ha of forests, which covers only 1.515 percent of the geographical area of the district. Most of these forests are concentrated in the northern half of the district. Tufanganj block has the maximum area of 2,188.08 ha under forests while the blocks of Haldibari, Sitai and Dinhata II have no forests at all. These forests are moist deciduous and the most common and valuable tree is the Sal(Shorea robusta). Bamboos and Champa trees are also associated Sal forests. Rauwolfia serpentina occurs as shrubs in the district".[24]

Cooch Behar district has a moderate humid climate in a mean temperature range of 8°C(January) and 37.8°C(August) with heavy rainfall. The average annual rainfall in the district is about 3200 mm, nearly 93% of this is received between April-September. Pre-monsoon showers starting in February gradually go on increasing till the advent of monsoon.[25] Atmospheric humidity reaches a maximum 100% between May-September during the monsoon; in winter this fall but is never below 50%. Average rainfall data for 50 years between 1901-1950 are tabulated below.

Table 3.6

Mean-Monthly Rainfall of the District of Cooch Behar (1901-50)

Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Sadar	7.6	19.8	38.9	156.2	426.7	833.9	747.8	580.1	591.8	191.3	10.2	3.3	3607.6
Dinhata	9.4	17.8	28.2	126.0	358.9	659.9	539.2	434.1	446.3	166.4	9.1	1.8	2797.1
Matabhanga	7.9	18.8	33.3	113.0	344.9	741.7	683.8	533.7	492.2	146.6	11.2	2.5	3129.4
Mekhliganj	6.1	21.1	33.5	101.6	294.6	663.2	650.0	566.2	470.7	158.7	12.5	2.8	2981.0
Tufanganj	8.4	21.3	37.6	160.8	428.0	808.5	726.7	530.9	573.8	181.1	11.4	3.1	3491.6
Koch Bihar	7.9	19.8	34.3	131.5	370.6	741.4	669.5	529.0	514.9	168.8	10.9	2.7	3201.3

Source : District Gazetteers, Koch Bihar,1977,pp.21.

Table 3.7

Average Rainy days in the Cooch Behar District (1981-50)

Stations	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Sadar	0.6	1.6	2.4	7.5	15.3	19.8	19.2	17.5	16.1	6.1	0.7	0.2	107.0
Dinhata	0.8	1.6	2.2	6.7	14.5	18.2	16.9	15.1	14.2	5.5	0.5	0.1	96.3
Matabhanga	0.6	1.7	2.3	6.4	14.1	18.5	18.3	17.3	15.0	5.5	0.6	0.2	100.5
Mekhliganj	0.6	1.5	2.1	5.8	12.9	18.2	18.5	18.1	15.4	5.0	0.6	0.2	98.9
Tufanganj	0.7	1.8	2.6	8.0	15.9	19.8	19.0	16.6	15.9	6.2	0.7	0.2	107.4
Koch Bihar	0.7	1.6	2.3	6.9	14.5	18.9	18.4	16.9	15.3	5.7	0.6	0.2	102.0

Source : District Gazetteers, Koch Bihar,1977,pp.21.

3.4 Land-Use Characteristics

Cooch Behar is a primarily agricultural district with an economy mainly deriving from agricultural activity. Except for some tea in the northern areas, and wood and tobacco the district does not have any other big industry worth the name. In the absence of significant forest tracks more than 68.34%[26] of the district's land area is under cultivation. Land-use dynamics in the district over the current century can be understood from the figures in a table below.

Table 3.8

Land Utilisation Statistics in Cooch Behar

(Areas in acre)

	1981-82	1949-50	1986-87
1. Geographical Area (Excluding Enclaves)	836480	820600	826252
2. Area under non-agricultural Use	na	na	170768
3. Forests	9845	15400	13012
4. Barren & Unculturable Land	127299	75100	35264
5. Permanent Pastures & other Grazing Land	na	na	447
6. Area under Orchards,Plantation & Miscellaneous Trees	na	na	25540
7. Culturable Waste Land	180776	130200	820
8. Fallow & Other than Current Fallow	na	na	3920
9. Current Fallow	102110	160500	na
10. Net area available for Cultivation	488441	439400	569866
11. Area Sown more than once	na	na	542627
12. Gross cropped Area	na	na	1111693
13. Cropping Intensity in %	na	na	195

Source: (i) Annual Plan on Agriculture,1986-87,Cooch Behar,
(ii) District Gazetteers,Koch Bihar,1977,pp.62.

Table 3.9 below is a summary picture of changes taking place in the land-use pattern starting at the turn of the century till the time of accession, supplemented by figures drawn from the decade just passed.The more recent figures in the table afford an indication of multiple-cropping trends through study of cropping intensities. Blockwise/subdivisionwise land-use characteristics are also provided

in the next table which highlights the distributional aspects of the district's land-use patterns (land areas in enclaves within Bangladesh territory have however been left uncovered in the official statistics):

Table 3.9

Land-Utilisation in the District of Cooch Behar 1901-02 to 1964-65 ('000 acres)

Year	Area not Available for Cultivation	Other Uncultivated Land excl. Fallow	Current Fallows	Net Area Sown	Doubled Cropped
1881	157.4	162.5	na	477.4	na
1901-02	127.2	180.7	102.1	408.4	16.5
1949-50	90.5	130.2	107.5	439.4	21.3
1950-51	102.1	124.9	92.9	500.7	72.0
1951-52	102.5	104.9	66.7	549.3	88.0
1952-53	108.6	118.0	64.1	532.7	82.0
1953-54	111.1	105.8	38.2	569.3	87.5
1954-55	110.6	105.3	66.7	548.8	89.0
1960-61	112.9	67.0	42.8	600.7	84.5
1961-62	112.9	66.2	23.7	620.6	112.3
1962-63	113.0	64.9	14.3	631.2	110.0
1963-64	107.0	58.2	5.0	653.2	171.1
1964-65	107.0	58.9	9.0	648.5	170.2

Source : West Bengal District Gazetteers, Koch Bihar,pp.63.

Table 3.10

Blockwise Land Utilisation Statistics in Cooch Behar District

(Area in ha)

Block Name	Land Area	Non-Agricultural Area	Forest Area	Barren Area	Pasture	Plantation Area	Culturable Waste	Fallow	Net Cultivable Area
Cooch Behar I	37204	12073	92	na	49	471	330	310	23899
Cooch Behar II	36105	15159	1921	352	32	100	422	30	18789
Tufanganj	57344	8208	2161	na	na	6255	na	816	39904
Total Sub-Division	131353	35420	4174	352	81	6826	752	1056	82592
Dinhata I	28692	4706	20	na	na	92	97	na	23777
Dinhata II	26445	6179	na	na	na	1000	640	na	18622
Sitai	15488	4895	na	2000	na	401	na	40	8152
Total Sub-Division	70625	15780	20	2000	na	1493	737	40	50555
Mathabhanga I	31860	7001	558	na	na	402	840	na	23059
Mathabhanga II	31020	200	136	11321	na	667	363	40	18293
Sitalkuchi	25856	2459	60	60	40	42	640	351	22210
Total Sub-Division	88736	9654	754	11381	40	1111	1843	391	63562
Mekhliganj	28351	3692	320	544	na	882	na	na	23413
Haldibari	14948	4591	na	na	60	28	na	na	10269
Total Sub-Division	43799	8283	320	544	60	910	na	na	33612
Total District	334513	69137	5268	14277	181	10340	3332	1587	230391

Source : Annual Plan on Agriculture,1986-87,Cooch Behar,pp.17.

Sub-divisional classifications in the table above are by agricultural rather than civil sub-divisions. A comparison, between sub-divisions of the ratio of sub-divisional land-area: district land-area against the corresponding sub-divisional net cultivable land-area: net cultivable land-area for the district enables identification of subdivisional potential for land development. Minor percentage variations do exist between the two ratios over the sub-divisions of Cooch Behar(39% against 35%), Mathabhanga(26% against 27%) and Mekhliganj(13% against 14%); in the case of Dinhata sub-division the two ratios are identical at 21%. These sub-divisional characteristics point to Cooch Behar and Dinhata as being relatively more agriculturally-developed sub-divisions with more intensive land-use; the converse applies to Mathabhanga and Mekhliganj sub-divisions.

Other relevant statistics which bring out the comparative features of land-use patterns are as follows. The pattern of ownership distribution of land-holdings in Cooch Behar reveals the following informations.

Table 3.11

Ownership Distribution of
Holdings in Cooch Behar

Holding Size	% to Total Holding	% to Total Area
Below 1 ha	51.99	41.40
1-2 ha	26.39	31.70
2-4 ha	12.20	21.50
Above 5 ha	9.42	5.40

Source : Annual Plan on Agriculture,Cooch Behar,1986-87.pp.7.

