

JL
Um2, N26GE.
N55.30.3
145266

Vol. XXX

JULY—SEPTEMBER 1955

No. 3

560

The

Indian Geographical Journal

Formerly

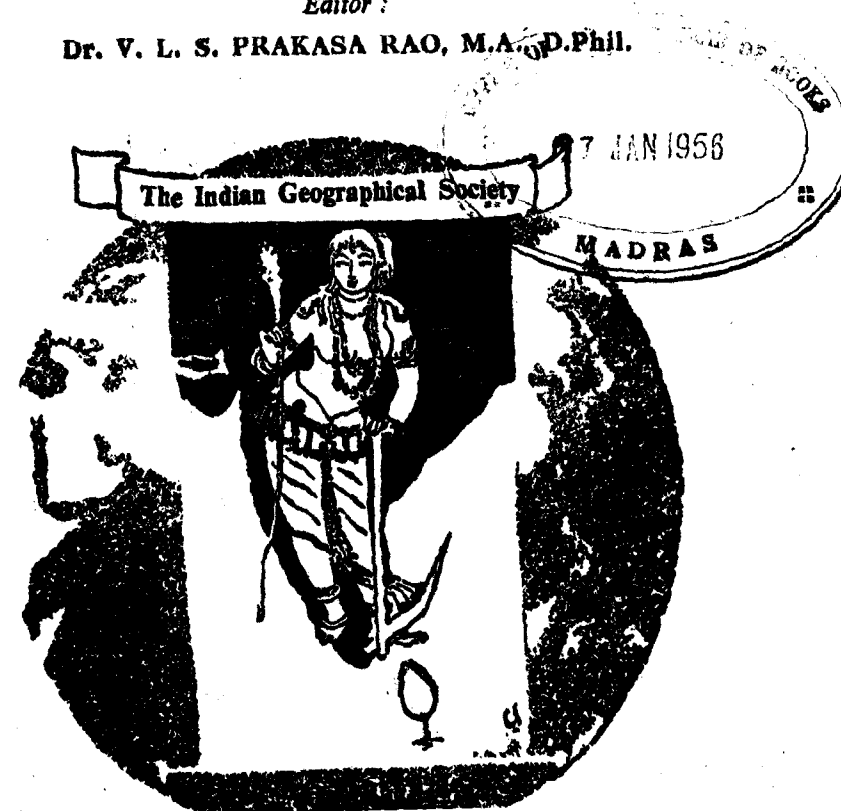
THE JOURNAL OF THE MADRAS GEOGRAPHICAL ASSOCIATION

PUBLISHED QUARTERLY

Editor :

Dr. V. L. S. PRAKASA RAO, M.A., D.Phil.

560
1-55



CONTENTS

	PAGE
1. A STUDY OF JUTE CULTIVATION IN WEST BENGAL —By Bireswar Banerjee	65
2. SUKKUR AND ITS ENVIRONS—A GEOGRAPHICAL STUDY —By Akhtar Husain Siddiqui, B.A. Hons. (Alig.) ; M.A. (London) -	79
3. AGRICULTURAL PATTERNS OF DHARWAR DISTRICT —By Prof. L. Y. Kulkarni	88
4. THE DISTRIBUTION OF RAILWAY COMMUNICATION IN WESTERN INDIA —By V. S. Gananathan	95
5. ABOMINABLE SNOWMAN —By REV. Swami Pranavananda, F.R.G.S.	99

PUBLICATIONS OF THE INDIAN GEOGRAPHICAL SOCIETY

THE INDIAN GEOGRAPHICAL JOURNAL—Quarterly

Annual subscription: Rs. 8/- and Admission fee: Rs. 2/-

Monographs:—

1. **Hydro-Electric Power Development in India—A Geographical Analysis** by Dr. George Kuriyan, Reprinted 1948. Rs. 3/-;
2. **Geographical Education in Indian Universities** by Prof. Kedar Nath Srivatsava. Rs. 1-8-0.
3. **Silver Jubilee Souvenir Volume and the N. Subramanyam Memorial Volume 1951.** Rs. 15/-; (Pp. 228 with 82 illustrations). Containing articles of high reference value from Professors of Geography from all over the world.

Advertisement Tariff

Full page	Rs. 30/-	per insertion.
Half page	„ 15/-	„
Cover page	50 per cent extra.	

THE INDIAN GEOGRAPHICAL SOCIETY,

UNIVERSITY EXAMINATION HALL,
MARINA, MADRAS-5 (India).

THE INDIAN GEOGRAPHICAL JOURNAL

Formerly

THE JOURNAL OF THE MADRAS GEOGRAPHICAL ASSOCIATION

Vol. XXX

JULY—SEPTEMBER 1955

No. 3

*The Editor takes no responsibility for the views expressed in the Journal.
Authors alone are responsible for their respective statements.*

A STUDY OF JUTE CULTIVATION IN WEST BENGAL

BIRESWAR BANERJEE,

Department of Geography, University of Calcutta.

INTRODUCTION

Production of jute was a monopoly of Bengal. It was introduced into world trade by the East India Company, by the end of the 18th century. Since then the acreage of jute cultivation increased from a few thousand to million acres. The partition of Bengal into East Pakistan and West Bengal, had completely dislocated the jute economy. Major percentage of the acreage falls in East Pakistan, whereas the industry is located in the neighbourhood of Calcutta. Calcutta jute mills, for a time experienced dearth of raw jute. But this was well compensated by increase in the acreage and production by means of diverting land from rice cultivation and by reclaiming waste lands. In 1947, immediately after partition, 2,29,000 acres were under jute cultivation in West Bengal, i.e., only 39 p.c. of the total jute acreage of India. In 1952-53, 8,36,000 acres were brought under jute cultivation, an increase of 214 per cent within 5 years. This increase was mainly due to India's policy to increase the production of the fibre, which accounted for about 40 per cent of her total foreign currency and 60 per cent of her dollar earnings and to the lucrative selling prices of raw jute in the State, during the post-partition years. West Bengal is even now the largest jute growing State in India, yielding about 52 per cent of the total Indian output. In spite of all efforts made in recent years to initiate jute growing in other countries, India and Pakistan are yet the producers of some 97 per cent of the world's supply. It outweighs other fibres, such as kenaf, mesta, etc., in being cheap, strong and resistant to wear and tear. Successful cultivation of jute depends on climate, soil, and also to a considerable extent on the market-price of raw jute. Of these factors, the first two are of primary importance, though the last factor plays an important part. In the following pages, the various aspects of this important cash crop of West Bengal are discussed.

In West Bengal, there are two major types of alluvium—old and new. The old alluvium is called 'Lal mati' or Khair and the new alluvium is popularly known as 'Pali mati'. The new alluvium is generally found near large rivers, specially in their deltas and is the alluvial soil *par excellence*. The soils of the western portion of the Burdwan division and parts of Malda and Dinajpur districts belong to the old alluvium. The whole of north Bengal with the exception of the hills and the three southern districts of the Presidency division belong to the latter category.

Almost the entire crop of jute in West Bengal is cultivated on the newer alluvial soil. The important jute tracts are situated mostly in the deltaic areas. During the monsoons, these tracts are flooded, some remain temporarily under a few inches of water, some are under 6 feet of water from June onwards, while a few others are inundated only in July and August.

The old alluvium becomes very hard during drought, and prevents the spreading of roots. This seems to be one of the main reasons for its unsuitability for the cultivation of this crop. Jute cannot also be grown on salt-impregnated soils. This explains the unsuitability of the saline tract bordering the Bay of Bengal, for jute cultivation.

The southern part of 24-Parganas, though suitable climatically, is not suitable from the point of view of soils. The saline soil of this region restricts jute cultivation. Similarly the northern part of North Bengal comprising the greater part of Darjeeling and the northern part of Jalpaiguri district are not suitable due to the acid nature of the hill soil. Jute cultivation is very limited in the western districts due to the laterite and old red alluvial soil. The Howrah-Hooghly region is suitable, due to its situation in the flood plains of the Damodar-Rupnarayan-Hooghly river, and the soil is excellent clay and silt loam.

Table II.—Soil analysis of selected stations in the jute growing regions of West Bengal.

	Gobardanda (24-Paraganas)	Pakuria (Murshidabad)	Hanskhali (Nadia)	Balurghat (W. Dinajpur)	Pursurah (Hooghly)
Moisture	1.12	1.80	3.32	4.12	1.64
Organic matter	3.90	2.64	1.72	0.84	4.05
Loss by ignition	5.14	7.52	8.53	4.06	6.88
Coarse sand	2.13	3.22	5.40	8.54	1.13
Fine sand	50.05	42.28	36.40	31.40	47.02
Silt	42.10	22.28	24.30	26.54	19.16
Clay	25.56	20.76	20.33	24.50	20.12
Nitrogen	0.063	0.088	0.064	0.078	0.053

An important feature of the jute growing lands of West Bengal is their extremely low altitude. Hundred-foot contour can be taken as the upper limit. The jute growing area bounded by the Bhagirathi and the Hooghly on the west and the Ichhamati on the east, hardly rises to over 25 feet above sea level. The result of this is, that, during the monsoon, areas which are generally above flood level have a wash or may be under a few inches of water for a few days. Such lands are called high lands. But lower lands, e.g., the low lying depressions between the natural levees formed along either banks of a river, are flooded by over-flow from the rivers, part of which may be under water for three months or more. In many cases such river banks are the highest points in the submerged tracts. The rapid deposition of the coarser particles of the silts on either bank of the river is the cause of the rapid levee formation in the rivers of West Bengal. Further the river is also a source from where silting takes place. But this is a slow process. The monsoon floods, in the lowest part of these depressions, may be 10 to 20 feet deep. However, silting goes on through communicating channels, even after the levees are raised above flood level. In time, these 'Jheels' (natural lakes) become shallower and finally dry up completely, except for a few days in the monsoon. These dried up 'jheels' become the ideal places for jute cultivation.

The optimum conditions for jute production are (i) more than 17 inches of rainfall and more than 20 rainy days during the growing season of the plant, (ii) loamy soil and (iii) flat or gently sloping land. The districts of Murshidabad, Nadia, northern part of Howrah, southern part of Jalpaiguri, Cooch Behar and north-eastern Dinajpur have such conditions and as such have more than 20 per cent of the net sown area under jute.

PROGRESS OF JUTE CULTIVATION IN BENGAL

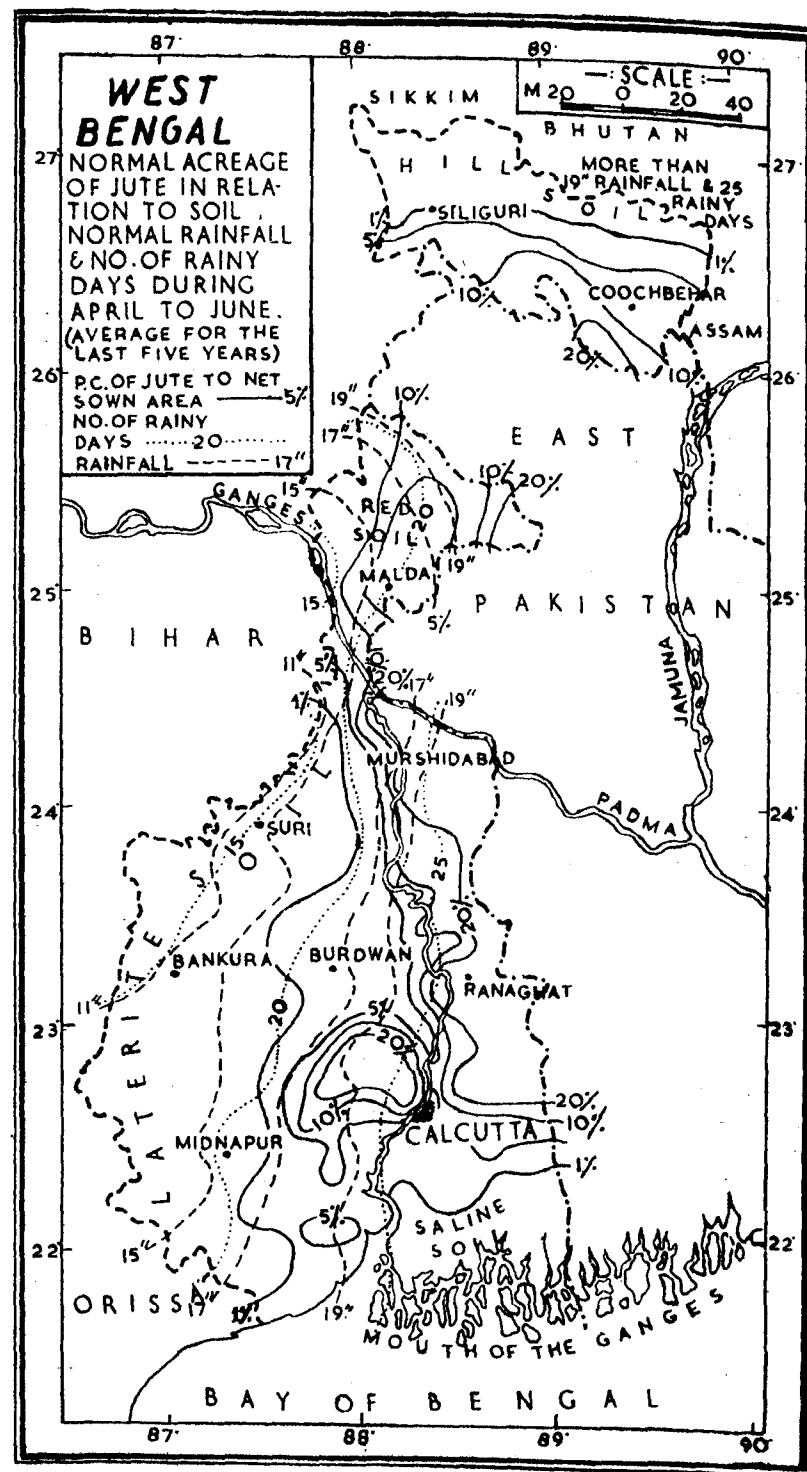
The history of jute cultivation in Bengal is somewhat obscure. The plant was used in the early days for food and medicinal purposes, and its fibre was used for cordage in the manufacturing of a kind of coarse cloth known as 'jat'. The rest of the world knew nothing of this unique fibre growing in the water-logged plains of Bengal, until, in 1793, Dr. Roxburgh, Curator of the Botanical Gardens, Calcutta, sent a hundred tons of raw jute to England.