Following the recording of share-croppers or bargadars under 'Operation Barga' since 1978 (according to the office of the Bengal Land Reforms[BLRO] patta, which means the acceptance of share-croppers' right to operate a particular piece of land) changes in land distribution have taken place throughout the State in West Bengal, and the position as of November 1990 in Cooch Behar district is that the land-rights of 80,990[27] bargaders have been registered over an area of 33,060[28] ha in Cooch Behar district. In percentage terms this works out to 5.68% and 7.51% of the State achievement, respectively.

Recording of Bargaders in Cooch Behar
& in West Bengal

Name	Number	Land Area
Cooch Behar	80,99,000	33,06,000
%	(5.68)	
West Bengal	14,26,69,000	440,31,000
%	(7.51)	

The percentage of cultivable area to total area for the State of West Bengal is 62.44% as against 76.05% for Cooch Behar; of this area 97.31% is sown for West Bengal as against 99.73% for Cooch Behar. The ratios of cultivable area per agricultural worker and net area sown per agricultural worker are 0.65 and 0.63, respectively, for West Bengal and 0.64 and 0.64, respectively for Cooch Behar. Higher ratios of the order of 0.67-0.83 obtained for the other North Bengal

districts of Malda, West Dinajpur (now divided into North & South Dinajpur) and Jalpaiguri, although the ratios for the adjoining Darjeeling district (excluding its hill sub-divisions) are lower at 0.58.[27]

Table 3.12

Land Area & the Land-Use in North Bengal

(1982-83 to 1986-87)

District	% of cultivable Area to Total Area	% of Net Area Sown to Cultivable Area	Cultivable Area Per Agricultural Worker	Net Area Sown Per Agricultural Worker
Malda	78.73	96.89	0.69	0.67
West Dinajpur	87.86	99.27	0.80	0.80
Cooch Behar	76.05	99.77	0.64	0.64
Jalpaiguri	47.17	99.41	0.83	0.83
Darjeeling	74.61	99.73	0.58	0.58
West Bengal	62.44	97.31	0.65	0.63

Source : Economic Review 1990-91,Government of West Bengal,pp.211.
Note * Agricultural workers used as per Census,1981 ** Current Fallows plus net area sown.

In an agriculture-dependent district with high agricultural bias in the occupational distribution these ratios are bound to be high, in consideration of lack of alternative employment opportunities. However, density factors have to be considered to establish beyond doubt that the ratios reflect crowding on land *per se* rather than non-availability of cultivable land because of high proportions of non-cultivable land. In Cooch Behar, as compared to Jalpaiguri for example, population density/km^2 is 523 against 346. Thus the ratios of cultivable area and net area sown per agricultural worker, which in the case of Jalpaiguri stand at 0.83, are substantially lowered for Cooch Behar at 0.64. Although a very high proportion of main-workers in Cooch Behar are engaged in agricultural occupations, this does not mean that they are gainfully employed; productive use of these main-workers dictates increases in cropping intensities for increased labour-absorption.

3.5 Cropping

The principal crops cultivated in the district are:

a. paddy of three kinds,aus,aman and boro
b. jute of two varieties, the capsularis and the oliotaris
c. tobacco
d. rape seed and mustard seeds
e. pulses - mug, masur, khesari, thakri, kulti, arahar
f. wheat
g. millets
h. Indian corn (makai)
i. roots and bulbs - mainly arum and potato, but also onion, garlic, ginger and turmeric
j. other fibre plants and matting grass
k. vegetables from market garden such as cauliflower, cabbage and chilli.

These are sown over four main cropping seasons, namely, boro (February-May), pre-kharif (March-June), kharif(June-September) and rabi(October-January). Paddy being the main cereal crop, sowing in the district is of the two traditional varieties aus and aman in addition to boro paddy which is a relatively a new introduction since it was previously a marginal crop in the marshlands or bils.[30] Two principal commercial crops are tobacco and jute with the former being concentrated mostly in Dinhata I, Sitai, Sitalkuchi and Mathabhanga I & II. Tobacco has the advantage of being cultivable on sandy land of poorest quality and Cooch Behar alone supplies about 72% of the total tobacco output of West Bengal. Following a concerted agricultural thrust all over the State, the response of Cooch Behar district has seen a visible shift to HYV varieties, along with increased fertiliser and pesticides use. Fertiliser consumption, for example, has increased from 1.82 kg/ha in 1971-72 to 15.09 kg/ha in 1985-86, most of this thrust coming in the period since the late 70's. In physical terms, the total quantity of fertilisers has jumped from a consumption of 831 MT in 1971-72 to 27,584 MT in 1988-89 for the district as a whole. The table below will help to define Cooch Behar's place vis-a-vis certain other districts and West Bengal as a whole, through comparison of index numbers of agricultural production and area productivity.

From the table below it can be seen that increase in area cultivated for Cooch Behar district is fairly creditable in the case of both cereals and all crops combined vis-a-vis the other districts. In comparison to the AllState figure, too, the index numbers for total cropped area for Cooch Behar district are creditable and above-average, although no comment can be made with a response to cropping of cereals because of the paucity of the corresponding State figures in aggregated terms. Cooch Behar also shows better performance particularly in cereals-acreage in comparison to other North Bengal(NB) districts, as well as to the agriculturally-progressive South Bengal(SB) district of Burdwan. Purulia, being one of the poorest SB districts, obviously trails behind. The reasons behind Cooch Behar's performance are manifold. A high ratio of cultivable land to total land, the presence of a settled agricultural population with no significant tribal component, favourable soil and climatological characteristics are some of them. However in the absence of any significant proportion of cultivable land presently given to non-agricultural use, the increase in area cultivated in Cooch Behar is primarily the result of multiple-cropping; this is borne out by another reference to the earlier tables pertaining to the land utilisation in the district where the long-term decline in all fallows (current & other) and increases in double-cropped area, as well as increased cropping intensity tell the tale. However, this situation also ordains the future prospects of agriculture in the district. With the lack of scope for expanded acreages along the extensive margin, successful development of agriculture has come to depend increasingly on intensified cultivation, for which irrigation and other facilities are pre-requisite.

Fortunately, scope for this exists; production and productivity levels in Cooch Behar are yet to attain the levels reached by the progressive agricultural districts of the State. In view of the fact that agricultural modernisation and the use of irrigation and other technological inputs are relative newcomers to Cooch Behar, significant results await an agricultural thrust in the right direction. However the economic future of Cooch Behar's population cannot be divorced from the development of agriculture in the near future - it

is utopian to talk of an industrial solution to the district's backwardness, especially when the resource-base and the human factors therein all point to its innate agricultural potential.

Table 3.13

Agricultural Area,Production & Productivity
in some Districts of West Bengal

(Index Numbers: Base:Triennium ending Crop Year 1969-70=100)

District	Year	Area		Production		Productivity	
		Cereals	AllComb	Cereals	AllComb	Cereals	AllComb
Cooch Behar	1987-88	115.55	113.41	111.77	117.12	96.73	103.27
(NB)	1988-89	134.33	128.44	138.68	143.07	103.24	111.39
	1989-90	128.11	124.38	145.69	146.97	113.72	118.16
West Dinajpur	1987-88	103.53	102.70	107.07	106.45	103.42	103.65
(NB)	1988-89	105.55	101.94	136.27	138.30	129.10	135.67
	1989-90	101.83	97.26	162.09	155.24	169.18	159.61
Jalpaiguri	1987-88	112.00	113.99	106.45	132.10	95.04	115.89
	1988-89	113.26	114.43	99.37	130.02	87.46	113.62
	1989-90	112.97	112.73	112.10	139.52	99.23	123.76
Burdwan	1987-88	113.80	123.25	157.94	196.38	138.79	159.33
(SB)	1988-89	108.06	116.34	177.68	213.71	164.43	183.69
	1989-90	108.80	116.57	173.52	207.62	159.49	178.11
Purulia	1987-88	103.38	103.28	151.64	148.56	146.68	143.84
(SB)	1988-89	100.30	99.45	131.73	131.03	131.34	131.75
	1989-90	104.69	103.98	154.63	153.48	147.70	147.61
AllState	1987-88	na	109.85	na	159.07	na	144.81
	1988-89	na	108.75	na	177.25	na	162.99
	1989-90	na	109.80	na	182.96	na	166.63

Source: Economic Review,1990-91,Government of West Bengal,pp.41-45

* NB:North Bengal SB:South Bengal

3.6 The Irrigation System

That irrigation perspectives in Cooch Behar have changed substantially in recent times is obvious from the tangential and sometimes contradictory comment in the older sources. Hunter records that "irrigation is not common in Kuch Behar".[31] Another source remarks about the district that "for irrigation it depends entirely on its heavy rainfall", and elsewhere that "irrigation is not common, although tobacco plants both in the nursery and in the field are watered.Aman paddy, requires water, which the monsoon supplies. The rain water is contained in the ails around the fields. Although artificial means of keeping up or assisting the productive power of the soil, such as manuring and irrigation are not much adopted, the natural fertility of the soil is great".[32] The Gazetteer[33] reports : "the rainfall in the district being quite heavy and well distributed

the cultivator hardly needs artificial irrigation for his crop occasionally during the tobacco season in winter the accumulated waters are lifted by dons for irrigating tobacco-fields". Later the Gazetteer [34] comments "while the average annual rainfall in the district is heavy, the occurrence of dry spells during the crop seasons is not less frequent than other floods. For assured crop production, therefore, arrangement for additional irrigation devices both during rabi and kharif cultivations is necessary". It states that with the command area of existing irrigation units being very limited, "changes in the water transmission system as also in the technique of application of water to crops may help improve the situation".[35] Although the district does not experience droughts in their true sense, large fluctuations in river levels during and after heavy precipitation are reported.[36]

Such large-scale development in irrigation facilities as is exhibited by the district in recent years follows under the Accelerated Food Production Programme (AFPP) launched by the State Government since the mid-'70s with assistance for their irrigation component being extended through the Command Area Development Programme (CADP) with World Bank support. As a result percentage of gross cropped area of the district having access to irrigation expanded from an estimated 5%[37] to 10.26%[38] between the years 1974-75 & 1985-86.

Irrigation facilities at present are inadequate. Two tables below give some idea of the irrigation profile of North Bengal by districts:

Table 3.14

Cultivable Area & Irrigation Potential in North Bengal

District	Area (Sq.km.)	Net cultivated Area(ha)	Net Irrn. Potential Created	% of Irrigated Area
Malda	3773	280850	69000	24.56
West Dinajpur	5358	395984	81637	20.62
Cooch Behar	3387	230391	39500	17.14
Jalpaiguri	6227	225676	35441	15.70
Darjeeling	3149	66871	20086	30.03

Source: Conference on Regional Development of North Bengal ' Prospects & Potentials Background Paper,1986,Government of West Bengal,pp.32.

Table 3.15

Gross Cropped Area & Cropping Intensity in North Bengal

District	Gross Cropped Area (ha)	Cropping Intensity
Malda	414838	161
West Dinajpur	609796	153
Cooch Behar	452358	196
Jalpaiguri	400169	179
Darjeeling	112476	168

Source:Conference on Regional Development of North Bengal Prospects & Potentials Background Paper,1986,Government of West Bengal,pp.32.

Cooch Behar, with a predominantly agricultural economy and little forest cover, still scores relatively low among the North Bengal districts in terms of percentage of area under irrigation (the percentage figures here are for net rather than gross cropped area). It does "appear paradoxical that inspite of inadequate irrigation facilities in the area, cropping intensity for different districts compares favourably with the rest of the State....relatively high rainfall and low monthly potential evapo-transpiration [because of high humidity] contribute towards retaining the favourable trend. Moreover soil moisture is contained for a considerable period even after the departure of monsoon".[39] Despite these high cropping intensities productivity indices are not very remarkable for Cooch Behar Table 3.15.

In the face of the overwhelming dependence of the district's economy on agriculture and the backwardness that this exhibits, two alternative development prescriptions might theoretically emerges. The first is the long-term and somewhat utopian one of the giving Cooch Behar's development an industrial underpinning. The more practical prescription, however, would be to exploit the natural advantage inherent in the district's primarily agricultural complexion and to concentrate on injection of a technology-induced transformation of traditional agriculture. The merits of such an approach are that no immediate disruption need take place in Cooch Behar's occupational profile, while its importance as a feeder of agriculture produce to the State can be expanded overall, just as is already evident in the case of tobacco cultivation. New technology in agriculture however demands substantial input of fertilisers, pesticides and improved seeds, in which irrigation plays a complementary role. In the case of Cooch Behar the need for expanded irrigation has been brought out by the foregoing discussion. Focus now moves on to whether the potential for this exists in the district or not.

3.7 Groundwater

Groundwater in Cooch Behar district occurs "under both water table and confined conditions in aquifers which range in depth from about 2 to 303 meters below ground level (m.b.g.l.) .... the water table varies with the topography and becomes steeper towards the northern side....with the onset of monsoon, the water levels gradually tend to rise and ultimately reach a level beyond which there is no further rise. At this stage, the system has reached its saturation point and after this, rainfall does not have any appreciable effect on the hydrogeological set-up; whatever rainfall is received after this saturation point, is thrown off by the system as surface run-off and practically none of it percolates down into the groundwater reservoir as recharge. It has been observed that the saturation point is reached sometime in late August. As the monsoon ceases, this process is reversed and the water levels start declining with the onset of summer. Withdrawal of groundwater from dugwells and tubewells have not in any way changed the groundwater regime in the district".[40]

Groundwater in Cooch Behar is a renewable resource subject to periodic replenishment from:

"i) direct infiltration from precipitation, and
ii) infiltration from streams and rivers flowing across the district".

Besides rainfall which is the principal source of recharge for the aquifers, "seepage from existing canals or streams and rivers and return flow of irrigation water forms the other sources of recharge".[41]

The main utilisation of groundwater in the district is for agriculture apart from the very small percentage that represents domestic drawal. However "utilisation of groundwater for agriculture and irrigation has not attained its optimum level in any part of the district.... considering the appreciable amount of recharge received annually through rainfall, the withdrawal of groundwater has been negligible which leaves a tremendous scope for further large scale development of water".[42] Some idea of the groundwater potential is available from data relating to water drafts of various source of irrigation." Yield tests conducted on tubewells in the district have shown that the tubewells, in general, if suitably constructed are capable of yielding 160-220m^3/h for drawdowns varying from 1.08-9.94m. Medium duty irrigation tubewells in the district generally yield between 22.7 and 45m^3/h. Dugwells, tapping the shallow aquifers in the district can normally yield upto about 500m^3/d".[43]

Groundwater drawings throughout the district of Cooch Behar exhibit characteristics ranging from slightly acidic to slightly alkaline in the ph-range of 6.5-7.8, and are suitable for both domestic as well as agricultural purposes. Chemical analysis reveals chloride content of 3-105ppm (parts per million) and a relatively high bicarbonate content of 20-510ppm. Iron content is somewhat excessive, specially in localised pockets, in a range of 0.04-10.2ppm. This occasionally may call for treatment prior to the release of water for potable purposes. Fluoridation in the water is however within permissible limits at 0.12-0.37ppm. In the monsoons, because of dilution, chemical concentrations are somewhat reduced. No appreciable variation in this composition is found between higher-strata and lower-strata drawings i.e. between dugwells and tubewells. As such chemical constitution of groundwater throughout Cooch Behar district falls within the safety standards laid down for drinking water by the Indian Council of Medical Research in 1975.[44]

The detailed technical report on the irrigation potential of Cooch Behar district by the CGWB, Ministry of Irrigation, Govt. of India provides a wealth of technical information on the hydrogeology of the region, which has significant bearing on any irrigation study. Assessment of the available groundwater potential has been made on the general lines of the 'water table fluctuation approach'.[45]

Annual estimates of exploitable groundwater balance in the aquifers comprising the groundwater system of Cooch Behar district are based on computed monsoon and non-monsoon recharges net of the annual existing ground water draft. For each block, recharge during the monsoon period (A) is computed by the following formula :

A = [Block-area(km^2) x
Yearly average seasonal watertable fluctuation(M) x
Average specific yield(%)] +
[Net monsoon pumpage (MCM) -
Seepage from surface irrigation systems(MCM)] x
Proportion of annual rainfall falling in the monsoon period +
Seepage from surface irrigation systems (MCM)

(MCM = Million Cubic Meters)

Blockwise recharge during the non-monsoon period (B) is estimated by :

B = Rainfall recharge from non-monsoon rains +
Seepage from surface irrigation systems (MCM)

Average specific yield in A, above, is assumed to be around 15%, which represents the limits of accessibility to tappable groundwater structures imposed by technology. The rainfall infiltration factor for the district is estimated to be 25%, with 75% of rainfall being lost through surface run-off.

Net annual groundwater recharge (C) is thus the total of monsoon and non-monsoon recharge, of which 30% is assumed to be irrecoverable due to evapo-transpirational losses etc., leaving 70% as the groundwater potential (created by natural recharge) available for irrigation/domestic use.