According to Dr. Royle, jute was grown all over the Gangetic delta. According to Kerr, jute was extensively grown in the Ganges-Brahmaputra delta, along with the districts of Malda and West Dinajpur (now in West Bengal), Rangpur and Dacca (in East Pakistan) and Purnea (in Bihar) during 1872. Mr. Kerr records that the total area under this crop in Bengal was approximately 9,25,899 acres with an estimated out-turn of 13 million maunds. Since then and till 1892-93, the total area under cultivation increased to 19,97,439 acres with an annual out-put of 5.9 million bales of 400 lbs. each. Thereafter for about a decade, the total acreage remained more or less stationary with slight variations. In 1907-08 the acreage was maximum, estimated at 38,83,200, the largest area ever put under jute cultivation.

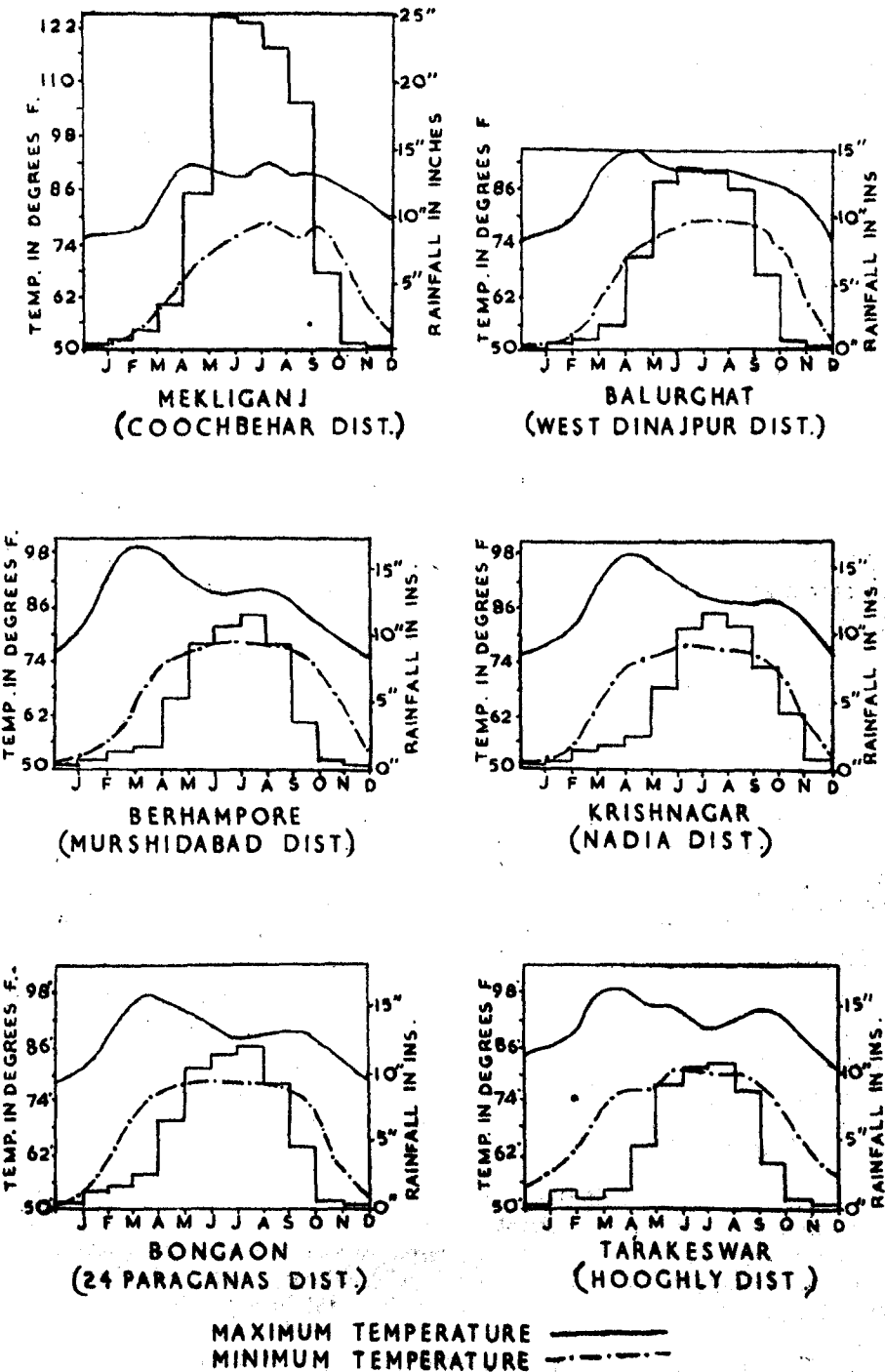
From 1908-09 onwards to 1920-21, the acreage varied between 2.4 and 3.4 millions. In the year 1921-22 the acreage came down to 1.6 million.

In the early thirties, there was a fall in acreage by 15 to 20 per cent as compared with the late thirties. But a rise was recorded in 1933-34, in spite of the low prices then prevailing. It is interesting to note that the rise and fall in acreage do not always synchronise with the rise and fall of the prices of

JUL 14 1934, N 26 618 N 55.30.3-4



NORMAL TEMP. & RAINFALL GRAPHS OF A FEW JUTE GROWING STATIONS IN WEST BENGAL



raw jute. However, with a view to harmonise production with the price of raw jute, the Government thought it a necessity to control the cultivation of jute through legislation. Accordingly, an ordinance was promulgated, and all the jute holdings of Bengal were registered in 1939, whereby the total acreage in 1940-41 was restricted to the actual area under cultivation in 1939-40. But the ordinance remained a dead statute when with the advent of World War II, the demand for raw jute increased to cope with the growing needs of the jute mills, then producing hessians, jute bags, etc., to meet war requirements. The result was that more land was brought under jute cultivation in those years.

With a view to collecting the agricultural statistics of Bengal, the Government made a plot to plot survey in 1944-45, which revealed that about 2 million acres were under jute cultivation and jute was next to paddy. Topping the list was the district of Mymensingh—with 23 per cent of the total acreage of the State, followed by the district of Rangpur with 13 per cent, Faridpur with 6 per cent, Dacca with 8.6 per cent and Tipperah with 7.8 per cent. The acreage in the districts of Dinajpur, Nadia, Jalpaiguri, Murshidabad, 24-Parganas and Hooghly varied between 27,000 and 50,000, while the districts of Bankura and Birbhum had practically no cultivation of the crop.

The partition of Bengal in 1947 was a landmark in the history of jute cultivation. Over 70 per cent of the good jute growing lands formed part of Pakistan. To prevent the collapse of the jute industry due to the scarcity of the raw material, the acreage under jute had to be increased.

JUTE TRACTS OF WEST BENGAL

Even after the partition, West Bengal retains the pride of place as the largest jute growing State, producing 51.4 per cent of the total Indian output.

A study of the distribution of jute lands at once reveals that there is concentration in the east, in the southern part of North Bengal and in the new delta of West Bengal, and this is because of the ideal conditions for the cultivation of jute found in these areas. Jute cultivation in the western part of the Burdwan district is very sparse and this is due to unfavourable soils. The following are the important jute producing tracts in the State :

(i) The area lying east of the Bhagirathi and the Hooghly, (excluding the southern part of 24-Parganas) and the Hooghly and Howrah districts to the west of the river Hooghly; (ii) the central zone: Malda and west Dinajpur districts; (iii) the northern zone, comprising the districts of Cooch Behar, southern Jalapaiguri and southern section of Darjeeling district; and (iv) Midnapur and Burdwan.

The eastern part of the first zone is characterised by flat alluvial lands with high fertility, humid climate with more than 19 inches of rainfall and 25 rainy days during the growing season, while the western part is a high and undulating land of hard clay and drier climate. This district is responsible for producing about 17 per cent of the total jute of West Bengal.

The soil formation of the district of Nadia, except its eastern fringe, where transformation of soil from sandy to clayey loam is taking place, consists mainly of light sandy loam of low fertility. In 1947-48, only 5 per cent

of the net sown area was under jute, though the acreage increased to more than 20 per cent in recent years. The most remarkable feature of this tract is its sharp increase in acreage during the last few years inspite of the inferior quality of the fibre.

The district of 24-Parganas consists of a flat land of new alluvium interspersed with several sluggish and stagnant rivers and many 'bils' or marshes. The cultivation of jute is mainly concentrated in the north and central sections of the district, of course, naturally excluding the Hooghly side urban tracts. Its cultivation is also restricted in the south due to salt impregnated soils. The maximum concentration occurs in the north-east, where the percentage of jute to the net sown area has now increased to more than 20 per cent. Of this, the Baduria area has a very high concentration with more than 30 per cent of the net sown area under this crop.

The soil of the Hooghly district is chiefly new alluvium, of 5 to 10 feet thickness, with a sub-soil of tenacious clay, formed from the silts of the Damodar and the Saraswati, except in the Goghat region. The highest concentration is in the Tarakeswar-Poorsura area which accounts for more than 30 per cent of the net sown area. Normally, 10 per cent of the net sown area is under jute but now it has increased to more than 20 per cent. The post-partition years recorded a yield of more than 200 per cent. The crop is sown on 'suna land', i.e., the land above the water level.

The district of Howrah has clay and deep loamy soils formed from the silts of the Damodar and the Rupnarayan. The concentration of jute cultivation is found in the north and in the central tracts traversed by the Damodar and Kana Damodar, and in the west bordering the Rupnarayan in the typical "Sunaland". Jute cultivation is not so important in the South and in the interior of the villages, where during the rain, vast sheets of water accumulate forming swamps. The yield per acre in this area is increasing.

The second zone comprises the districts of Malda and West Dinajpur. Jute cultivation is concentrated in the police stations of Kharba, Harishchandrapur and Manichchak situated between the Mahananda, the Kalindi and the Ganges. The Raiganj area in the west, drained by the Nagar and the Mahananda, and the Balurghat in the east drained by the Atrai of West Dinajpur, are typical jute tracts. But the central and eastern parts of West Dinajpur and Malda respectively are unsuitable for jute cultivation due to the proverbial infertility of the 'Barind Land'. The normal yield in Malda increased from 10 to more than 20 per cent.

The third zone comprises the districts of Cooch Behar, Jalapaiguri and Darjeeling and may be collectively called the northern jute tract of West Bengal. The concentration of jute cultivation is to be found between the Tista and the Jaldhaka or Singamari, in the lowlands of western Dooars, and in the region south of the tea areas of the districts of Darjeeling and Jalapaiguri. Yields vary from area to area. It occupies only 5 per cent of the net sown area in Rajganj and 30 per cent in Sitalkutchi-Gitaldaha area of south-west Cooch Behar. The importance of the area lies in the fact that it yields a superior quality of jute.

The fourth zone lies in the western part of the Burdwan division. There is practically no jute cultivation on the hard laterite soils. But the south-eastern part of the Midnapore district, with the alluvial soils of the Kasai and

the Rupnarayan, is important for jute cultivation, as also the Purbasthali region on the Bhagirathi in the district of Burdwan.

The following conclusions can be drawn from the above study: (i) the highest concentration of jute cultivation is to be found on the river silts and clay loams; less on the sandy loams near the river, lesser on the sandy loams away from the river and the least on the laterite soils; (ii) in the past few years, the jute tracts recorded an increase in acreage from 200 per cent in Hooghly to 420 per cent, in Nadia district. This phenomenal increase is attributable to both natural and human factors. Of the natural factors mention may be made of climate and soil; and of human factors, mention may be made of (i) the high selling prices, (ii) proximity of the market, (iii) propaganda, such as 'grow more jute' campaign, (iv) distribution of seeds of improved strains, (v) scientific methods of cultivation, and (vi) the readily available cheap agricultural labour. But associated with this increase in acreage, is the utilisation of autumn (aus) paddy land for jute cultivation. In the district of Hooghly alone more than 90 per cent of the (aus) paddy land has been transferred to jute in the course of the last few years. The overall transfer of aus-land to jute in West Bengal is estimated at 2,00,000 acres, but the reclamation of waste land for the purpose is only 55,000 acres.

Table III.—Percentage of acreage and production of jute in different districts of West Bengal.

Districts	Percentages of acreages to the total of the West Bengal		Percentages of Production to the total of the West Bengal	
	1947-48	1954-55	1947-48	1954-55
24-Paraganas	15.44	14.64	15.03	15.60
Nadia	8.33	9.35	9.34	8.57
Murshidabad	16.58	17.82	14.16	13.50
Malda	10.40	6.68	7.43	4.63
West Dinajpur	6.06	6.37	7.16	4.50
Jalpaiguri	9.88	7.90	9.33	8.65
Darjeeling	0.87	1.12	0.73	1.10
Cooch Behar	13.97	13.14	15.29	12.70
Burdwan	2.14	2.54	2.59	5.11
Birbhum	0.03	0.05	0.03	0.05
Bankura	0.11	0.33	0.07	0.40
Midnapore	4.26	5.12	3.83	6.24
Hooghly	10.00	11.64	12.28	15.71
Howrah	1.94	3.30	2.27	3.24

THE CHANGING LAND USE AND THE AGRONOMY OF JUTE IN WEST BENGAL

With the partition of Bengal, West Bengal was left with 2,29,000 acres of jute land in 1947-48 out of a total of about 2 million acres of undivided Bengal. This however, rose to 8,36,000 acres in 1952-53, thus recording a net expansion of over 300 per cent. Production increased from 6,48,000 bales in 1947-48 to 24,12,000 bales in 1952-53 (of 400 lbs. each).

Table IV.—Index of jute acreage expansion in West Bengal.

Districts	1947-48	1949-50	1951-52	1953-54	1954-55
24-Paraganas	100	195.4	303.6	165.7	193.4
Nadia	100	256.3	584.6	295.5	229.8
Murshidabad	100	255.9	353.4	181.0	220.6
Burdwan	100	203.9	615.7	191.2	245.6
Birbhum	100	625.0	500.0	875.0	375.0
Bankura	100	620.6	931.0	333.3	600.0
Midnapore	100	276.1	390.2	226.5	247.0
Hooghly	100	185.7	381.6	193.2	244.0
Howrah	100	219.2	398.0	201.0	348.1
Jalpaiguri	100	92.7	158.9	171.4	165.6
Darjeeling	100	117.4	156.5	270.0	270.0
Malda	100	158.5	275.8	209.7	133.2
West Dinajpore	100	188.8	279.5	333.6	216.1
Cooch Behar	100	109.0	244.9	154.0	192.2
West Bengal	100	186.8	329.3	201	209

Table V.—Increase in the acreage of jute in West Bengal districts.

Districts	1947-48	1949-50	1951-52	1953-54	1954-55
24-Paraganas	41,140	58,005	1,24,800	68,600	80,200
Nadia	22,190	43,415	1,29,800	65,800	50,900
Murshidabad	44,160	70,605	1,56,200	80,000	97,500
Burdwan	5,695	11,950	35,300	10,900	14,000
Birbhum	80	305	400	700	300
Bankura	290	150	2,700	1,000	1,800
Midnapore	11,345	16,775	44,100	25,600	27,900
Hooghly	26,635	50,570	1,01,500	51,400	64,900
Howrah	5,170	10,380	20,700	10,400	18,000
Jalpaiguri	26,815	30,425	41,800	45,100	43,200
Darjeeling	2,315	2,015	3,600	6,100	6,100
Malda	27,705	30,605	76,400	58,100	36,900
West Dinajpore	16,135	21,620	47,900	53,700	34,700
Cooch Behar	37,210	36,755	90,900	57,300	71,500
West Bengal	2,66,400	4,98,000	8,76,000	5,34,700	5,47,900

Scrutiny of the above tables reveals that (i) the larger fluctuations in jute acreage are generally found in areas of high intensity, (ii) the increase is conspicuous in the districts of 24-Parganas, Nadia and Murshidabad, (iii) the increase is marked by about 200 per cent in the northern districts, (iv) the increase of acreage in the western districts, such as Midnapore, Burdwan, Cooch Behar is about as much as their counterpart, east of the Bhagirathi. The

remarkable increase in the eastern districts is due both to physical and economic factors, while in the western districts, the increase is limited by natural factors, and in the northern districts, by the remoteness of the market and high cost of transport.

How to attain self-sufficiency in jute production has become the most perplexing question. It has been roughly calculated that India requires about 6.2 million bales for the consumption of her mills and for export. The production in 1950-51, was 3.3 million bales. The additional target figure of the Planning Commission has been tentatively fixed at 2.6 million bales to be reached by 1955-56. Production reached to 4.6 million bales in 1951-52, thus showing an increase of 66.8 per cent in the first year of the Five-Year Plan. Although initially the output of jute went up during the first two years of the Plan, it suddenly decreased to 3.1 and 3.2 million bales in 1953-54 and 1954-55 respectively, due to low jute prices and unfavourable seasonal conditions, thus affecting the production of the fibre.

The recent increase in the acreage of jute is due to: (i) reclamation of waste land, (ii) diversion of autumn paddy land to jute, (iii) double cropping of winter paddy land, (iv) increased use of fertilisers, (v) adoption of plant protection measures, (vi) propaganda for adopting improved methods of cultivation, along with the prevailing high prices of raw jute in the market.

About 55,000 acres of waste land has been brought under jute cultivation in West Bengal. Such reclamation is made by turning a vast tract of waterlogged lands into a culturable one, as in the districts of 24-Parganas, Nadia, Murshidabad and parts of Midnapore, and by providing irrigation facilities through inundation canals. But these experiments of cultivating jute on these reclaimed waste lands, however, proved disappointing, as also the experiment of growing jute on about 50,000 acres of sub-marginal lands in the districts of Hooghly, Howrah and 24-Parganas.

The increase in acreage in jute cultivation is also due to the diversion of autumn paddy land to jute. About 2,25,000 acres of such land was diverted during 1951-52 and 1952-53, and out of this, more than 75,000 acres from the districts of 24-Parganas and Hooghly, and more than 15,000 acres from the districts of Nadia, Murshidabad, Malda, West Dinajpur, Jalpaiguri, Cooch Behar, Midnapore and Howrah. This resulted in a loss of one ton of food for every three acres diverted.

Increasing production by the method of double cropping is becoming popular in many parts of West Bengal. In 1952-53, about 1,00,000 acres of jute land were brought under transplanted paddy after the harvesting of jute. Recent researches have revealed that the single cropped 'winter paddy land' with jute as the first crop and paddy as the second one, met with remarkable success, specially with *C. olitorius* on both the intermediate and lowlands. The productive capacity of land can be increased by application of adequate manures and fertilisers. The cultivators are familiar with cowdung and castor-oil cake. Recent researches have proved that compost manuring gives a high yield in *C. capsularis* but in *C. olitorius* the yield cannot be increased beyond a certain limit.

The problem facing the Bengal jute cultivators is to produce more jute on less land and not to increase its acreage at the expense of foodgrains. This is possible by adopting 'improved methods of cultivation'. 'Improved methods

of cultivation' include cultivation, (i) either by row-cropping or line-sowing as against the usual method of broadcast sowing; (ii) use of seeds of improved strains. The row-cropping of jute cultivation eliminates wastage of seed, ensures uniformity in spacing and plant growth, reduces the cost of production by 20 to 30 per cent, and increases the yield by 5 to 7 maunds per acre. A new hand pushed jute drill has been devised in 1951, to undertake row cropping of jute on a large scale. Line sowing by hand is unpopular with the cultivators, as much labour and time are required. Seeds bred by the Jute Agricultural Research Institute can raise the average output by 20 per cent or more. Some of them yield better quality fibre and mature earlier by three weeks, thus making the jute lands available for the second crop of winter rice.

ECONOMICS OF JUTE PRODUCTION

The rural economy of West Bengal is based on subsistence farming. The poor cultivators have no other sources of income. Hence the importance of a money crop need not be over-emphasised. Jute is not a consumption crop like paddy, and if it does not bring a lucrative price, the growers will ultimately have no incentive to grow jute. (Ref. Table VI).

Table VI.—Acreage and harvest price of jute in West Bengal.

Seasons	Average under jute	Harvest price of jute in the preceding season per maund (82.2 lbs.)
1947-48	2,66,400	Rs. 35 0 0
1948-49	3,49,900	Rs. 35 0 0
1949-50	4,98,900	Rs. 42 0 0
1950-51	6,50,000	Rs. 45 0 0
1951-52	8,76,000	Rs. 100 0 0
1952-53	8,36,300	Rs. 60 0 0
1953-54	5,34,700	Rs. 33 0 0
1954-55	5,47,900	Rs. 26 0 0

The variation in the acreage of jute cultivation is related to the variation in jute prices. The price boom increases production. But if the growers do not get a fair price to cover their cost of production and a small profit, they will not have any inducement to take up to jute cultivation, specially in lands of low fertility.

It may be noted in this connection that the increase in the acreage of jute in recent years might be partly due to reclamation of waste lands, diversion of food crop-lands to jute, adoption of improved methods of cultivation, etc., but primarily due to the attractive price of raw jute in the State during the post-partition years along with good weather conditions.

CONCLUSION

The ideal conditions for growing jute are found in East Pakistan where 60 per cent of the world raw jute is grown. Next in importance comes West Bengal. In India, jute is cultivated only in West Bengal, Bihar, Orissa, Assam and Uttar Pradesh, West Bengal contributing more than 50 per cent of the

production in India. With India as the largest producer of jute goods in the world, the annual requirement of Indian jute mills for raw jute is approximately 7 million bales. The average annual production of raw jute in India at present is about 3.5 million bales. Another half million bales, were produced during 1952-53, by improved cultural methods. The average yield of raw jute per acre in West Bengal is about 2.4 bales, but yields as high as 5 to 6 bales per acre were recorded in many parts of West Bengal during the last few years. It is therefore quite possible to produce jute to meet the requirement of the Indian jute mills from the existing area under cultivation. All that is necessary, is to increase the production of jute by intensive scientific cultivation, from the existing acreage, without encroaching upon the other food crops. Increased production of jute in India is essential not only to stabilise the jute industry but also to regain the lost world trade in raw jute.

SELECTED BIBLIOGRAPHY

- Choudhury, N. C. — *Jute & Substitutes*, 1933.
- Finlow, R. S. — *The Production of Jute*, J. Text. Inst., 1939.
- Kerr, H. C. — *Report on the cultivation of and trade in Jute in Bengal*, 1874.
- Kundu, B. C. — *Jute, More Jute.. Jute & Gunny Rev.*, 3rd Annual No., 1952.
- Royle, J. F. — *The Fibrous Plants of India*, 1855.

SUKKUR AND ITS ENVIRONS. — A GEOGRAPHICAL STUDY

By

AKHTAR HUSAIN SIDDIQUI, B.A. HONS. (Alig.); M.A. (London).

LOCATION AND SIZE

Geographically, the town of Sukkur is situated in a well irrigated tract at the headworks of the Sukkur Barrage canals. It lies at the junction of many inland high-ways, running from different parts of the Sind region, the adjoining provinces of Baluchistan and the West Punjab. Thus it has been practically a 'mandi' or a market town from the very beginning.

The town of Sukkur is about three miles in length and about two miles in breadth. The eastern limit of the town is marked by the river Indus, which separates it from Rohri. There are two units or blocks, called Old and New Sukkur, separated from one another by a railway embankment. New Sukkur and the newly built area of Civil Lines have been erected on and about a cluster of low hills, which are a continuation of the chain that runs from Rohri on the right bank of the river Indus, southward for nearly fifty miles. The island of Bukkur in the middle of the river between Sukkur and Rohri is a link in that chain.

PHYSIOGRAPHIC ASPECT

Geologically, the Sukkur-Rohri area falls within the upper part of Sind, consisting of the flat alluvial plain but with a few isolated ridges, viz., the Sukkur and Rohri hills. The foundation of Sukkur itself has been laid in an area which consists of a broad alluvial plain on both sides of the river, interrupted near Sukkur and Rohri by the limestone ridges. The island of Bukkur, lying in the middle of the river between these two towns, is also composed of the Kirthar series, a white and yellowish Nummulitic lime-stone.

Thus geologically, the foundation of this town has been laid in a rocky area, where there is still much room for further extension towards the north and north-west.

The hills of Sukkur and Rohri rise to a height about 150 feet from the plain in the immediate neighbourhood of the Indus. This rocky pocket of the Sukkur-Rohri hills is chiefly interesting because it is intersected by the main stream, which has cut its way through these lime-stone rocks between the towns of Sukkur and Rohri instead of cutting its course through the alluvial plain to the east or west of these hills. The central portion of the plain in Upper Sind, in which the Sukkur-Rohri area lies and which is traversed by the present course of the river Indus, is higher than the areas lying eastwards and westwards. Beyond this rocky pocket, a belt of marsh extends from north to south at some distance from either bank of the river. The river at Sukkur and Rohri point is actually flowing on an elevated ridge formed by itself, and the river bank is only fixed at Sukkur-Rohri in the North of Sind.

The selection of this area for the siting of these towns in the past and for the construction of the Barrage recently, was obviously due to its topographical stability. The Sukkur area as a whole may be described as a flat table land, chiefly over lain with alluvium, and with a few isolated ridges standing on this plain. Due to this outstanding topographical features this area presents better prospects for establishing a stable town in upper Sind along the banks of the river Indus, where there is always a danger of great floods in the country and river 'bunds' are breached occasionally during the rainy season.

In general, the climatic conditions of Sukkur and its neighbourhood are similar to those which prevail throughout Upper Sind. The air is generally dry. Rainfall at Sukkur is less than 4 inches and temperature, over 107°F in June. Although the air is very dry and hot in summer, it is not so distressing as elsewhere in the north. The nights are generally cool. The climate almost resembles that of the semi-desert type. During summer, dust storms are very common every evening.

The weather conditions during December, January and February are typically cold and bracing. From April to June, and some times in July, hot dry winds blow from the North-east and South-east. During May and June, the scorching heat of the sun is intolerable. The temperature in the shade goes upto 112°F. The humidity mounts to 80 per cent. Dampness makes the climate sticky and disagreeable.

In this irrigated tract, the town of Sukkur is subject to much water logging which results in mosquito breeding. For this reason malaria is the main disease affecting the population during the winter season. During June, July, August and September the high humidity, bad sanitary conditions of the larger part of the town and the unsatisfactory diet of the major section of the population, often lead to the out-break of cholera, small-pox and diarrhoea in the town. The outbreak of such epidemics is local, and always starts from the section of the town where the poor or working class population is housed. The majority of the cases are always in those localities which may safely be called the slums of the town, where even the domestic water-supply is always infected. The dirt and the refuse of the houses contaminate the atmosphere and are mainly responsible for the spread of such diseases in the town. For the above reason the epidemic germs breed in abundance and make the winter and rainy season generally un-healthy.

HISTORICAL GROWTH OF THE TOWN

Historical evidence regarding the origin and early settlement of Sukkur is lost in obscurity, yet its past history is very closely connected with the other ruins of the area, which now form part of Sukkur and its environs. But, from the past records of the Arabs and the English as also from the works of Dr. Pithawalla and Abdul Hamid Khan of Karachi, who have tried to justify the situation and identification of many a town of old and Arab Sind, it is clear enough that the old village of Sukkur, which now has grown into a big town, was founded just after the island of Bukkur was occupied by the ruler and the royal families of the province.

Aror, a ruin nearly 3½ miles to the south-east of the town of Rohri, was the first historical town of the area, and used to be the capital of a Hindu Raja. Later the population appears to have migrated to Bukkur and Rohri. As the island of Bukkur has its own military and strategic importance, it has

served as an important station in both Hindu and Arab days. It seems probable that after the ruining of Aror, Bukkur was selected as capital and it was fortified. Simultaneously with the fortification of the island, the small village might have grown up as an annexe to the Bukkur fort, and the miscellaneous population settled there under the Royal protection and patronage. For this reason this small village had no record of history. This theory is strengthened by the fact that the old village of Sukkur lies about a mile away from the island, on a high-lying rocky ground. In the neighbourhood of the island, the river flows slightly above the level of the land on either side, and as there was no 'Bund' to protect the area from the flood waters of the river, people naturally selected the higher spot, as their village site.

In 1839 the town of Sukkur was captured by the British forces and it became a military base. In 1842 the town was made over to the British Government in perpetuity. A description of Sukkur of those days was given by Rev. T. N. Allen, who found that the rocky portion of the area was surmounted by officers' flat-roofed houses built of sun-dried bricks and in the centre stood the dome of a tomb. The best buildings were the shops of Parsi merchants and the houses of conductors in commissariat department. The old Sukkur was just a heap of ruins. A good number of the houses in the town belonged to the merchant community.

The new town of Sukkur was established in the year 1839 after the conquest of Upper Sind by the British Government and the new town was situated nearly a mile away from the old, just at the bank of the river on a rocky ground but was connected with it by a metalled road, the intervening space being covered by Government buildings. With the advent of the British forces the old Sukkur also showed signs of revival and there was an influx of merchants and traders who opened shops all along the Bunder Road, which runs parallel to the bank of the river. A number of barracks were also built for the soldiers between Old and New Sukkur. Sir Charles Napier thereafter abandoned Sukkur as a military station. When this happened it attracted much attention from the traders and it continued to prosper as a market town.