Of this groundwater potential, existing groundwater draft comprises drawings for agricultural, domestic & industrial purposes that are already being made. Groundwater draft(D) is thus given by:

D = [Existing annual agricultural draft -
Seepage from surface irrigtion systems (MCM)] +
Existing annual domestic and industrial draft (MCM)

Once again, assuming a loss-factor of 30% as above, 70% of this existing annual draft constitutes present drawings. Thus the ground water balance available for development(G) is estimated; for each block, by:

G = Net annual recharge(C) - Net annual draft(D)

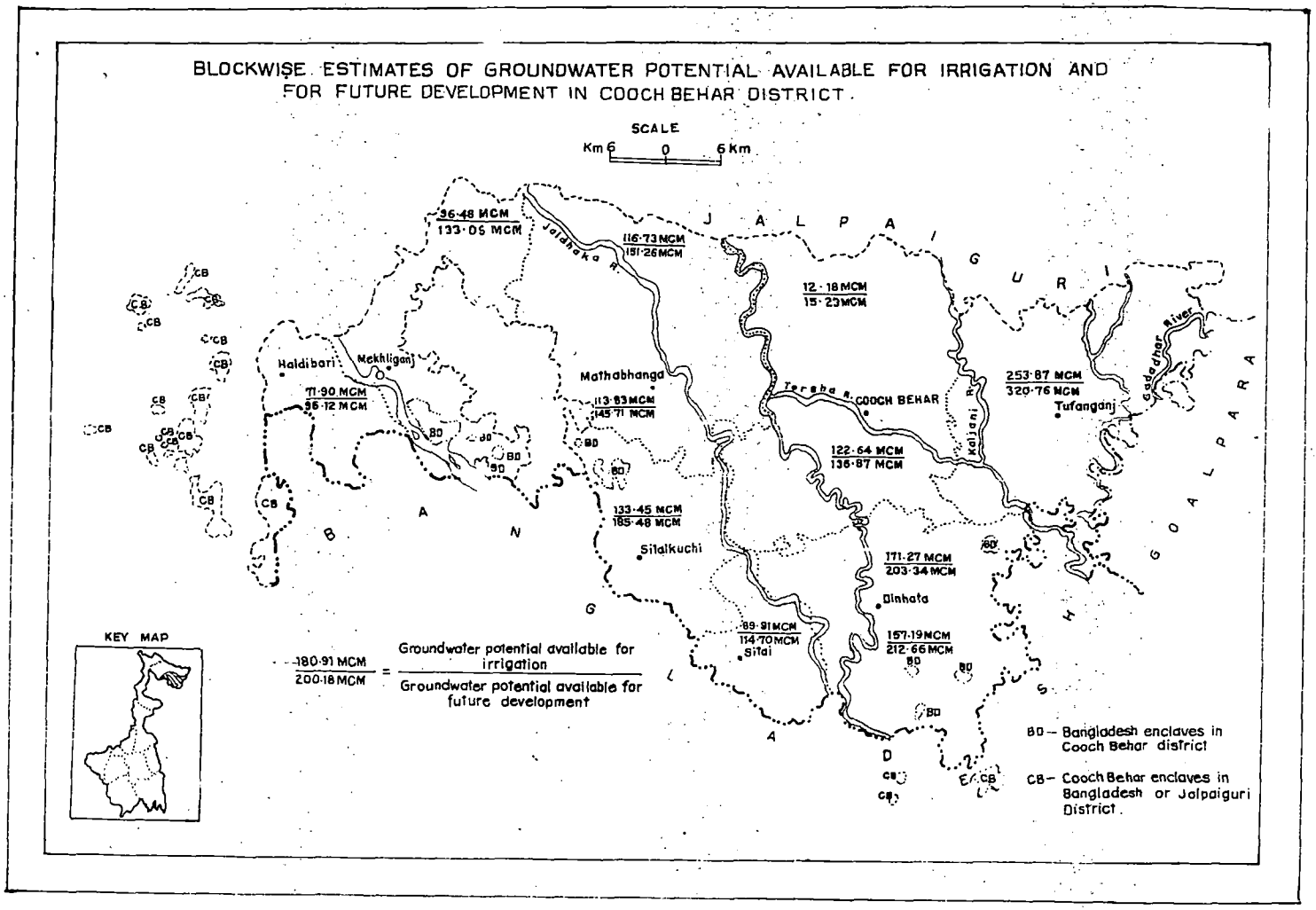
The three tables below provide blockwise estimates of the above hydrogeological measures.

Table 3.16

Blockwise Estimation of Annual Recharge & Potential Available for Irrigation in Cooch Behar District

Name of the Block	Recharge during Monsoon period (MCM)	Recharge during Non-Monsoon period(MCM)	Annual Recharge (MCM)	Potential Available for Irrigation: 70% of Annual Recharge(MCM)
Cooch Behar I	103.49	69.63	173.12	121.18
Cooch Behar II	105.25	69.95	175.20	122.64
Tufanganj	283.62	79.05	362.67	253.87
Dinhata I	189.78	54.89	244.67	171.27
Dinhata II	173.29	51.27	224.56	157.19
Sitai	98.44	30.01	128.45	89.91
Mathabhanga I	122.83	43.93	166.76	116.73
Mathabhanga II	119.84	42.78	162.62	113.83
Sitalkuchi	155.14	35.50	190.64	133.45
Mekhliganj	93.14	43.26	136.40	95.48
Haldibari	73.22	29.50	102.72	71.30
Total			2067.81	1447.46

Source : Technical Report, Series:d No.33 Central Ground Water Board,1983, pp.Appendix V(c).


BLOCKWISE ESTIMATES OF GROUNDWATER POTENTIAL AVAILABLE FOR IRRIGATION AND FOR FUTURE DEVELOPMENT IN COOCH BEHAR DISTRICT.
SCALE
Km 6 0 6 Km
36·48 MCM / 133·05 MCM
Jaldhaka R.
116·73 MCM / 151·26 MCM
12·18 MCM / 15·23 MCM
J A L P A I G U R I
Haldibari
Mekhliganj
71·90 MCM / 86·12 MCM
Mathabhanga
113·83 MCM / 145·71 MCM
Teesha R.
COOCH BEHAR
Kaljani R.
253·87 MCM / 320·76 MCM
Tufanganj
Sadarhat river
122·64 MCM / 136·87 MCM
133·45 MCM / 185·48 MCM
Sitalkuchi
171·27 MCM / 203·34 MCM
Dinhata
89·91 MCM / 114·70 MCM
Sitai
157·19 MCM / 212·66 MCM
B A N G L A D E S H
KEY MAP
180·91 MCM / 200·18 MCM = Groundwater potential available for irrigation / Groundwater potential available for future development
BD – Bangladesh enclaves in Cooch Behar district
CB – Cooch Behar enclaves in Bangladesh or Jalpaiguri District.