In appearance Sukkur is a place of contrast. The little plain in which the station stands, resembles a vast quarry. The station area is bound by a semi-circle of lime-stone hills, crowned everywhere with dull grey quadrilateral houses on the flat tops of which stand parallel rows of pillars bearing light roofs. Behind these houses on a rocky top the tall sugar loaf tower of Mir Masum Shah stands up against the sky. Metalled roads giving off a strong glare slope up the faces of the hills to a plateau where the civil lines appear clean and trim, though frequently diversified with ruined tombs. A certain amount of vegetation and a few gardens are also seen in this area. As soon as the top of the ridge on the farther side of this plateau is reached and one descends the other side, there stands closely packed Sukkur with narrow streets on a levelled plain, running parallel to the river Indus. In this part of Sukkur all the *prima facie* repulsiveness of the town is seen. A little farther in the south western corner of the town close to the head-works of the Barrage, lies the Barrage township a colony of the employees of the Irrigation Department which came into existence after the completion of the Sukkur Barrage. The area in between the Barrage township and New Sukkur has been covered with a few 'Kachcha' houses, a dairy farm and a garden lying adjacent to the township. The Sukkur river-flat is all lined with stone piers and 'ghats' at which cargo boats load and unload. Piles of wheat, wood and other grains lie in the shade of spreading banyan trees. Beyond these piers

is the yard where the country boats are built. The whole length of the Bunder Road is one of a steady activity. Behind the shops and ware-houses which face the river bank lies the new town curling round the hills with its high flat-topped houses packed close together. Beyond it on the North-western extremity of the town is an area where a few factories, the railway work-shop, power house, water-works and large railway colony are established.

POPULATION

So far as the population of this town is concerned hardly any thing can be ascertained earlier than 1872, as no records are available. The first official census of the town was enumerated in the year 1872 and its population then was estimated as 13,318.

The table given below gives the estimated figures of population from 1872 to 1951 :

Year	—	1872	1881	1891	1901	1911	1921	1931	1941	1951
Population	—	13,318	27,389	29,302	31,318	35,294	42,759	69,277	66,649	77,026

From the above table it is clear that the population of the town has increased nearly six times within 80 years. The increase in the first twenty years from the date of the first census is evidently connected with the opening of the railway from Kotri to Sukkur and from Rohri to Khanpur in the year 1878 and the construction of the Lansdown Bridge in the year 1889 which connected the town with several other important towns of Northern India. Railways gave a good chance for many traders to come and avail themselves of opportunity, while the policy of the early administration was also in favour of developing Sukkur into a market town. In the next thirty years the increase was connected with many economic events of the region, like the opening of the Railway work-shop and a few industries which threw open jobs to the unskilled population. Secondly the improvement on the old canal system increased the agricultural productivity, and in 1921 it was a fairly important market town in Northern India and the majority of the population was engaged in the grain trade. In 1931 the population of the town increased five times due to the construction of the Barrage, which employed thousands of workers. Later on, the Barrage township was also added, which is in fact a colony of the employees of the Irrigation Department. In 1941 the population for the first time showed a decline which was obviously due to a large fall in the number of ordinary labourers who had to leave when the Barrage was completed. The increase shown in 1951 is due to the great influx of Muslims from India who have settled down in Sukkur. It is difficult to say whether there will be any further increase in population, without any expansion of the town, or in its industries. The population of the town has increased to such an extent that under the present state of affairs it cannot easily provide further accommodation or employment to its inhabitants.

WATER SUPPLY AND SEWAGE DISPOSAL

The first and the most important problem of the town dwellers was solved by the Municipal Board in the year 1895 when the water works were started in the town. These water works lie on the bank of the river Indus near the island of Bukkur. In its early stages the water was drawn from sunken wells, which were beneath the bank. The water is now pumped

directly from the river. In order to remove the silt with which the river water is laden, the water is collected in the big collecting reservoirs, where much of the silt settles at the bottom. From these reservoirs the water is carried to the filtration plant and finally it is collected into masonry reservoirs from where it is pumped to different tanks. The total capacity of all the six tanks is estimated to be about 10,49,583 gallons. Later on, it is served through pipe lines in the town of Sukkur. There are 5 main supply lines, running from these tanks to the different parts of the town. The plant being a small one, is not sufficient to meet the town's entire requirements of fresh and pure water. The average amount of water at present supplied comes to 24,00,000 gallons a day. The supply is calculated at 30 gallons per head daily. The water supply which is derived from the Sukkur Water Works is of a high standard of purity. The water is sedimented, filtered, and chlorinated with bleaching powder. Patterson's Rapid Filters are in use.

Open and shallow drains generally running on either side of the roads carry the sewage water into the main drain. There is also one small sanitary works, which is quite insufficient for its tasks of water drainage for the town. The open and shallow drains create insanitary conditions and for this reason many parts of the town are very dirty.

TRADE

The town of Sukkur, being situated in a very favourable position has attained the status of a 'mandi' or market town in Upper Sind. Being located on the Indus and at the Junction of the railways, it gathers up a greater portion of the trade of the region than any other town in Sind except Hyderabad. Before the opening of the Railway line and the construction of the Lansdown Bridge many steamers and boats used to ply on the river and the town was the chief inland river port for traffic carried by the Indus Steam Flotilla and native boats between the Punjab and Sind. After the construction of bridges, although the river traffic has diminished considerably, the prosperity and commercial importance of the town still mainly depends upon its river traffic with the West Punjab. Even to-day, country crafts are used for this purpose.

Wheat is the most important commodity which is brought for transaction in this mandi. The greater bulk of the crop produced in Upper Sind is brought to this town either by rail or by road and river. For road and rail borne traffic Sukkur is the natural market for the upper part of the lower Indus Basin, as it is connected by metalled roads with Larkana, the Upper Sind and the Sukkur Districts. For this reason most of the crops harvested in the Sukkur and Upper Sind districts are stored first at Sukkur and then transported by rail to other parts.

Besides the agricultural products, deodar wood is an imported commodity which is floated down the river in great bulk from the Punjab. A considerable quantity of it is consumed locally.

INDUSTRIES

Little can be said about the industrial aspect of the town in the past. The entire industrial life revolved round the pivot of the cottage industries. The common indispensable artisans found in the town were the black-smiths, shoe makers, carpenters, jewellers, weavers and potters. The skilled carpenters, weavers and jewellers turned out excellent articles for practical use. There

TABULAR STATEMENT SHOWING THE EXISTING INDUSTRIES IN SUKKUR

Nature of Work	No. of mills	Power used	Approx. No. of persons employed daily	Finished Products.	Output.
Industries based on Agricultural Products:					
1. (a) Flour Milling—Large Scale.	1	Oil	60—70	Flour	50—70 tons a day
(b) " " —Small Scale.	2	"	15—20	"	10 " "
(c) " " —Small Units (Chakkis)	30	Oil & Electricity	100	"	Local work
2. (a) Oil Milling	6	"	100	Oil & Oil cakes	2,73,000 mds. capacity Expellers 6, Refinery Plant—1
(b) Indigenous oil-seed crushing or ghanai oil	180	Animal	70	"	Local Work, Oil yield 30% Cake yield 70%
3. Rice Milling,	1	Oil	30	Rice	
4. Cotton Ginning & Pressing.	1	Oil	90	Cotton bales	Cotton 4718 bales (A season Cotton seeds 33,000 mds.)
Manufacturing Industries:					
5. Biscuit & Confectionery	3	Oil, gas & Electricity	525		Biscuit 10,000—17,000 lbs. a day. Confectionary 4,200 lbs. a day
" " (Small Units)	10	Hand	42	Confectionery	7,000 lbs. a day
Knitting	2	Hand	56	Socks, underwear etc.	—
6. Ice Making	4	Oil	12	Ice	12 tons a day
7. Iron Work-shops & foundries	4	Electricity	210	—	—

Nature of Work	No. of mills	Power used.	Approx. No. of persons employed daily	Finished Products.	Output.
8. Lock Making	1	Hand & Oil	20—25	Locks and Suit case materials	
9. Zari Making	1	Hand & Oil	40	Zari lace	30 lbs. a day
Industries Based on Forest Products:					
10. Boat Making	1	Hand	10		
11. Saw Mills	10	Electricity & Oil	50	Planks	Local work
Cottage Industries:					
12. Handloom	900	Hand	900	Cloth	—*
13. Soap	1	Oil	—	Washing soap	150 mds. a day *
14. Shoes Making	—	Hand	100	All sorts of shoes and leather works*	
15. Furniture	—	Hand	200	Wood work	

*Work is done by the individuals in their cottages

were and still are, workers in fine arts for which Sind is well known. The woollen and silken goods are worth mentioning. Even to-day cottage work is being carried on in several parts of the town. Handloom cloth, rope, shoes, wooden articles and jewellery are products which are worth noting.

For the first time in the industrial history of this town, in the year 1890-91 the then Central Government of India set up a railway workshop at Sukkur, which provided jobs for about 500 people. In the year 1906 a small scale cotton-ginning factory was set up and in the year 1911-12 a flour mill was located at Sukkur, which could employ about 70 persons. In the year 1915, a set of rice husking hullers and an ice plant was opened in the town. In the year 1918 a cotton press was also attached to the local flour mill. In the year 1921, a foundry and two small scale oil mills were set up at Sukkur. With the extension in the railway workshop, 2,000 people were employed there. In 1925 the number of rice husking and small size flour mills, locally known as chakkis, increased to eight. In the year 1937 hosiery work with hand-machines on a small scale employing 30-40 people was started in the town. Two biscuit and confectionery factories were also set up in the same year.

Before 1942 almost all the factories worked by steam, but with the creation of the power house for the town a few of them used the electric power to run the factories, whilst many of them had their engines converted to consume fuel oil because of its low cost. With the help of the electric power supply a few more repairing workshops were also started in the town and the number of the foundries rose to six. In the year 1943, a silk weaving handloom factory was also established. Since then no more factories or industries have been started, except for the Zari works, started by a Delhi refugee who was the owner of the works at Delhi and has come to Sukkur with many of his old workers.

According to a personal survey of the industries of the town carried out in March, 1951, the existing position of the industries in the town is shown in the following table.

Having studied the industrial position of the town, it can safely be remarked that the town of Sukkur has become an important centre for export and the commerce and trade of the town have contributed to the growth of population, as well as the industry, whatever form it has taken. The relation of the character and importance of various industries in the town with the agricultural products produced in the area serving it, has an important bearing on the localization of various industries in the Sukkur area.

PROPOSED INDUSTRIAL ESTATE

The third industrial Estate of Sind is to be located at Sukkur. The area for this estate has been chosen in the north-western corner of the town, which is topographically a part of the Sukkur hills. The eastern limit of the area is marked by the river Indus and the western by the railway line. Shikarpur Road runs through the area. In this area a few factories are working already. The entire estate comprises two sites lying in the east and the west of the Shikarpur Road and covers an area of 850 acres.

This estate is intended to provide factories for industries based on local raw materials, chief of which are woollen, oil-seed industries and hide and skin processing. The advantages of establishing such industries in Sukkur are enormous. Water and electric power are both available. Labour can be

recruited entirely locally, which is the greatest single economic factor in industry. Communications with Karachi and other parts of Sind, Baluchistan and the Punjab by road, rail and river are good. The area is so planned as to afford all the facilities which industry can possibly require. Most of the populations which can be employed, reside within walking distance of the area in the old town.

In spite of all the advantages, there is one drawback within the area: it has leather and woollen industries, which being obnoxious, are always liable to contaminate the river water, while the water works is situated very close to it. It is desirable that the planners should take these dangers into account in the interests of public health and locate these industries or the water works at a convenient distance so that the water should remain free from all possible pollution.

CONCLUSION

At present the town of Sukkur cannot claim to be a planned town as there has been no attempt to develop it as such. For many decades it has been working as a market town and it is only during the past few decades that some attempts have been made to set up a few factories. But most of the factories are ill-equipped and are on a small scale. The greatest drawback is the lack of proper sites for locating the factories. A number of factories have been set up in the heart of New Sukkur, and this only adds to congestion. The town is badly in need of some plan, and land-use within the City should be controlled, through zoning.

At present most of the roads are dusty and the lanes are just dark and narrow alleys, through which nothing bulky can pass with ease. The drainage is mostly cleared by evaporation in many parts of the town. In the interest of the public health, the roads should be developed in such a way that they should be wide enough for all traffic and the internal road pattern should be radial. The plots of land which are to be zoned for industry, commerce, and trade and residential purposes, should be allocated allowing for the estimated increase in population.

(My thanks are due to my friends Dr. Ram Loochan Singh, and Mr. S. Hamid Hassan Naqvi, for their valuable suggestions.)

REFERENCE

1. Smith, J. W. — *Gazetter of the Province of Sind 'B' Volume III — Sukkur Dist., Bombay.*
2. Pithawalla, M. B. — *A geographical Analysis of the Lower Indus Basin (Sind), Parts I, II, III and IV (reprinted).*
3. Blanford, W. T. — *The Geology of Western Sind, Mem. Geo. Sur. Ind. Volume XVII, Calcutta. 1880 Pp. 101-108.*
4. *Annual Report on the Public Health in Sind for the year 1937, Karachi, 1939.*
5. *Large Industrial Establishment in India, 1911, 16, 18, 20, 22, 23, 27, 37, 42, 44, 46.*
6. *Annual Factory Report of the Presidency of Bombay and Sind.*
7. *Census Reports of the Bombay Presidency, 1871-31 (b) Sind 41-51.*

AGRICULTURAL PATTERNS OF DHARWAR DISTRICT

PROF. L. Y. KULKARNI,
Head of Geography Department, Karnataka College, Dharwar

INTRODUCTION

The district of Dharwar lies in the south of Bombay State, and has a total area of 5,284 square miles. Agricultural patterns in India are varied and Dharwar is no exception to it. For this purpose, I have selected some major crops grown in 1923 and 1952 for a comparative study. Another object of this paper is to investigate the controlling factors that determine the crop distribution in this area and finally to know whether the District as a whole is self-sufficient in food production. While working on this problem, one great difficulty I had to face is to get the required statistics. The area of the State of Bombay has been considerably increased since 1949 due to the merger of the Indian States. To make the comparison of the present Dharwar District with the old one, is a task still more difficult because in many of these merged villages the records are not maintained.

PHYSICAL SETTING

The District of Dharwar can be broadly divided into three natural regions. To the west of this district, lie the hills which are an extension of the Western Ghats. To the east of the District lies the plateau region; while in between these two there is a transitional belt which runs almost parallel to Poona-Bangalore railway line (Map 1). In the north-east, there are five small ranges most of them rising between 700 and 1,000 feet high above the plain. The Kappat Range covers a large area, five miles in width and 32 miles in length. In the western part of the district, there are a number of small ranges especially in Dharwar, Kod and Shiggaon taluks, separated by valleys.

Dharwar District contains granite, Kaladgi and Dharwars. Laterite occurs in the west, while in other parts of the District, Archeans are found commonly¹.

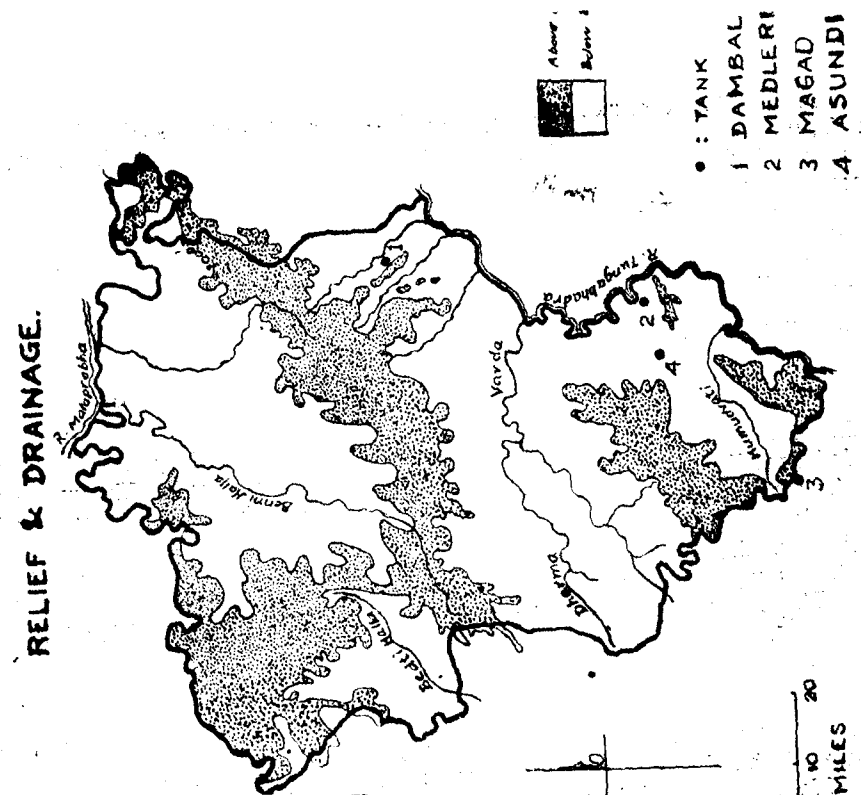
Unfortunately, there is no big river system in this District. A large number of streams, except the Bedti, flow eastward. Malaprabha and Tungabhadra are the only two important rivers but they flow along the border and that too only for a short distance. (Map No. 2). Bennihalla rises south of Hubli and joins the Malaprabha which flows along the northern boundary for about 20 miles. Varda, Dharma and Kumudwati are small rivers that get dried up for the greater part of the year and are thus useless for irrigation. The only consolation in this connection is that there are numerous tanks scattered throughout the district, which are probably the result of topography. There is only one stream—Bedti—flowing to the west towards the Arabian Sea.

CLIMATE

Temperatures in May do not rise above 90°F; while in January the maximum temperature recorded so far is round about 80°F. This area is fortunate in receiving its rainfall from both the monsoons. The Western tract gets its highest rainfall of the year from South-West Monsoon with a maximum in July, while Ron, Gadag and Haveri talukas receive more rainfall from North-

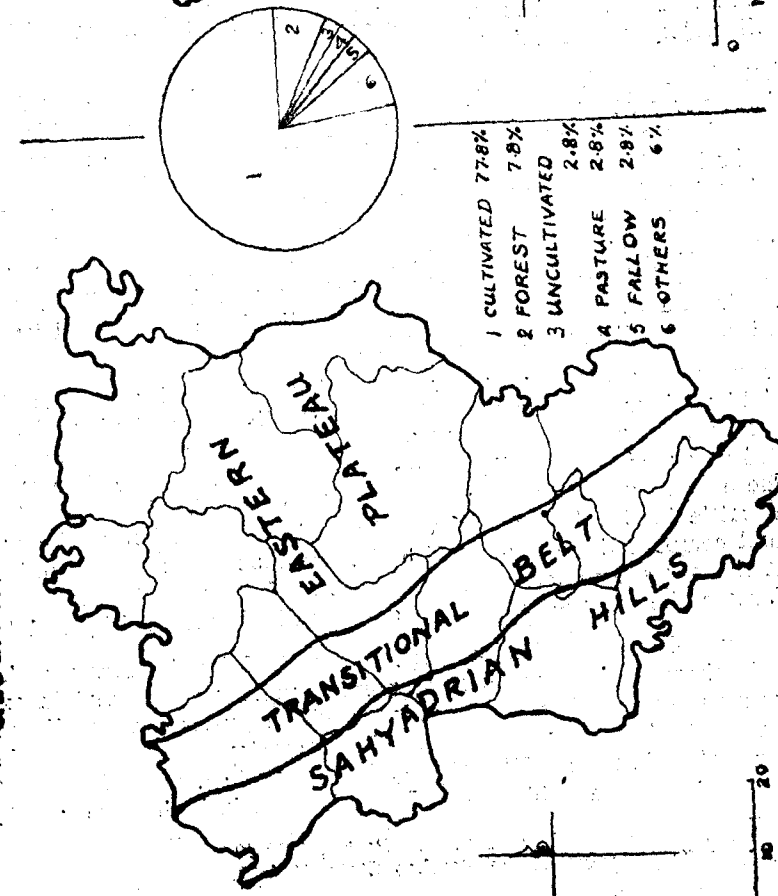
¹ Bombay Gazetteers. Vol. XXII, Dharwar.

DHARWAR



No. 2

GEOGRAPHICAL REGIONS



No. 1

East Monsoon. The total rainfall is however not high, the average for the whole district being only 33 inches. But the important characteristic of this rainfall is that it is well distributed through a greater part of the year. Western talukas get about 40 inches. Eastern ones are comparatively dry getting about 23 inches in a year. Highest rainfall is received in Kalghatgi where the average is 49 inches. The timely monsoon rains favour the Kharif crops. However, the large breaks in the S.W. Monsoon some times result in a considerable loss in the paddy yield. Rabi crops like Jowar, wheat and gram are obtained because of the showers in December and January from N.E. Monsoon.

AGRICULTURAL PATTERNS

The distribution of crops is controlled first by the soil-type which can be divided broadly into two classes. First type is the red soil. The western part of the district has this type where rice is largely grown. The second type is the black cotton soil best suited for cotton production. Dharwar district stands first in the Bombay State in the production of quality-cotton. The black soil is very fertile and is found mainly in the Eastern Plateau of the District. There is another type of soil which is found in the transition belt.

The second factor that controls the nature and distribution of crops is the rainfall which is well-distributed for about eight months. In most of the areas of the district, the range of temperature is low. There is no striking difference in elevation which can indirectly change the temperature. The agriculture of the district, largely depends, therefore, on the distribution of rainfall. Most of the talukas in the plateau region and the transition belt produce all major crops except rice.

There is not much scope in the district for increasing irrigation facilities. Hardly three per cent of the cultivated land is irrigated. Out of this, a large acreage is under rice. Tank irrigation is a special feature of this area. There are 865 tanks in this district which constitute 58 per cent of the State's Total. Of these, Dambal, Medleri, Mugad and Assundi are important, (Map No. 2) though most of them are dry in April and May. In the month of June, the level of water rises above 100 feet in some cases. The maximum height so far recorded was 148 feet in case of Dambal tank in 1940². There are two canals—Varda and Dharma—which irrigate hardly 800 acres. Well irrigation is practised on a small scale in this district.

The inset sector diagram (maps 1 & 2) shows the land use of the district. Out of 34 lakhs, which is the gross total, more than three-fourths is under crops, excluding the double cropped area which is about 53,000 acres. The area under forest in 272 thousand acres while the uncultivated area is more than one lakh acres.³ There is very little provision for pasture and this has restricted the number of cattle in the district. If we study the distribution of the present land use and compare these figures with the previous years, one would easily notice that the acreage under crops is increasing from year to year. During the last 25 years, the acreage under different crops had increased by 3½ lakhs.

Unfortunately no rotation of crops is practised by the farmers, though it would help them to improve their economic conditions to a certain extent. Mixed farming is practised in many villages where pulses are usually mixed with Jowar. Out of the two crops, Kharif is important as it covers a larger acreage than Rabi. Rice is a Kharif crop in the western part of the district, while wheat and gram are Rabi crops. Jowar is sown in both seasons. Cotton

² Irrigation Report of Bombay Province: Part I, 1939-40.

³ Season and Crop Report of the Bombay State, 1951-52.

is sown as Kharif crop in the eastern plateau region. There are two varieties of groundnut. One takes about 3½ months where groundnut is followed by wheat or gram. The other variety takes 5½ months where nothing is sown afterwards. In the transitional belt this first variety of groundnut is followed by wheat in a large number of cases.

The western part of the district is devoted to rice only, which is an important crop in Kalghatgi, Shiggaon, Hangal, Hirekerur and Dharwar talukas. In the transitional belt, the nature of the crop is changed. "Transition Zone may be described as a Contact Zone"⁴ where the nature of crops is different from the other regions. Here the place of rice is taken by wheat and jowar. In addition to these food crops, commercial crops, like cotton and oil-seeds are also grown. This is the richest part of the district. It is in this belt that one finds higher density of population, compared with the other two regions. It is in this belt, one finds the growth of industries, concentration of handloom industries, cotton mills, cotton ginning and pressing factories, oil mills, which is probably due to better means of communications in this area.

The eastern plateau region receiving little rainfall can be separated roughly by 25" annual isohyet from the transition belt. The vast plain of this region round Ron, Bailhongal, and the Bennihalla Basin are Black Cotton Soil areas, with deeper and more fertile soils, where intensive agriculture is practised. "The prominent feature of the plain is its exceedingly rich black soil, which is almost identical to the Trap Ragur in its agricultural characters⁵." Cotton is the most important crop of the region, but jowar, pulses and oil seeds are also grown in this area.

MAJOR CROPS AND THEIR DISTRIBUTION

Local variations in the distribution of crops are due to variation in soils and relief. The percentage of the major and minor crops to the cultivated area is as follows:—

Year	% of Major crops	% of Minor crops
1922-23	68.5	31.5
1937-38	71.5	28.5
1951-52	79.0	21.0

It is evident from the table that the total percentage under the major crops is gradually increasing while the acreage under minor crops is on the decline. The following table shows the distribution of the major crops:

	1922-23 (acres)	1951-52 (acres).	Increase or decrease (acres)
Rice	130,487	171,199	40,712 plus
Jowar (Kharif & Rabi)	582,724	725,134	142,410 plus
Wheat	279,509	259,724	19,785 minus
Groundnut	3,718	197,993	194,275 plus
Cotton	566,491	530,421	36,070 minus
Total	1,542,929	1,884,471	341,542 plus

⁴ Brunhes: Human Geography, P. 282.

⁵ Deshpande C.D.: Western India: Page 146.

is clear that within a period of 25 years, there is an addition of 3½ lakhs of acres under major crops. Reduction in acreage under wheat and cotton is partly due to the restrictions put forth by the Government on cotton acreage and partly because, these areas are being used for minor crops. But this shortage in acreage is compensated by groundnut, which shows a striking difference in production, 52 times that of 1922-23.

RICE

Rice acreage is steadily increasing. The cultivation is restricted to the wet area, bound by the 30" isohyet. It is mainly an irrigated crop in the district. A little concentration is also seen in Hangal taluka, because of the Dharma and Varada Canal Irrigation. The Kod and Kalghatgi talukas are the other two centres of rice cultivation. Rice is sown as a Kharif crop without exception. It is also grown in Dharwar, Shiggaon, Hangal and Hirekerur talukas, where tank irrigation is practised on a large scale. In the low land areas of the Sahyadrian Hills pulses are grown as Rabi crops. Of-late, rice is being grown even in the talukas of the transition belt, and this is not so much because of the favourable conditions prevailing there, but probably because of the desire of the people, and also the Government to become self-sufficient in all types of grains. The Rationing System, introduced by the Government in all areas, must have been chiefly responsible for this.

JOWAR

More than 1/3 of the cultivated land is under Jowar. During the period of 25 years, there is an increase by 1½ lakhs of acres. Jowar is sown both as a Kharif and Rabi crop but the acreage under Kharif crop is more than three times that of the Rabi crop. Jowar is fairly well distributed in the eastern plateau region as well as in the transition belt. The Jowar is concentrated in Haveri, Gadag, Ranebennur, Navalgund, Shirhatti and the eastern parts of Dharwar and Shiggaon talukas. It is a leading crop of the plateau region where the rainfall is comparatively less. Where Jowar is grown as a Kharif crop no other crop is grown afterwards. Rabi Jowar is grown in Ron, Bankapur, Nargund and Navalgund. It is a common practice of the farmers to combine Jowar with pulses especially Tur. In the northern part of the plateau region jowar and cotton are grown in alternate years. Out of the five major crops of the district, Jowar stands at the top covering 35 per cent of the total cultivated area.

WHEAT

It is purely a Rabi crop grown in the Bennihalla Basin probably because of lower winter temperatures and the rich black soil which retains moisture for a long time. In most of the cases groundnut is followed by wheat. It is sown in the northern half of the transition belt. Navalgund taluka shows the biggest acreage, (67,000 acres). Then comes Ron, Gadag, Nargund, Hubli, Kundgol in order of importance. While in the talukas of Kalghatgi, Hangal, Byadgi, Hirekerur and Ranebennur wheat is almost absent. Out of these, Hirekerur (38.7 inches), Hangal (38.2 inches) and Kalghatgi (48.5 inches), receive more rainfall and therefore these areas are devoted to rice. While in Byadgi and Ranebennur the soil is deep black which favours the growth of cotton. Wheat is grown in some of the talukas of the eastern plain because the area receives rain from the N.E. Monsoon which is very useful for a Rabi crop like wheat.

GROUNDNUT

During the last 25 years there is a considerable change in the acreage of this crop. About 194,000 acres have been added during this period. It is a Kharif crop sown largely in the transition belt as well as in the plateau region. The crop is concentrated in the eastern talukas of the district. Shirhatti is at the top, with 31,000 acres under groundnut. Then follows Ranebennur, Mundargi, Ron, Haveri in order of importance all of them having more than 20,000 acres under this crop. Nargund and Navalgund and Kalghatgi show strikingly little acreage under groundnut.

COTTON

This is one of the most important commercial crops of the District, and it is widely distributed. Cotton is sown as a Kharif crop restricted to "Black Cotton Soil" area of the plateau region. Ron stands first in acreage with almost one lakh of acres under cotton. Navalgund, Gadag and Kundgol show wide distribution each having more than 50,000 acres under cotton. The western parts of Dharwar, Kalghatgi, Hangal and Hirekerur show the absence of this crop. The 20" isohyet can be considered as a boundary for this crop.