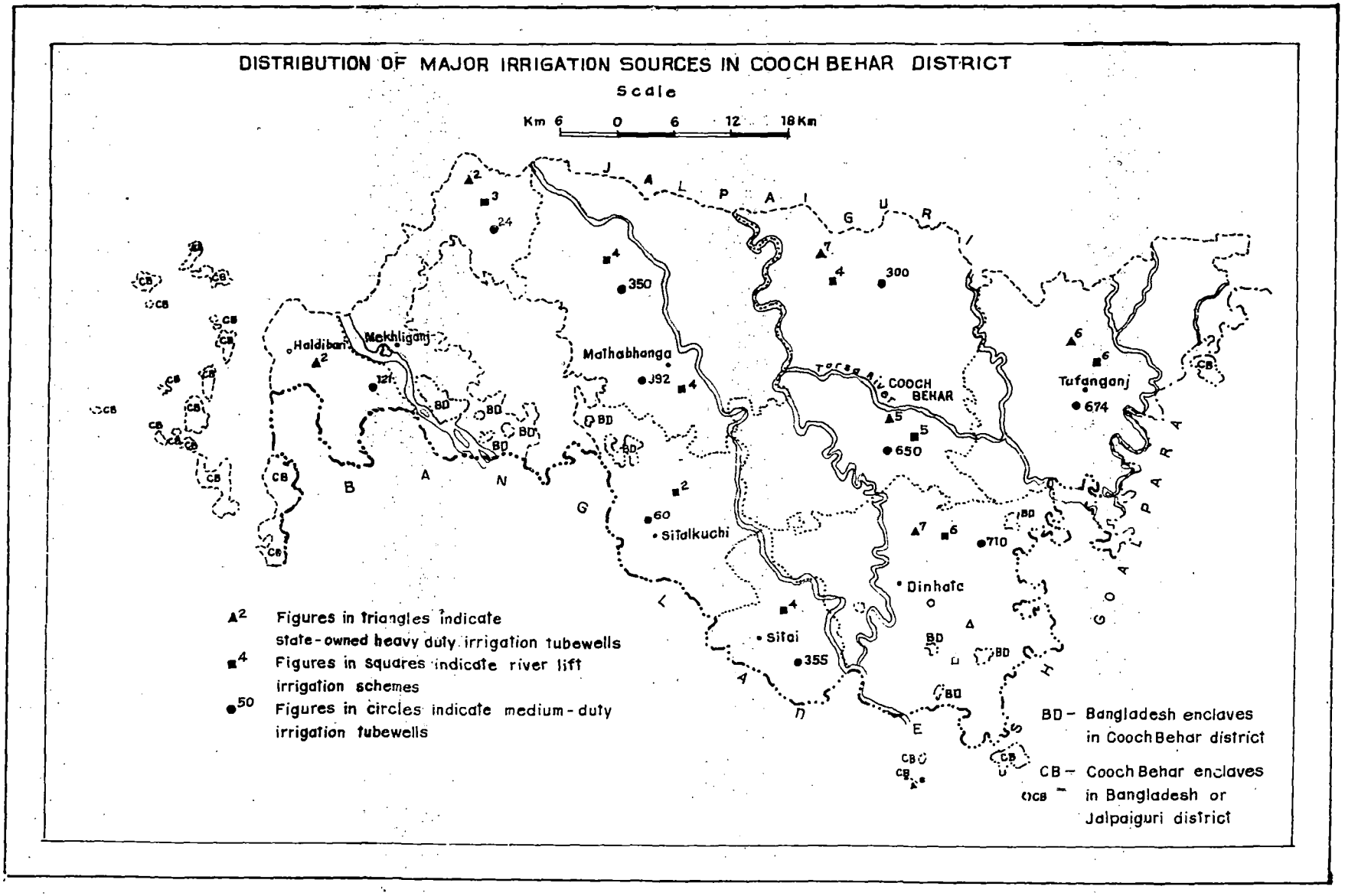

DISTRICT OF MAJOR IRRIGATION SOURCES IN COOCH BEHAR DISTRICT
Scale
Km 6 0 6 12 18 Km
J A L P A I G U R I
Haldibari
Mekhliganj
Mathabhanga
COOCH BEHAR
Tufanganj
Sitalkuchi
Dinhata
Sitai
B A N G L A D E S H
Figures in triangles indicate state-owned heavy duty irrigation tubewells
Figures in squares indicate river lift irrigation schemes
Figures in circles indicate medium-duty irrigation tubewells
BD – Bangladesh enclaves in Cooch Behar district
CB – Cooch Behar enclaves in Bangladesh or Jalpaiguri district

Table 3.17

Blockwise Estimation of Groundwater Draft in Cooch Behar District

Block Name	Agricultural Draft(MCM)	Domestic Draft(MCM)	Net Annual Draft(MCM)
Cooch Behar I	16.34	5.55	21.89
Cooch Behar II	32.80	5.53	38.33
Tufanganj	34.16	7.75	41.01
Dinhata I	36.23	5.10	41.33
Dinhata II	7.75	4.15	11.90
Sitai	11.85	1.90	13.75
Mathabhanga I	11.69	3.81	15.50
Mathabhanga II	13.13	3.78	16.91
Sitalkuchi	1.72	3.44	5.16
Mekhliganj	0.61	2.70	3.31
Haldibari	4.58	2.02	6.60
Total			216.59

Source : Technical Report,Series:d No.33
CGWB,1983,pp.Appendix V(d).

Table 3.18

Blockwise Estimation of Groundwater Balance Available for Further Development in Cooch Behar District

Name of the Block	Annual Recharge (MCM)	Net Annual Draft (MCM)	Groundwater Balance Available for Further development(MCM)
Cooch Behar I	173.12	21.89	151.23
Cooch Behar II	175.20	38.33	136.87
Tufanganj	362.67	41.91	320.76
Dinhata I	244.67	41.33	203.34
Dinhata II	224.56	11.90	212.66
Sitai	128.45	13.75	114.70
Mathabhanga I	166.76	15.50	151.26
Mathabhanga II	162.62	16.91	145.71
Sitalkuchi	190.64	5.16	185.48
Mekhliganj	136.40	3.31	133.09
Haldibari	102.72	0.60	96.12
Total			1851.22

Source : Technical Report,Series:d No.33, Central Ground Water Board,1983, pp.Appendix V(e).

From the tables it can be seen that "the potential available in the district for irrigation is of the order of 1,447.46 MCM, while the total ground water available for development is about 1,851.22 MCM".[46]

In view of this large available resource of groundwater, it is useful to develop some idea of the order to which it has been harnessed for development. An assessment of this can be made by considering the ratio of net annual draft : net annual recharge, which is to the order of 216.59 : 2067.81 or 10.47%[47] for the district. "Thus, it may be seen that practically the entire resources of Cooch

Behar district virtually lie untapped at present, which could be suitably harnessed and utilised by application of safe and scientific principles of groundwater planning and management".[48]

The report comments that all the blocks in the district provide good scope for development of groundwater through dugwells and medium- & heavy-duty tubewells. "With the increased irrigation potential, the farmers in the district should be encouraged and persuaded to resort to multiple-cropping pattern through assured irrigation, which in turn would result in the up-grading of the economic status of the people and the district as a whole".[49] The recommendations are for drilling of more irrigation wells and setting up many more river-lift irrigation schemes on the perennial river systems. "Commercial banks and other institutional financing agencies should come forward with suitable soft-loans enabling purchase of pump-sets and other agricultural inputs by the small and marginal farmers in the district".[50]

3.8 Minor Irrigation Schemes

Agricultural draft of groundwater is accomplished through wells/borings under the categories : dugwells (mechanised and non-mechanised); shallow tubewells electrified & diesel-powered; and deep tubewells (powered alternatively by submersible/turbine pumps). In addition to groundwater sources, culturable water resources also comprise surface flow irrigation (SFI) via a system of barrages and interlinked canals) and surface lift irrigation (SLI) from proximate riverine sources. The schemewise distribution for the whole of Cooch Behar district as of 1988 is stated in the following Table.

From the table below it is evident that surface lift schemes are the primary irrigation support for the district besides traditional dugwells. However, surface irrigation schemes do not draw groundwater and are more susceptible to rainfall aberrations and fluctuating river levels. Thus the mainstay of the district's irrigation profile are shallow tubewells, which account for the bulk of the area irrigated. The computed average command area figures show a difference between STW & SLI schemes that is less than expected, keeping in mind that SLI schemes are multi-user in nature with much more capital investment and pumping capacity.

Table 3.19

Minor Irrigation Schemes in Cooch Behar,1987-88.

Scheme Category	No.of Schemes Schemes	Area Irrigated (ha)	Average Command Area/Scheme (ha)
Dugwells	3763	1706.42	0.45
STW	11331	11603.83	1.02
DTW	51	930.07	18.23
Total Ground Water Irrn.	15145	14240.32	0.94
Surface Flow Irrn.	115	210.51	1.83
Surface Lift Irrn.	1918	3214.07	1.67
Total Surface Irrigation	17178	3424.58	0.19
Total AllSchemes	32323	17665.20	0.54

Source : Compiled from data in State-Level Data Abstract, SWID, Government of West Bengal, 1988.

Discharge figures for groundwater borings, noted earlier, have shown yields of 500m^3/d for dugwells, 22.7-45 m^3/h for STW and 160-220m^3/h for DTW, under normal condition. In comparison, river lift schemes have an average yield of 200m^3/h, but a high incidence of water recycling from seepage, which in the non-monsoon period is as much as 30% of the total water diverted at the outlet of the pump.[51] Command areas, under full-rated conditions for the above schemes are from 2.02-2.83 ha(5-7 acres) per STW and 40.46 ha(100 acres) per DTW. The command area per dugwell is not available. As against the groundwater schemes, the command area for RLI schemes is rated at 52-56 ha. However, nowhere in the district does the average area irrigated from RLI exceed 26 ha. "This under-utilisation of the capacity is due to the reluctance of the farmers to take water from these schemes on payment basis and also the sandy nature of the soil which prevents large command areas".[52]

DESIGN OF THE CASE-STUDY

The foregoing discussion has fixed the importance of irrigation facilities in the development of agriculture in Cooch Behar district. Since the purpose of this research is to investigate the importance of electricity in a primarily agrarian economy, Cooch Behar provides an ideal territory for field investigation. Features of electricity distribution and consumption in the district, insofar as they pertain to the subject of study, have already been brought out in the chapter on electricity. With the high rural bias that prevails in agrarian economies the importance of electricity as a productive input may demand extension of the hitherto industry-based concepts of the productive nature of electricity; this point is often missed in perspectives on power-development over the country and the region.

In addition to the productive potential embodied in electrification of rural areas, the other more commonly recognised attribute of electricity is as a component in the improvement of the availability of life. In some sense, confinement of public and governmental attention to only this attribute gives power perspectives an unduly urban orientation that may of course be the fruit of conscious targeting of India's developmental strategies to industrialisation. At a regional level such strategies are often inequitable and lead to an exacerbation of inter-regional and rural-urban differentials. They also have been held responsible, by scholars critical of their thrust, for creating a development process that has tended to bypass the village, by and large. Mis-direction of development efforts are also held responsible for the emergence of technological dualism in countries with large agrarian populations.

Cooch Behar is an epitome of all these problems : development in the district has been tardy because of its 'no-industry' status; with its predominantly agrarian situation it has no foreseeable industrial future; and, unless development processes are tailored to its situation, the district will be bypassed in the general progress achieved by the State and the country.

Mere stress on agricultural extension may not be enough. The agrarian economy of the district gives agriculture the potential of emerging as a leading sector which can carry with it, the needs and aspirations of rural society. This inevitably entails technological intervention into traditional agricultural patterns, and at an accelerated rate.