SELF-SUFFICIENCY

Like other parts of India, the population of the Dharwar district is increasing from year to year though not at the same rate. According to 1951 Census the density of population of the district is about 300 persons per square mile. The following table shows the increase of population of the District:

Year.	Persons.	Density per Sq. mile.
1911	1,026,000	223
1921	1,036,000	225
1931	1,102,000	239
1941	1,201,916	262
1951	1,575,916	300 (including Savanur)

According to the Ration System, the quantity of food grains given to each individual adult was 220 tolas per week. This means 22 lbs. per month or 264 lbs. during the course of a year. The yields of crops estimated by the Agriculture Department are as under:

Rice	1140 lbs. per acre.
Wheat	500 "
Jowar (Kharif)	1000 "
Jowar (Rabi)	400 "
Groundnut	2000 "
Cotton	90 lbs. lint "

The total population of the whole district in 1951 was 1,575,386 according to the 1951 census. At the rate of 264 lbs. per individual, the total quantity of rice, jowar and wheat is as follows:—

Rice	195 millions of lbs.
Jowar (kharif)	551 "
" (rabi)	104 "
Wheat	130 "
Total	980

Thus the total quantity of food available for all the people of the district is almost double the consumption. The quantity of cotton available for the whole population is 48 millions lbs. of lint. This means every man will get about 30 lbs. of lint. During the last 70 years, the total population of the district increased by 100 per cent. And if this rate of increase is maintained in future, there is bound to be a shortage as there is no more land that could be brought under cultivation. At present however, Dharwar District is more than self-sufficient in the matter of food and cotton.

The diagram (Map 1) shows that the net sown area in this district is more than 77.8 per cent of the gross total area. There is very little scope for extension of cultivated land. The yields of all the major crops as elsewhere in India, are very low. Besides, the quality of grain is very poor. Most of the farmers unfortunately are still illiterate. It is gratifying to note that the Agriculture Department is making every effort to improve the situation since our Independence and are trying to do their best under the scheme of "Grow More Food Campaign". Improved varieties of seeds are being supplied to farmers. Manures like groundnut cake and manure-mixture are sold at low rates. In many areas compost pits are dug and filled with manures. Loans are given by the Government to construct wells and purchase bullocks. In addition to this, experiments are carried on at Agricultural Farms where increase in yields have been recorded. In spite of these measures the progress is very slow. First, because the purchasing power of the farmers is so low that they are not in a position to purchase the needed equipment or manures though they realise their importance. Loans given for various purposes fall too short of their requirements. This means that attempts to reform the cultivator will not be successful as long as his purchasing power remains low.

THE DISTRIBUTION OF RAILWAY COMMUNICATION IN WESTERN INDIA

By V. S. GANANATHAN,

Head of the Department of Geography, University of Poona, Poona-7.

INTRODUCTION

Western India, for the purposes of this study, includes the three states of Kutch, Saurashtra and Bombay. These three states have been taken together not because they form a geographical unit but because their location demands their inclusion under such a title; for the same reason other parts of India have to be excluded. The reason for taking administrative units together is an obvious one; figures relating to area and population are available only on the basis of such units.

This Western India has considerable topographic ruggedness and experiences, over an extensive area, heavy monsoon precipitations. Within its scope are also regions that experience famine conditions due to failure of normal precipitations. For three to five months in the year coastal shipping becomes very irregular because of the monsoon conditions in the Arabian Sea. Excepting the first class roads, all roads are subject to considerable erosion in the tracts of heavy precipitations. Under such conditions the importance of railway communication becomes very great.

The total area of Western India is 1,49,609 sq. miles; the population is 40.7 millions (1951).

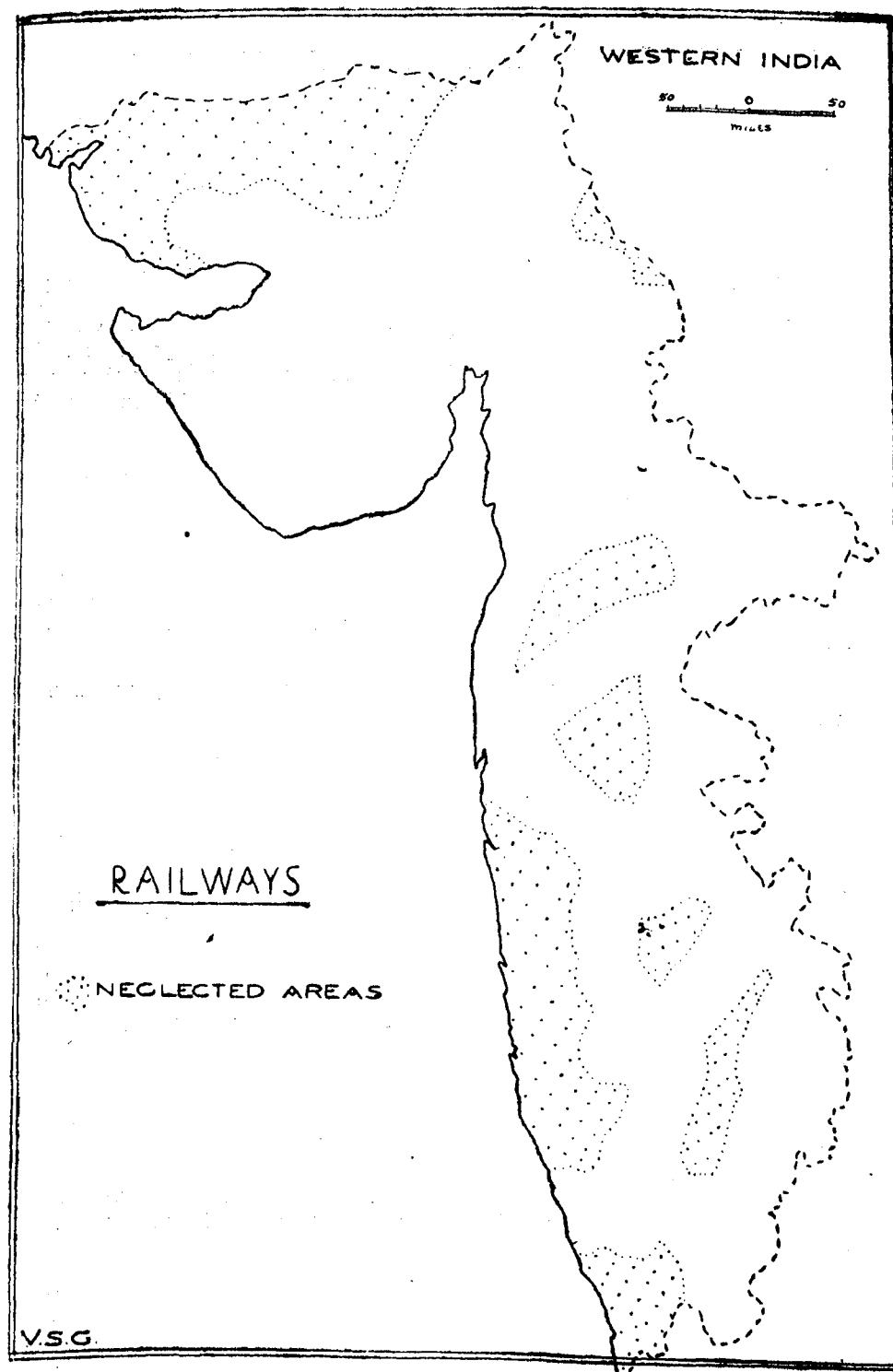
ACTUAL DISTRIBUTION OF THE RAILWAYS

The total route-mileage is 5,002 miles. Table I gives the nature of this distribution among the three component states. While Kutch has only a small length of rail-route, Bombay has a total of 3,568 miles. Apparently Bombay is well-equipped with this important means of communication. A closer examination, however, reveals that Bombay is not actually as well-equipped as Saurashtra is. If the area is taken into consideration then Bombay comes on a poor second to Saurashtra. For every sq. mile of its territory Saurashtra shows a route-mileage of 111.50 yards, while Bombay has only 56.35 yards for its sq. mile (Table II). Kutch has only 2.63 yards per sq. mile of its territory.¹

Relating route-mileage and the population similar results are obtained (Table III). Bombay comes out last with 10,078 people for every mile of its railway, while Saurashtra comes out on top with one mile of track for every 3,044 people of its population. Kutch takes a middle position with 7,560 people for every mile of its track. Bombay, in other words, has not enough route-miles of track for its large population. It can very well increase its railway communication facilities.

A study of the map showing neglected areas (areas within which every station is more than twenty miles from the nearest railway track) shows, again,

¹ This may be compared to the conditions in U.S.A. where in the area of lowest railroad development (the grazing lands of the west) there are 39 yards of track per sq. mile; in the busy north-east of the U.S.A. there are 391 yards per sq. mile of territory.



the poor position of railway communications in the Bombay State. An approximate area of 20,000 sq. miles is neglected in the Bombay State, while Kutch

has only 12,000 sq. miles of neglected area. Saurashtra has not one sq. mile of such neglected territory.

In the matter of different gauges of tracks, Bombay, again, shows a difficult and unfortunate position. All the three gauges (Broad, Metre and Narrow) are found in this State, with more than 480 miles in each (Table V). It would be, consequently, very difficult to bring about any uniformity or continuity of railway communication within the State by scrapping one or two of the gauges. Kutch, in this respect, is fortunate in having its short railway in one gauge only. Saurashtra has most of its track in the metre gauge and could easily scrap, if necessary, the broad gauge track of thirteen miles length only.

MAIN DEFECTS

Taking an overall view of the whole of Western India in the matter of the distribution of railway communications, it is possible to say that there are two major defects, viz. uneven distribution and multiplicity of gauges.² Some example will clearly illustrate this position.

Mandvi (Kutch), Ratnagiri and Malwan (Bombay State) are towns with more than 25,000 people each; and each one of these is more than thirty miles from the nearest railway track. An extensive area, nearly 10,000 sq.³ miles, east of the Bombay-Mormugao coastline has no railroad communication at all. On the other hand, a small area of about 120 sq. miles (Baroda-Godhra-Anand triangle) has more than 120 miles of track.

If one wishes to go from Miraj (South Bombay) to Rajpipla (North Bombay), journeying over metre, broad and narrow gauges is necessary, requiring many changes at junction points; the total distance is about 520 miles, Kolhapur and Sholapur, two important cities in South Bombay, find the shortest route to each other (total distance of 190 miles) over three gauges; a longer route, over two gauges only, is nearly double the distance (about 360 miles).

REMEDIAL MEASURES

Considerable improvement will be achieved if the following measures are adopted:—

- (i) Conversion of the following routes to the Broad Gauge:—
Viramgam-Surendra Nagar-Thar-Rajkot; Thar-Navlakhi;
- (ii) Construction of new lines, metre gauge between:—
Bijapur-Miraj; Kolhapur-Ratnagiri; Poona-Sangamner-Manmad;
- (iii) Construction of new line, narrow gauge, linking Bhuj and Mandvi.

CONCLUDING REMARKS

It is surprising that Bombay State, believed to be one of the progressive states in India, should come out so poorly in this study of railway communications in Western India. Thirty-two talukas, all without railways within their

² While absolutely even distribution of railway communications cannot be achieved in any country, such large areas of neglect cannot be justified.

³ The one extensive area without any railway communications, mentioned herein, has a population of some three millions and nearly 10,000 sq. miles; there are more than 3,500 settlements in it, of which more than thirty have a population exceeding 5,000 each.

territories, are actually more than twenty miles from the nearest track; in other words, every station within thirty-two talukas is more than twenty miles from the nearest track. To argue that surface configuration and absence of considerable settlements in these areas have been the cause of this neglect is rationally unacceptable. More difficult terrains have been conquered by railways; and railways have, more often than not, brought settlements in their wake.

Construction of railway through Kolaba and Ratnagiri districts would relieve Bombay Port of much of its activities as a port for coastal traffic, thereby enabling it to perform its international functions more efficiently. This would be an important indirect benefit arising out of the new tracks; the direct benefit to the two districts and the Bombay State will be very great particularly because these two districts are very important rice-producing ones in the whole state. The remedial measures suggested are essentially ones that may be taken up first in a larger scheme of expansion of the communication facilities in the whole of Western India.

TABLE I

	Area.	Population.	Length of railway (route mileage).
Kutch	16,724 sq. mls.	5,67,606	75 mls.
Saurashtra	21,451 sq. mls.	4,137,359	1,359 mls.
Bombay	1,11,434 sq. mls.	35,956,150	3,568 mls.

TABLE II

Length of railway (route mileage) per sq. mile of territory :—

Kutch	2.63 yards per sq. mile.
Saurashtra	111.50 yards per sq. mile.
Bombay	56.35 yards per sq. mile.

TABLE III

Number of people per mile of (route mileage) railway :—

Kutch	7,560 per mile of railway.
Saurashtra	3,044 per mile of railway.
Bombay	10,078 per mile of railway.

TABLE IV

Neglected areas in the three states (more than 20 miles from the nearest railway communication) :—

Kutch	12,000 sq. mls. approximately.
Saurashtra	Nil.
Bombay	20,000 sq. mls. approximately.

TABLE V

Route mileage of different gauges of railway :—

	Broad Gauge.	Metre Gauge.	Narrow Gauge
Kutch	Nil.	Nil	75 miles.
Saurashtra	13	1,234	112 miles.
Bombay	1,447	1,639	482 miles.

ABOMINABLE SNOWMAN

REV. SWAMI PRANAVANANDA, F.R.G.S.

(of the Holy Kailas & Manasarovar, Almora).

During the last ten years, sensational news, stories and legends, regarding the 'Abominable Snowman' from lay public as well as Himalayan Expeditionists have become a feature in the press. One can read that hardly there has been a person who has seen one, or got at reliable firsthand knowledge of the same, devoid of legend or exaggeration. Added to this, confusion is worse confounded by the fact that different persons have translated differently,—and some times grossly mistranslated—the original Tibetan words designating or describing this animal, used by local population (Tibetan), who from all accounts can be supposed to have a more intimate knowledge of this object, than others. Really, however, the Tibetan word *mi-te* connotes 'man-bear'. In August 1935, I heard of the *me-te* (Man-bear), for the first time, when I was at Thugolho gompa (monastery situated on the southern shores of the sacred Lake Manasarovar, western Tibet) when I had gone there to select a place for my sojourn in Manas Region for twelve-months.

A Tibetan dokpa (shepherd) pilgrim from Markhan (Eastern Province of Tibet) was describing an incident as to how one of the sheep of his flock was attacked by a *mi-te* at the Kyang Chhu (16,000 feet), a tributary of the Tamchok Khambab (Brahmaputra). It was dusk time, when the dogs began to bark violently. The dokpas spotted an animal, which they thought to be a changu (wolf) at first sight and immediately fired two shots at the beast with their matchlock guns (literally flintlocks). Somehow both the shots missed the aim, the animal left the sheep dead bleeding and ran away. The shepherds saw the creature from a distance of about 100 cubits. The animal at first ran on all fours; after running for some distance it stood on its hind legs to look back at the place from which the shots came, and seeing a number of men standing together, it disappeared into the upper portions of the valley. On its hind legs the animal was described to be of the height of a man and light red or reddish brown in colour. They called it *mi-tre*.

Again, in the month of June, 1937, I heard of the 'mi-te' for the second time, when I was camping at the traditional source of the Tamchok Khambab or the Brahmaputra. A number of myakora (pilgrim) nomads, from Bongba and Amdo Province in Northern Tibet were camping on the banks of the Brahmaputra, four miles down the source. They had gone there to try their luck if they could get a dong (wild yak), for a change in their meat. They were of course on their way to Lake Manasarovar and Kailas. During the course of a talk they told me that the source regions of Tamchok Khambab (Brahmaputra) and Kubi Tsangpo abound in wild yak (dong), Tibetan gazelle (goa), wild sheep (na and iyan), Tibetan antelope (cho) and lynx (yi). Incidentally the nomads told me that they saw a 'mi-te' at the source region of the Kubi (17,000 feet), one of the headstreams of the Brahmaputra. The 'mi-te' or the red bear once attempted to attack one of their sheep, while they were grazing on the slopes of a mountain in a deep valley but was scared away by a pack of watch dogs, which began to fiercely bark at it. They further reported that the 'mi-te' is found at several places on the Tibetan side of Nepal border. This and the information gathered by me from other

Tibetan go to show that the Tibetan know 'mi-te' to be the red bear. One of the three varieties of bear familiar to them.

In my books *Exploration in Tibet and Kailas—Manasarovar*, I made mention of three fauna of Kailas—Manas Regions (Pages 111 and 69 respectively) black bear (*tom*), brown bear (*te*), and man-bear (*mi-te*), (walks on hind legs like man).

In the word *tre* the letter *r* is so very lightly pronounced that it is almost inaudible. So for all practical purposes, I prefer to use the word as *te* only. I have not seen the *mi-te* myself but collected this information from a number of local Tibetans and from shepherds and pilgrims going to this region from Eastern and Central Tibet, contiguous with the Himalayas. Since the sensational news of the Abominable Snowman became a prominent topic in the Press, in connection with almost all the Himalayan Expeditions, in the year 1950, I instructed some of my Tibetan friends in Manas Region to collect firsthand information by offering a good present in cash, and I got the following information in July 1953. One *mi-te* visited the Tomomopo Camp (15,000 feet) on the Tag Tsangpo, on the south-eastern side of Manasarovar. In February 1953, the *mi-te* passed by that way in the evening. The shepherds camping at Tomomopo witnessed, with great curiosity, the animal moving in the Tag valley, some times on all fours and sometimes on its two hind legs. At that part of the year the upper regions of the valleys and even the vast plains of the Tag Tsangpo are under snow. So, perhaps, the animal came down so near the shepherds camps in search of food, either vegetarian or non-vegetarian. Perhaps, not finding an opportunity of snatching away any sheep, since the shepherds were all alert, it disappeared into the upper region of the valley.

The following is the account given by my informant. The foot-prints of the *mi-te* left on the hard ground scantily covered by sand measured 16 fingers or 11 inches in length and 7 fingers or 5 inches in breadth. The legs had 5 toes each and the hands (*lhakpa*) only 4 toes, or only 4 toes could be seen in the imprints. In Tibetan, the front legs of an animal are called *lhakpa* or hands and the hind ones *kangba* or legs. The toes were two fingers or 1½ inches long; all the toes are almost of the same size, excepting the little toe which is a bit shorter than the rest. The animal when on its hind legs was described as being a little taller than a tall man. The colour of the bear was deep brown, as that of the *ngaruserchung* (*brahmani* duck), though the shade varies from one part of the body to another. The body of the animal is covered with a thick coat of reddish brown hair and the hairs on the face are pretty long. Ten days after, when the shepherds had gone up the valley for grazing their sheep, they marked the footprints of the *mi-te* on the snow fields to be a subit (18 inches) in length and corresponding width as well with no traces of the toes whatsoever. This, obviously, was due to the melting of the snow at the edges of the imprints and the consequent enlargement of the whole.

It was also reported that the *mi-te* sometimes attacks the yak and even man, when found alone. In Manas region *mi-te* is found near about the sources of the Brahmaputra and the Kubi. Much like the wild yak, often times the *mi-te* makes excursions into the snow fields and on to the glaciers.

Shrubs, grass, moss, rhubarb, champa-estella (*pang*), small plants, and flowers are found growing on either side of glaciers beginning from the snout

right up to the head, after the winter snows melt away. As a matter of fact, I have seen vegetation right upto an altitude of 20,000 feet or so. The question, therefore does not arise as to what the *mi-te* or any other animal wandering in these regions may be after. I have actually seen wild horses and domesticated yaks digging snow with their hoofs and pushing aside sufficiently big stones with their noses for picking up grass and its roots.

It may be noted in this connection that the *mi-te* (red bear) like wild yak, kyang, (Tibetan wild horse), lynx, snow leopard, wolf, ibex, bharal, ghural, Tibetan antelope, musk-deer, and other animals often make excursions far on to the snow fields and glacier both during winter, and other seasons, in search of food and some times for wandering's sake. So it is no wonder or a mystery that the footprints and tracks of these or other animals are seen on snow and glaciers, freshly made or old and distorted. As a matter of fact, I had actually seen, during my winter sojourns in Tibet during the years 1935-37 and 1943-44 long tracks of wild yaks, wolfs, and other animals mentioned above for miles together. When the whole of Manasarovar Region was covered with heavy snow in winter, on two occasions a number of domestic yaks, belonging to the shepherds of Nonokur, camping on the Tag, travelled on snow right up to Selung Hurdung, a distance of thirteen miles. As recently as even on October 1, 1954, when there was a heavy snow fall, on Manasarovar yaks from Ritjen camp trecked on snow for seven long miles to Shushup Tso in search of grass. Even in the Indian Himalayas, I saw the black bear wandering on snow, in winter, during my stay at Gangotri in 1934-35. Also the musk-deer and bharal were seen wandering leisurely and aimlessly on the vast expanse of snow round about the Gangotri temple in midday.

Since the *mi-te* walks sometimes on all fours and sometimes on hind legs only, it is but natural that the tracks of footprints are seen in double and sometimes in single files as the case might be.

When the footprints are observed long after they have been exposed to sun, it is no wonder, that due to the melting of the snow along the edges, the marks became enlarged to a length of nearly about 18 inches with corresponding width, in case of the *mi-te*. In much the same way, Eric Shipton's footprints of the size of a young elephants must obviously be those of a lynx, snow leopard, or wolf, magnified to the dimensions, by the molten snow, during the period intervening between the time that they were made by the animal and the moment of observation. The footprints on the snow could be defaced or deformed, or decrease in dimensions, with the details of the finger marks, etc., obliterated as a result of snow blizzards or by blowing of strong winds.

When I was crossing the Khandosanglam pass, in 1941, I came across giant footprints as long as 21 inches. Khandosanglam is a pass east of Kailas peak, which according to Tibetan Traditions could be negotiated only by those pious pilgrims who have completed twelve circumambulations of the Holy Kailas peak by the regular parakrama route. As such hardly one or two pilgrims in a year negotiate this pass. My guide from Diraphuk gompa (second monastery of Kailas) informed me that a lama from Kham had crossed the pass some twenty-five days before we did. The glacier was about a mile long and is full of deceptive crevasses. The footprints left by my predecessor, the mama, on the deep snow melted away a good deal along the edges by the warm sun of July, with the result that a trail of footprints, each 21 inches long, with corresponding width was before us when we were crossing the pass.

A credulous or a superstitious pilgrim would have easily described the foot prints as those of a great Himalayan Yogi, a thousand years old, or as those of Asvatthama, or Hanuman (one of the seven immortal chiranjivis) of the Mahabharata fame; they might as well have been described by some Himalayan Expedition party as those of a "Horrible Abominable Snowman" or by an anthropologist as those of a pre-historic man connecting him with the modern man.

I may recall in this connection that Col. A. Waddell was the first Westerner to mark the footprints of the *mi-te* in 1899, in the north-east of Sikkim. Later, members of different Himalayan expeditions also noted similar footprints at heights ranging from 10,000 to 21,000 feet above the sea level, in the Karakoram ranges, Salween valley in Burma, Kulu valley, Garhwal, Nepal, Sikkim, Chumbi valley, Bhutan and Assam, etc., and a few others in regions contiguous with Bhutan, Sikkim, and East of Nepal on Tibetan side. Much of the information regarding the origin of the footprints was however not firsthand, having been based on hearsay, which by the way, was a mixture of myth, legend, superstition, exaggeration, and imagination.

Let us now closely examine the real meaning of the Tibetan words used for the so-called Abominable Snowman. The following table indicates the different ways in which the expressions and words are translated by the expeditionists.

- mi-te* — abominable, filthy, disgusting to a repulsive degree, dirty.
 - miteh-kangmi* — abominable snowman.
 - mih-teh* — teh par excellence of the Sherpas.
 - me-te* — man bear.
 - mih-man* — man bear.
 - yeh-teh* — rocky area — animal; animal which lives in a rocky area.
 - yeti-mi* — te.
 - yite-mi* — te.
 - kangmi* — snowman.
 - gangmi* — snowman.
 - mi-go* — wild man.
 - mi-do* — which goes like man; dangerous to man; man bear.
 - mi-chempo* — big man.
 - mi-bompo* — strong man.
 - dzu-teh* — livestock — animal; animal which is dangerous to livestock, red bear.
 - chhu-mung* — water goblin.
 - lho-mung* — mountain goblin.
- The following are the correct meanings of the corresponding terms:
- mi*; *mih*; *me*; *meh* — man.
 - te*; *teh*; *tre* — bear.
 - kang*; *gang* — snow.

mi-gve; *mi-go* — Beast that walks like man; these terms are used for snowman (bear man) in Amdo and Kham Province of Tibet (now China), these terms are also used by known to Tibetan on the Indian border adjoining the Province of Kham.

Yeh-da; *yih-da*; *yeh-te*; *yi-te* — These terms are used for a mythological being with the throat as thin as a needle and stomach—as big as a mountain; hence a ghutton use these terms to *mi-te* also, since they believe it, due to ignorance of facts, to be a dreaded creature.

tu-do; *thu-do*; *dhu-dho* — A general term for a beast or a four legged creature.

hlo-mung — Wild witch or goblin.

tho-mung; *chuu-mung* — Snow (literally water) goblin; since many have not actually seen the *mi-te* or man-bear and since they consider the same to be a fearful dreaded being connected with witchcraft, they wrongly do the '*mi-te*' or red bear as *tho-mung* or *chu-mung*.

As a matter of fact, Tibetan words are pronounced with a wide range of sound, sometimes beyond recognition for example, *t* is pronounced as *th*, *d*, and *dh*; *k* is pronounced as *kh*, *g*, and *gh*.

It may be mentioned in this connection that these wild, exaggerated false and wrong stories are heard of mostly on the Indian and not on the Tibetan side. Very likely, mistranslation of local words by the foreigners is responsible for misconception which prevailed and mislead many. The fact that the matter was not investigated thoroughly on the Tibetan side—where the local population have a correct knowledge of the identity of the animal, and several have been actual eye witnesses as well of the red bear has helped the perpetuation of the wrong notion.

The terminology given above boils down to two expressions *mi-te* and *Kangmi* which respectively mean 'man-bear' and 'snow-man'. These two connote the same object and they are the alternative terms used for the same animal, just as people call the orang-outang as *bana-means* or wild man.

On this score the so-called 'Abominable Snowman' is no other than the red bear of the Himalayas, the colour of the animal varying from light brown to reddish brown. The indisputable evidence from all sides points to this conclusion. All speculations, exaggerations, fanciful hypotheses, and fantastic stories and legends, believed or woven in this regard, must be set at rest.

It is just possible that the *te* (brown bear) and the *mi-te* (man-bear or red bear) might be indetical; or it may be that these two are confounded one for the other by the Tibetan on the Indian side of the Himalayas; and that it is the footprints of these animals that have been puzzling the brains of so many expeditionists, scientists, and lay men at large.

I have also got a report not so far confirmed by a firsthand informant, that the *te* and the *mi-te* both go into hibernation under some rocks, protected from wind, or in a cave, from the middle of November or December to the end of February; that getting up from hibernation, they sometimes dig deep into

the snow in search of grass, and roots, and they sometimes make excursions on avalanches, in spring, for excavating the bodies of bharal, blue sheep, and gazelle, killed and buried under avalanches. I give this here, as it may throw some light on the occurrence of the footprints of the *mi-te* in snow at high altitudes.

So far as my knowledge goes, the langur or the black faced monkey of the Himalayas has never been seen wandering on snow as it is seldom or never seen beyond the tree-line. As a matter of fact most of the langurs in the upper Himalayas are seen getting down to warmer regions much before the snow fall. So the footprints observed on the snows, by some of the Himalayan Expeditionists could not be those of langurs.

SELECTED LIST OF BOOKS IN STOCK

(Terms: 11 annas per shilling and Rs. 5 per dollar net,
postage or freight extra.)