The present study thus derives its orientation from this standpoint. Electricity is an important contributor to economic productivity; in agrarian economies this productivity can be unleashed by irrigation and by the technological adaptation of irrigation systems to increased use of electricity; perspectives on power demand and development must take cognigence of this and shed their urban-industrial biases. An approach to quantifiable assessment of the problem, as stated, is made by detailed investigation of the various economic and technological parameters that define this issue, over selected blocks of Cooch Behar district.

While field investigation was only feasible for the selected blocks themselves because of the limitations of time and circumstance, block-selection was done carefully so as to ensure a properly-representative study. Full consideration was thus given to the distinctive characteristics of the district, its subdivisions and their blocks, in th light of the information already included in the earlier sections of this chapter. The two blocks thus selected were Dinhata I, belonging to Dinhata subdivision, and Tufanganj I, belonging to Tufanganj civil subdivision but otherwise a constituent of Cooch Behar Agricultural subdivision as earlier stated. Population in Tufanganj I was 1.62 Lakhs in 1981 with a density of 497 while in Dinhata I it was 1.86 Lakhs with 652 population density. Dinhata in any case is most densely-populated block in Cooch Behar district. The population distribution has a more urban character in Dinhata I, which includes Dinhata Municipality; Tufanganj I is heavily-rural dominated. Rural:urban ratios are 31.94 for Tufanganj I and 11.84 for Dinhata I, and are indication of this.[33]

Broad features of land utilisation in these blocks are available from Table 3.10. Over the whole district these blocks constitute a more developed agricultural sample, but since the study focuses on irrigation aspects, selection was purposively directed. There is however substantial inter-block variation in the general block characteristics to regard these two blocks as constituting a heterogeneous sample.

Tufanganj lies to the north-east of the district sharing its borders with adjoining Jalpaiguri; the land border with Assam, however, now falls in Tufanganj II block, after re-constitution. To the west Tufanganj I is bordered by both Cooch Behar I & II and to the south by Dinhata II. Dinhata subdivision forms the south-eastern border of Cooch Behar which merges on the international border of India and Bangladesh; enclaves of Indian territory in Bangladesh fall under its jurisdiction. Dinhata I is the western segment of the sub-division and shares its southern boundaries with Bangladesh. To its north lies Cooch Behar II and to the west, across the Jaldhaka (or Mansai), lies Sitai.

Being in a riverine bed heavily crossed by rivulets, large variation in soil constitution are found even in as small a geographical area as the blocks in question bear reference to. Tufanganj is traversed by the Raidak and Kaljani systems; the richest black loams however lie to the east[34] in Tufanganj II block. The loam constituent in Tufanganj I soil is nevertheless higher than in Dinhata I, with a 50:50 percentage distribution between loam: sandy loam & sandy-clay loam over Tufanganj blocks I & II, together.[35] For Dinhata I sandy loam constitute 70% and loams themselves are only 30%. Clays are absent from the soil in Dinhata I,[36] pointing to low moisture-retentivity and poorer soil, which is why tobacco cultivation is more

widespread. Northern Dinhata I to the west of the old course of the Dharla is sandy; however, to the east more loams are formed under the influence of the Mansai system.[57] Highlands or dangas, are generally more sandy than the lowlands and less fertile but proper manuring can yield rich crops of tobacco, sugarcane etc.[58]

As the earlier of the available figures refer to the period before bifurcation of Tufanganj into Tufanganj I and Tufanganj II, it is difficult to ascertain the precise position of Tufanganj I from older secondary sources. However, treating Tufanganj I & II as constituting Tufanganj, some idea of variations in soil textures can be gleaned from the blockwise soil texture's chart given below.

Heavy soils comprising clays and clay loams are absent in the district. As much as 85% of land in Tufanganj (I & II) is an medium elevation, highlands constitute only 9% and lowlands 4%. The corresponding figures for Dinhata I are 81%,13% and 5%, respectively.[59] More elevational variation is found in Dinhata I, with more danga land.

Block Profile: Soil Textures

(cultivable ha)

Name of the Block	Light Sandy	Light Sandy	Medium Sandy Loam	Medium Sandy-Clay Loam
Tufanganj (I & II)	9124	19950	7090	3740
Dinhata I	3600	16640	2536	993

Source : Compiled from Annual Plan on Agriculture,Cooch Behar,1986-87,Table 1.4.3.pp.15.

Chemical constitution of soils show 87% (ph-acidic):13% (ph-neutral) for Tufanganj I & II, and 80% (ph-acidic):20% (ph-neutral) for Dinhata. Available phosphates and potash are also better in the case of Dinhata I but the difference in organic carbon constituents between Tufanganj (I & II) and Dinhata I is marginal.[60]

BLOCK PROFILES

3.10 Agriculture

Information relating to the rural situation and agriculture in the study block is presented in the tables to follow. Because of the difference between civil and agricultural administrations in Cooch Behar, it is still difficult to obtain separate figures for Tufanganj I from official statistics, hence agricultural data are presented for Tufanganj I & II as a whole.

The first table shows the distribution of rural population in Dinhata I and Tufanganj I over various agricultural classes. Differences between blocks are immediately obvious from the bracketed percentage expression. Urban populations in the two blocks have been excluded in the percentage computations - Tufanganj in any case is primarily rural with a small urban settlement administered by a municipality, whereas Dinhata I includes a larger municipal town. From the table it is seen that the marginal farmer & landless labourer segment is more predominant in Dinhata I than in Tufanganj I. Dinhata I being bordered by Bangladesh has high population density with a large component of resettled people, which accounts for this. Tufanganj has a more settled agricultural population with a larger proportion of owner-cultivators. This is corroborated by percentages of those holding pattas (permanent titles) to lands which are higher for Tufanganj. Bargadars too are numerically stronger in Tufanganj I.

Table 3.20

Distribution of Rural Population in
Dinhata I and Tufanganj I Blocks

Population	Dinhata	Tufanganj
Landless Labourers	18400	14193
%	(11.74)	(8.24)
Bargaders	2420	5220
%	(1.54)	(3.03)
Patta-holders	4921	12280
%	(2.85)	(7.13)
Small Farmers	1180	3285
%	(0.75)	(1.90)
Marginal Farmers	9353	8932
%	(5.96)	(5.18)

Source : Compiled from Block Profile, Cooch Behar 1989-90,Bureau of Applied Economics & Statistics, West Bengal.

Note

Figures available in the quoted sources are often subject to serious typographical error and need to be corrected before use as has been done here]

Definitions:

Small Farmer : Cultivator with landholding less than 2ha or class I irrigated land less than 1ha.,

Marginal Farmer: cultivator with landholding less than 1ha or class I irrigated land less than 0.5ha.,

Agricultural Labourer : person with no land other than homestead and drawing 50% income from agriculture.

As earlier noted land & soil conditions are better in Tufanganj I than in Dinhata I, even though the latter has the bigger stake in the major cash-crop of the district i.e. tobacco. Dinhata I, therefore, represents an agriculturally less-endowed block where Tufanganj I is comparatively better off. This difference provides a useful frame of reference for the sample study.

The table below brings out the relative positions of Dinhata I and Tufanganj I & II (combined) in respect of their agricultural patterns. Yield figures are also provided for Cooch Behar district although they pertain to an earlier year for which data were available. Comparison of block yields with district yields does show the blocks to be better in most cases, with differences being large enough, usually, to nullify potential errors in comparing figures for disparate years. Howeveg a glaring opposite is found in boro paddy (which is completely irrigation-dependent) for which the block yields tend to be low; so also for wheat.

Figures for cropping production and yields are shown in table below.

Table 3.21

Area, Production and Yields of Principal Crops in Dinhata I and Tufanganj (I & II) Blocks 1984-85

	Area(ac)		Production (MT)		Yield(kg/ac)		
	Dinhata	Tufanganj	Dinhata	Tufanganj	Dinhata	Tufanganj	Cooch Behar
Aus Paddy	26895	49913	9682	20214	360	405	297
Aman Paddy	29470	86352	17181	46457	583	538	489
Boro Paddy	373	4369	383	4277	1028	979	1261
Jute	12232	2164	6429	1097	525	507	468
Wheat	7297	12628	5253	7041	720	558	742
Mustard	1727	7133	305	1569	177	220	na
Potato	1413	2581	4807	9188	3402	3560	3390

Source : Compiled from Block Profile, Cooch Behar 1989-90,Bureau of Applied Economics & Statistics, West Bengal & Annual Agricultural Plan, Cooch Behar 1986-87.

Note: ac=acre, MT=Metric Ton, kg=Kilogram.

Between blocks Dinhata I seems to obtain higher yields in most cases except for aus paddy, mustard and potatoes. It had earlier been noted that Dinhata I was agriculturally less-endowed, which may now appear to be paradoxical. The reason is however apparent from study of boro paddy, where Dinhata I excels: Dinhata I, in its comparatively adverse agricultural situation places higher reliance on technology and obviously has greater access to irrigation. Also it is quite likely that with wel-entrenched commercial cropping of tobacco, more enterprise is displayed by the Dinhata farmers. Aus paddy is gradually being supplanted by boro varieties; the fact that Tufanganj still persists in high acreages of the former is both a pointer to the higher moisture-retentivity in Tufanganj's soil and also to less dynamic agricultural practices. In combination with this, reference may be made to the Table 3.8, 3.9 & 3.10. Figures therein pertain to net acreage sown and area in which more than one crop is grown, over Dinhata I, Tufanganj I and , for the sake of comparability with the cropping table, over Tufanganj I & II (combined). Ratios of double-cropped area to net cultivated area show that double cropping is lower in the case of Dinhata I and higher for Tufanganj I; for Tufanganj I & II (combined) it increases handsomely, on inclusion of the agriculturally best-endowed block of Tufanganj II. On decomposition, the ratio for Tufanganj II would be as high as 90.15%. Keeping this in mind it is possible to assume that area, production and yield figures for Tufanganj in Table 3.13 would be lowered substantially by exclusion of Tufanganj II; so that the same technological divide between Dinhata II and Tufanganj I, as earlier alluded to, would appear more strongly.

3.11 Irrigation

After consideration of agriculture over the study-blocks attention now needs to be focused on their irrigation profiles. There has been substantial modification on irrigation technology from the traditional don system used to draw water from bils and other manual means of well-irrigation. Access to new technology however is recent,

following from the AFPP programme, and now accelerated by the Special Food Production Programme(SFPP) and the Integrated Rural Development Scheme(IRDP) schemes, along with schemes in the State-sector under the auspices of the State Department of Minor Irrigation. Technologies provided difference: the schemes in the State-sector consist, in the case of the study-blocks, of surface lift technology under the multi-user RLI(river lift irrigation)schemes and deep-boring technology using turbine/submersible pumps under DTW(deep tube well)schemes, while IRDP and SFPP schemes provide credit-linked support for installation of single-user medium-duty irrigation tube wells by private cultivators. In the later case,assistance is channelised to the District Rural Development Agency(DRDA) from funds made available through NABARD and World Bank auspices.

The bigger schemes are heavily capitalised with much greater water draft, technical details of which have been mentioned earlier. Assistance for STW is disbursed at subsidies of 25%, 33.75% and 50% of scheme-cost, respectively, for small farmers, marginal farmers and weaker sections (comprising scheduled castes/scheduled tribes/handicapped persons), the rest of expenditure being funded through bank loans under district credit plans prepared by the Lead Bank. Similar subsidies obtain for SFPP assistance except that 50% subsidy only applies to tribal farmers. In cases where the total scheme costs does not excess Rs. 3000/- for small farmers, Rs.4000/- for marginal farmers and Rs.5000/- for tribal farmers, the DRDA bears the entire cost with a provision that a willing farmer is permitted to meet any excess expenditure from his own resources.[61] The IRDP comprises a target-oriented package scheme addressed to rural population living below the poverty line, defined at a family income-level of Rs.6400/- or less,[62] funding for which is drawn from the Central and State Government on 50:50 sharing basis. As such the ceiling on subsidies for minor irrigation is in percentage rather than monetary terms.[63] Minor irrigation assistance under SFPP does not demarcate the specific target population on the basis of family income-ceilings,hence subsidies are bound within monetary limits. Applications from potential beneficiaries,in both cases, are processed by the DRDA.

Given their agricultural situations, the two study-blocks are expected to show differentiation in their approach to irrigation and irrigation technology. Salient features with respect to this are brought out in the Table 3.22.

The Table below shows distribution of STWs in Dinhata I and Tufanganj I by land-holding groups, with district figures for comparison. Separate columns provide the percentages of block-category to total district-category. Bracketed expressions, on the other hand, are distributive percentages of block-category to block-total. Once again it can be seen that there is divergence between Dinhata I and Tufanganj I. The distribution in Tufanganj I is of a more modal nature with closer correspondence to the district-pattern; Dinhata I is more extreme with greater clustering of STWS in the holding categories above one ha. At the upper end however Dinhata I is more convergent and Tufanganj more divergent than the district. Dinhata I with its poorer soil situation and more depressed occupational distribution indicates low response from the marginal categories of farmers; on the other hand larger farmers are much more inclined to adopt irrigation technology, even at the cost of funding it from their own resources - this re-defines their competitive bent. Much less evidence of such risk-bearing exists for Tufanganj I or for Cooch

Behar as a whole. Block-to-district category percentages echo the same findings: Tufanganj I contributes the larger part of marginal scheme-beneficiaries and Dinhata I, the larger part of the well-off beneficiaries. Figures at the bottom pertain to culturable command areas and to irrigation potential created. Once again Dinhata I with a smaller number of STWs has higher command areas and irrigation potential. Cooch Behar district figures provide a comparative standard.

Table 3.22

Shallow Tubewells (electricity & diesel) in Dinhata I & Tunfanganj I Blocks: Distribution by Landholding Groups

(no. of schemes)

Land Holding(ac)	Dinhata I	District	Tufangani I	District	Cooch Behar
0-1	402		912		4193
%	(22.05)	9.50	(43.91)	21.75	(35.84)
1-2	721		735		4283
%	(39.55)	16.83	(35.39)	17.16	(36.61)
2-4	552		335		2292
%	(30.28)	24.08	(16.13)	14.61	(19.59)
4-6	111		68		567
%	(6.09)	19.57	(3.27)	11.91	(4.85)
others	37		27		364
%	(2.03)	10.16	(1.30)	7.41	(3.11)
Total Scheme-holders	1823	15.58	2077	17.75	11699
Total CCA(acre)	6441.76		5697.89		3118.72
Total IP(acre)	7130.67		6460.19		34275.54

*CCA= Culturable Command Area, IP= Irrigation Potential

Source : Census of Minor Irrigation Schemes in West Bengal, 'Block Profile of Cooch Behar',SWID,1988.

Table 3.23

Shallow Tubewells in Dinhata I & Tufanganj I Blocks: Distribution by Power Source

STWs in Use	Dinhata I	Tufanganj I	Cooch Behar	West Bengal
Electric	37	49	245	33237
%	(2.07)	(2.43)	(2.16)	(9.06)
Diesel	1648	1964	8218	323621
%	(92.22)	(97.56)	(72.52)	(88.29)
Manual etc.	102	---	2868	9684
%	(5.70)		(25.31)	(2.64)
Total	1787	2013	11331	366542

Source : Compiled from :

i) Census of Minor Irrigation Schemes in West Bengal, 'Block Profile of Cooch Behar',SWID,1988.

ii) Census of Minor Irrigation Schemes in West Bengal, 'District Level Abstract',SWID,1988.

iii) Economic Review, Government of West Bengal, 1990-91.

iv) Block Plan of Dinhata I(1988-89) and Tufanganj I (1990-91).

The second Table 3.23 considers STW schemes in the study blocks on the basis of source of power. In this case percentage comparisons are also provided for the State of West Bengal besides Cooch Behar district. Comparing the State to the district, Cooch Behar reveals a crisis in energisation of STWs with a large 25.31% still being non-energised. Electrification in the district is also low at 2.16% compare to the State's 9.06%, though the State itself betokens very low electrifica- tion because of the low rural priorities of its transmission networks. Comparing blocks, energisation as a whole is better in Tufanganj I, so also for electrification. Dinhata I still has a diesel percentage that is much higher than the district and a much lower percentage of manually-powered STWs. For more allround assessment, one could consider the percentage distribution between three energy-sources for an agriculturally progressive district like Burdwan where the percentage ratio is 8.44:90.27:1.27.[44] Dinhata's pattern is close enough despite its lower access to electrically-powered STWs, even lower than for Cooch Behar district where it is located. Some understanding of these electricity aspects is also carried by the subsequent table.

Table 3.24

Community Irrigation Installations in Dinhata I & Tufanganj I Blocks
(h/a = hours per day)

Scheme	Energy-use 6.7h/d Dinhata I	Energy-use 7h/d Tufanganj I	Energy-use 6.63h/d Cooch Behar
DTW (no.)	7	2	51
CCA(area)	1260.09	311.22	5009.13
IP (area)	1383.69	311.22	6213.83
RLI (no.)	9	8	91
CCA(area)	2362.5	600	6153.22
IP (area)	2467.31	600	7456.17

Source : Census of Minor Irrigation Schemes in West Bengal, 'Block Profile of Cooch Behar',SWID,1988.

Note: CCA(culturable command area) & IP(irrigation potential) in the SWID Census, which are aggregates over Government and private SLI(surface lift irrigation) categories, have been adjusted by RLI-specific ratios obtainable in the block profile.

The table above presents information on RLI and DTW installations in the study-blocks. These installations are of larger capacities with well-yields upwards of 100m³/h and thus attached to multi-user configurations. Because of their nature, the schemes are Government-operated rather than private, even though some instances of RLI operated by public organisations are found elsewhere in the district. The DTWs are electrically operated while RLIs in the study blocks are diesel-powered, even though their ultimate conversion to electricity is technically feasible. DTW installations in Tufanganj I were relatively recent at the time of SWID Report(1988) hence data on culturable command area and irrigation potential appear somewhat arbitrary and independent of field conditions. Similar figures for Cooch Behar district provide a comparison, both for DTW and RLI installations. One thing that stands out in the table is the apparent lead that Dinhata I appears to have in irrigation compare to both Tufanganj I and to the district. This reinforces the observation earlier made about the more competitive attitudes of Dinhata I farmers. In the case of Tufanganj I, greater complacency appears to persist, which can be further elucidated by a reference to seasonal

cropping figures, later. In any case Tufanganj I does not make optimum use of irrigation capacities, neither in comparison to Dinhata I or to Cooch Behar district as a whole.

As many as four out of the eight Dinhata DTWs have underground distribution networks that are much more water-conserving than overground channels; these amount to 50% of such water-efficient distribution systems that exist in the district as a whole. Figures for average hours of availability for electricity per day during the peak season for the State-run DTWs are 6.7h/d for Dinhata I, 7h/d for Tufanganj I and an average of 6.63h/d of Cooch Behar district. Corresponding figures for electrically operated STWs are 4.7h/d, 8.4h/d and 6.4h/d,[45] respectively. Electricity, is more of a constraint for Dinhata I, but does not affect its higher intensity of irrigation.

Figures on kharif/rabi and other seasonal acreages are now considered in Table 3.25. The SWID's census does not provide seasonal acreages specific to RLI hence the figures on surface lift irrigation (including river/drain/tank based irrigation schemes) have been included. The percentages in brackets refer to the distribution of district acreages over blocks and schemes.

Table 3.25

Area Irrigated by Season & Scheme in Dinhata I and Tufanganj I Blocks, 1987-88

Dinhata I

Scheme	Kharif	Rabi	Perennial	Others	Total
STW(D+E)	1716.6	3718.9	146.3	570.8	6152.5
%	(17.7)	(15.2)	(30.8)	(13.1)	(15.8)
DTW	42.9	392.6	nil	35.2	470.7
%	(0.4)	(1.6)	(0)	(0.8)	(1.2)
SLI(RLI & Others)	240.3	897.6	0.9	179.2	1318.0
%	(2.5)	(3.6)	(0.1)	(4.1)	(3.3)

Tufanganj I

STW(D+E)	2217.3	3336.1	17.8	751.6	6322.9
%	(22.9)	(13.6)	(3.7)	(17.3)	(16.2)
DTW	nil	nil	nil	nil	nil
%	(0)	(0)	(0)	(0)	(0)
SLI(RLI & Others)	132.2	164.5	8.8	108.8	413.0
%	(1.3)	(0.6)	(1.8)	(2.5)	(1.0)

Cooch Behar

STW(D+E)	7702.2	17550.7	331.2	3077.6	28661.5
DTW	731.8	1385.9	nil	179.6	2297.3
SLI(RLI & Others)	1245.2	5469.3	143.8	1081.1	7939.5
Total	9679.2	24405.9	475	4338.3	38898.3

Source : Census of Minor Irrigation Schemes in West Bengal, 'Block Profile of Cooch Behar',SWID,1988.

From the table it is apparent that community irrigation is more effective in Dinhata I than in Tufanganj I. STW(D+E) is much more intensively used in the rabi season in Dinhata I; perennial irrigated acreages are also high. Tufanganj I, on the other hand, has higher acreage-intensity in 'other' irrigated seasons; since Table no 3.21 had suggested that traditional pre-kharif cultivation, especially of aus paddy is more predominant in Tufanganj I, the reason for such acreages are clear, boro cultivation being relatively lower there.

3.12 Directions for Empirical Study:

Given the native features of Cooch Behar district, the study region, and Dinhata I and Tufanganj I, the study-blocks, an assessment of irrigation impact on seasonal agriculture now needs to be made, particularly with reference to its energy-aspects. For this purpose field investigation was undertaken in selected villages: namely, Chilakhana, Ghogar Kuthi, Dwiper Par & Chamta in Tufanganj I and Bara Athiabari, Chhoto Phalimari, Bhatlaguri & Munshirhat in Dinhata I over a heterogeneous sample of cultivators, both from scheme-beneficiary and non-beneficiary categories. The purpose behind the field study was to elicit information about differential performance between schemes on the basis of their energy classifications, with special attention being given to the performance of the electrified sector.

The underlying reasoning is that any natural advantages conveyed by the use of a cheap and clean energy source like electricity will be converted into productive benefits for scheme-beneficiaries falling within the electrified sector. Low preponderance of electrified schemes in the State in general and in the study region in particular is the result of low generation and weak rural transmission networks, coupled with low priorities accorded to rural use of electricity for productive purposes of a non-industrial nature. That such a situation should persist indefinitely would augur ill for the prospects of rural development in regions where industrial alternatives are at a minimum. Hence the assessment undertaken is hoped to be timely and is expected *a priori* to argue the case for revision of electricity priorities so as to ensure equity in benefits imparted to both rural and urban segments of the population.

References

1. Notification No.3589.G.A. dated 1 January 1950, Majumder Durga Das,West Bengal Districts Gazetteers, Koch Bihar,1977.pp.6.
2. Majumder,D.D, 'West Bengal Districts Gazetteers', Koch Bihar,1977, pp.1.
3. Ibid. pp.27.
4. Ibid. pp.1.
5. Ibid. pp.27.
6. Ibid. pp.2.
7. Ibid. pp.2.
8. Technical Report : Series D No.33, Hydrology & Ground Water Potential of Koch Bihar District, Central Ground Water Board, Eastern Region,1983, pp.4.
9. Ibid. pp.18.
10. Ibid. pp.7.
11. Ibid.
12. Annual Plan on Agriculture, Cooch Behar, 1986-87,Principal Agricultural Office, Cooch Behar, pp.3.
13. Majumder,D.D, op.cit. pp.131.
14. Ibid pp.138-141.

15. District Census Handbook, Series 23, West Bengal, Part XIII-B, Koch Bihar District, pp.9.
16. Bose Ashish,Demographic Diversity of India, 1991 Census, State and District Level Data - A Reference Book, B.R.Publishing Corporation,Delhi,1991, pp.379.
17. Ibid. pp.381.
18. Op.cit. District Census Handbook, pp.9.
19. Op.cit. Majumder,D.D, pp.58.
20. Op.cit. District Census Handbook, pp.XIV.
21. Op.cit. Majumder,D.D, pp.153.
22. Op.cit. Technical Report, pp.4-5.
23. Op.cit. Annual Plan on Agriculture, pp.3.
24. Op.cit. Technical Report, pp.5.
25. Ibid.
26. Ibid. pp.7.
27. Economic Review 1990-91, Government of West Bengal,pp.86.
28. Ibid.
29. Ibid. pp.211.
30. Op.cit. Majumder,D.D, pp.14.
31. Hunter W.W, A Statistical Account of Bengal,vol.X,Concept Publishing Company,New Delhi,1984,pp.394.
32. Mitra A, Census 1951, West Bengal, District Handbooks Cooch Behar,Appendix II,An Account of Land Management in Cooch Behar, 1870-1904, pp.lxxi.
33. Op.cit. Majumder,D.D, pp.14.
34. Ibid. pp.65.
35. Ibid. pp.66.
36. District Plan 1989-90, Cooch Behar District, Office of the District Magistrate, Section 6,pp.IV.
37. Op.cit. Majumder D.D, pp.66.
38. Op.cit. Annual Plan on Agriculture, pp.20.
39. Conference on Regional Development of North Bengal Prospects & Potentials Background Paper,Goverment of West Bengal, 1986,pp.32.
40. Op.cit. Technical Report, pp.7.
41. Ibid. pp.11.
42. Ibid.
43. Ibid. pp.10.
44. Ibid. pp.14.
45. Over-Exploitation Committee Report, Agricultural Refinance Development Corporation, 1981.
46. Op.cit. Technical Report, pp.13.
47. Ibid.
48. Ibid.pp.14.
49. Ibid.pp.16.
50. Ibid.pp.17.
51. Ibid.pp.13.
52. Ibid.pp.11.
53. Op.cit. District Census Handbook, pp.8-9.
54. Op.cit. Majumder D.D, pp.67.
55. Op.cit. Mitra A, pp.xx.
56. Op.cit. Annual Plan on Agriculture, Table 1.4.1, pp.13.
57. Op.cit. Majumder D.D, pp.67.
58. Op.cit. Mitra A, pp.xx.
59. Op.cit. Annual Plan on Agriculture, Table no. 1.5.1.pp.18.
60. Ibid. Table 1.4.2.pp.14.
61. Annual Action Plan 1992-93, DRDA,pp.122-124.
62. IRDP Guidelines, Section I,pp.1.
63. Ibid.
64. Op.cit. Economic Review 1990-91, Table 5.21 pp.90.
65. State Level Abstract,Census of Minor Irrigation Schemes in West Bengal,1988,State Water Investigation Directorate (SWID), Government of West Bengal.