COGGIN BROWN AND DEY : India's Mineral Wealth, new rev. ed. published in November 1955	Rs. 30-0-0
SPATE : India & Pakistan, 1954	65/-
SHARMA : Location of Industries in India, 3rd rev. ed. 1954	Rs. 10-8-0
DAYAL : Bihar in Maps, 1953	Rs. 5-12-0
CHATTERJEE : Bengal in Maps, 1953	Rs. 10-0-0
DESHPANDE : Western India, 1948	Rs. 8-0-0
SESHAGIRI : Bombay Karnataka, 1949	Rs. 2-0-0
PITHAWALA : An introduction to Kashmir, 1953	Rs. 12-0-0
THOMAS : India's Basic Industries, 1948	Rs. 16-0-0
Indian Geographical Society Silver Jubilee Volume, 1951	Rs. 15-0-0
KURIYAN : Geographical Analysis of the Hydro-electric power development in India, 1948	Rs. 3-0-0
THIRUNARANAN : Site and Situation of the Madras City	Re. 0-4-0
PRAKASA RAO : Atlas of Andhra Desa	Re. 1-8-0
STAMP : Asia-An Economic and Regional Geography, 1952	35/-
CRESSEY : How Strong is Russia, 1954	\$ 3.00
SPENCER : Asia, East by South, 1955	\$ 8.50
Atlas of France, Vols. 1 & 2 with cardboard cover one set	Rs. 177-14-0
RUSSEL SMITH AND OGDEN PHILIPS : North America, 1952	\$ 10.00
ROBEQUAIN : Malaya, Indonesia, Borneo and the Philippines, 1954	30/-
Diercke Welt Atlas, Georg Westermann Verlag.	30/-
CARTER : Land Forms and Life, 1950	6/6
DURY : Map Interpretation, 1952	15/-
SYLVESTER : Maps and Landscape, 1952	25/-
A set of 27 sheets of O. S. and Bartholomew to be used in connection with the above 3 books on Map Interpretation.	168/3
ALICE GARNET : Geographical Interpretation of Topographical Maps, Text 10/6, Maps 15/-	Rs. 3-0-0
BHATIA : Elementary Map Work,	25/-
MONKHOUSE & WILKINSON : Maps and Diagrams, 1952	21/-
AUSTIN MILLER : The Skin of the Earth, a practical Geography Course, 1953	9/-
DEBENHAM : Map making, 1954	2/6
STRAHLER : Exercises in Land Forms, 1952	30/-
MONKHOUSE : Principles of Physical Geography, 1954	17/6
LAKE : Physical Geography, 1955	26/-
WOOLRIDGE AND MORGON : Physical Basis of Geography, 1954	12/6
CARSON : The Sea Around Us, 1953	18/-
SVERDRUP : Oceanography for Meteorologists, 1952	21/-
AUSTIN MILLER : Climatology, 1953	4/-
LE GROS CLARK : History of Primates, 1954	30/-
GOBLET : Political Geography and the World Map, 1955	12/6
STAMP : Intermediate Commercial Geography—Part 1, 1954	8/6
THATCHER : Economic Geography, 1952	8/6
CRONE : Maps and their Makers, 1953	12/6
CONO : Handbook for Geography teachers, 1955	56/6
CRESSEY : Land of 500 millions—A Geography of China, 1955	15/-
HUMLAR : Atlas of Economic Geography, 1955	

MAHALAKSHMI BOOK DEPOT

26, Nattu Subbaroya Mudali Street, Madras-4.

THE INDIAN GEOGRAPHICAL SOCIETY

1954

PRESIDENT :

DR. GEORGE KURIAN, B.A., B.Sc., Ph.D. (LOND.),
Professor of Geography, University of Madras.

VICE-PRESIDENTS :

DR. MISS A. R. IRAWATHY, B.A., (Hons.), B.E.D., Ph.D. (LOND.),
Principal, Queen Mary's College, Madras-4.

MRS. R. RADHA, M.A., L.T.,
Queen Mary's College, Madras-4.

SRI A. TIRUMALAI AIYANGAR, B.A., L.T.,
Sir M. C. T. M. High School, Madras-7.

SRI G. NARAYANASWAMY AIYAR, M.A., L.T.,
Government Arts College, Coimbatore.

SRI C. RAJAGOPALAN, M.Sc.,
Dr. A. C., Karaikudi.

SECRETARY :

DR. V. L. S. PRAKASA RAO, M.A., D Phil.,
Senior Lecturer in Geography, University of Madras.

ASST. SECRETARY :

MISS RUKMINI NAGANATHAN, M.A.,
Queen Mary's College, Madras-4.

TREASURER :

SRI M. P. RAJAGOPALAN, B.A., L.T.,
Sir M. C. T. M. High School, Madras-7.

EXECUTIVE COMMITTEE :

SRI S. V. GANAPATHY, B.A., M.Sc., A.R.I.C., (By the General Body).
MISS A. VASANTHA, M.A., (By the Council).

MEMBERS OF COUNCIL :

SRI P. G. DOWIE, M.A.,
„ V. S. GANANATHAN, M.A., L.T., Dip. in Geog.,
„ K. V. SUNDARAM, B.Sc., (Hons.),
„ U. MAJAL MUHAMMAD, M.A.,
MISS B. D'SILVA, M.A.,
„ A. VASANTHA, M.A.

Printed by T. K. Venkatesan at THE JUPITER PRESS, LTD., 109-C, Mount Road, Madras-18
and Published by Dr. V. L. S. Prakasa Rao, University Examination Hall, Madras-5.

Vol. XXX

OCTOBER—DECEMBER 1955

No. 4

The Indian Geographical Journal

Formerly

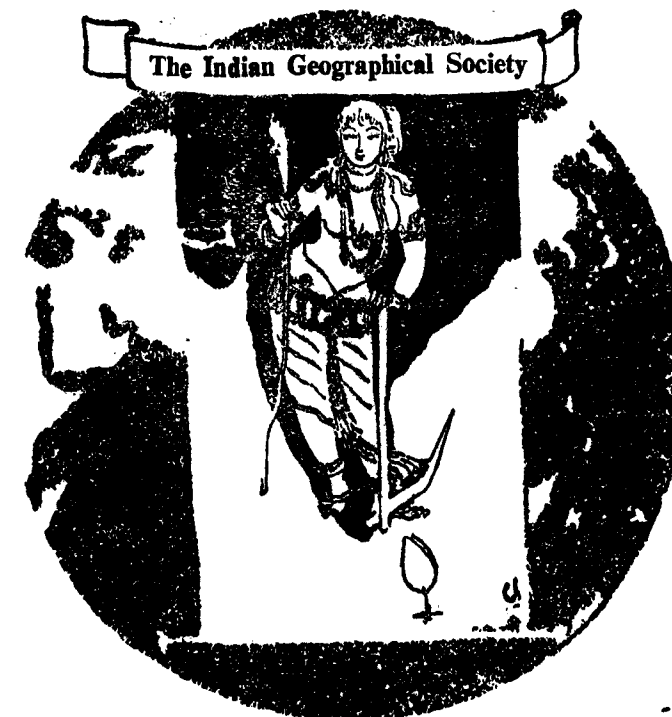
THE JOURNAL OF THE MADRAS GEOGRAPHICAL ASSOCIATION

PUBLISHED QUARTERLY

Editor :

Dr. V. L. S. PRAKASA RAO, M.A., D.Phil.

113
2-56



THE INDIAN GEOGRAPHICAL JOURNAL

UNIVERSITY EXAMINATION HALL,

MARINA, MADRAS-5,

INDIA.

CONTENTS

	PAGE
SEMINAR ON POPULATION IN ASIA AND THE FAR EAST	
—By Dr. George Kuriyan	105
A HISTORICAL GEOGRAPHY OF CHOTA NAGPUR	
—By Pradyumna Prasad Karan	109
THE PORTS OF ANDHRA	
—By Dr. V. V. Ramanadham and R. Krishnamurty ..	123
HOW ARID IS AGRA ?	
—By Shyam Sunder Bhatia	141
INDIAN FISHERIES	
—By Dr. K. H. Buschmann	147

PUBLICATIONS OF THE INDIAN GEOGRAPHICAL SOCIETY

THE INDIAN GEOGRAPHICAL JOURNAL—Quarterly

Annual subscription : Rs. 8/- and Admission fee : Rs. 2/-

Monographs :—

1. **Hydro-Electric Power Development in India**—A Geographical Analysis by Dr. George Kuriyan, Reprinted 1948. Rs. 3/-;
2. **Geographical Education in Indian Universities** by Prof. Kedar Nath Srivatsava. Rs. 1-8-0.
3. **Silver Jubilee Souvenir Volume** and the **N. Subramanyam Memorial Volume 1951**. Rs. 15/-. (Pp. 228 with 82 illustrations). Containing articles of high reference value from Professors of Geography from all over the world.

Advertisement Tariff

Full page	Rs. 30/-	per insertion.
Half page	„ 15/-	„
Cover page	50 per cent extra.	

THE INDIAN GEOGRAPHICAL SOCIETY,

UNIVERSITY EXAMINATION HALL,
MARINA, MADRAS-5 (India).

190
145266

THE
INDIAN GEOGRAPHICAL JOURNAL

Formerly
THE JOURNAL OF THE MADRAS GEOGRAPHICAL ASSOCIATION

Vol. XXX

OCTOBER — DECEMBER 1955

No. 4

*The Editor takes no responsibility for the views expressed in the Journal.
Authors alone are responsible for their respective statements.*

**SEMINAR ON POPULATION IN ASIA AND THE FAR
EAST***

[A brief account of the United Nations Seminar on Population in Asia
and the Far East, held at Bandung, between the 21st November and 3rd
December 1955.]

By

DR. GEORGE KURIYAN.

It is not often realised that population growth during the last three centuries has been less rapid in Asia and the Far East than in Europe, the Americas, and the world as a whole. Although current rates of mortality are much higher than what they are in the west, in recent years great reductions have been achieved in many countries of the ECAFE region and further improvements can be effected by the adoption of modern techniques in the fields of medicine and public health. With the exception of Japan, no nation in this region has yet shown any indication of major decrease in fertility to balance the drop in mortality rates. In consequence, it is probable that most countries will have a more rapid rate of population growth during the next decade or two, than what they have had in the recent past. Whether industrialisation, education, and other development programmes will lead to a slower rate of growth of population is a matter which merits further study. Certain countries like Japan and India, however, are adopting specific population policies to bring about a better relation between population and economic growth and to improve the living conditions and standards of individual families.

* At the invitation of the Government of Indonesia, a seminar on Population for the countries of the ECAFE region was organised by the United Nations, in collaboration with the International Social Science Council, at Bandung, Indonesia, between the 21st November and 3rd December, 1955. Prof. George Kuriyan, Vice-President, International Geographical Union, was the representative of the International Social Science Council. Twelve countries participated at the Seminar, Burma, Ceylon, India, Japan, Laos, the Federation of Malaya, Pakistan, Philippines, Singapore, Thailand, Viet Nam and the

Ums, N 4661E N55.30.3-4

The increase of population, particularly in the agricultural areas of many countries in the region, tends to aggravate the existing problems of under-employment and low productivity of labour, due to shortage of land and other resources and the lack of opportunities for employment in industry, trade and transport. Coupled with this, there is a widespread desire in the region to increase substantially the *per capita* consumption of goods and services and to improve the quality of housing. Meanwhile, the growth of population is adding to the volume of production that is required, if the people are to be housed, fed, clothed, and provided with other goods and services, even at the present unsatisfactory levels of consumption *per capita*. Thus, rapid population growth, although it increases the numbers of producers as well as consumers, magnifies the task of raising levels of living. Moreover, the large rural-urban migration which is occurring in many areas creates special housing problems for cities.

In most countries of Asia and the Far East, it is essential that industrialisation be accompanied by a vigorous programme for the improvement and modernisation of agriculture, in order to assure for their growing population, the production of an adequate supply of food and other agricultural products needed for the developing industries and the foreign market. Balanced programmes of economic development require careful planning for the utilisation of human resources, both in agriculture and non-agricultural occupations in urban and rural areas. For this, it is necessary to know the size and quality of the agricultural working force, the amount and nature of the land and its use, the capital available per worker in agriculture, and conditions influencing incentives for production. Further, it is also necessary to consider how agricultural development may influence the trends of population through its effects on migration, fertility and mortality.

These countries with a high rate of increase and heavy pressure of population on agricultural resources need industrialisation to relieve rural under-employment and to achieve a fuller utilisation of manpower. The presence of unexploited natural resources and of surplus manpower in some countries may facilitate industrialisation, but it must be remembered that there are a number of limiting factors to contend with, such as restricted market due to low purchasing power, deficiencies in the education and skill of the workers, and lack of trained management and capital. However, the manpower situation in some countries may make it desirable for the industrialisation programme to include the promotion of small plants and cottage industries in rural areas, partly because they will require less capital per worker, and partly also because they can use local labour during slack periods of agriculture, without diminishing

host country of Indonesia. To facilitate the work of the Seminar and to make it smooth and fruitful, the United Nations secured the services of several experts as discussion leaders, some from within and others from outside the region. These experts shouldered the burden of preparing plans and organising the necessary background material. Professor Pascal K. Whelpton, formerly Director of the Population Division of the United Nations and now Director, Scripps Foundation of Population Research, Miami University Oxford, Ohio, was the Director in charge of the Seminar. Each member Government, nominated its own representatives. India was represented by Dr. Rajeswari Prasad, Deputy Registrar-General, New Delhi, Ajit Das Gupta of the Indian Statistical Institute, and Dr. K. Visvanathan, Director of Public Health, Bombay. In addition, the International Social Science Council awarded twelve Fellowships to young qualified students of demography from the countries of the region, candidates who were not likely to be appointed as Government representatives and who could benefit by their attendance at the Seminar. On the recommendation of the Government of India, the International Social Science Council Fellowships were granted to Mr. K. B. L. Bhargava, Economics and Statistical Intelligence Officer, Gwalior, (Madhya Bharat) and Mr. R. K. Som of the Indian Statistical Institute.

food production. In planning an industrialisation programme there is need for demographic information, since the market and the labour force are influenced by the number, age and other characteristics of the people. Whether industrial development will be accompanied by a slackening of population growth, as has been the case in other regions, is a topic which requires further investigation.

Most countries of Asia and the Far East have a high percentage of children in their population, and rapid growth of the number of children of school-age can be expected during the next two or three decades. The result is to aggravate the difficulties which these countries face in attaining a satisfactory standard of literacy and education for all children. For proper planning of education, it is necessary to have current estimates of school-age population and projections of the number of children reaching school-age in future years, both for the entire region and for its various parts.

Another consequence of a high proportion of children to persons of working age, is to increase the difficulty of adequate capital formation through savings. It will usually be necessary to give special attention to methods of accelerating domestic capital formation by improving financial institutions and by using under-employed agricultural labour and those engaged in non-essential activities in the direct production of capital goods. Even though domestic sources of capital formation are fully utilised, it may still be advantageous for some countries to import foreign capital. There is need for more precise information regarding the inter-relation between changes in the size and composition of the population and capital requirements and capital formation.

An important aspect of the problem of economic development in Asia and the Far East is the need to achieve a balanced distribution of population within the countries and between urban and rural areas, in accordance with the changing needs for manpower in different sectors of the economy and the possibilities of providing the necessary social services and housing. For this purpose, it may be desirable in some cases to make an effort to check excessive migration from rural areas to the cities, while in other cases there may be a need for measures to stimulate such movements in an increasing scale. The encouragement of migration from densely populated areas, is an important aspect of economic development plans in certain countries (as for example Indonesia) which possess large, sparsely settled territories with rich, undeveloped natural resources. Such migration can alleviate over-crowding in the areas of out-migration and bring the unused resources into production, thus enriching national economy. On the other hand, certain countries (namely India and Japan) after a careful examination of the data regarding trends of differentials of mortality and fertility, and the outlook for expanding the capacity of the nation to support more people and raise their level of living, have adopted specific programmes designed to slow down population growth.¹ Since these countries do not have the opportunities for emigration on the vast scale which would be necessary to slacken the increase in numbers to the extent desired, the programmes adopted relate to the encouragement of smaller families.

¹ In India, community development programmes are being used as vehicles for conveying information about child-spacing to married couples who desire it. Japanese and Indian experience shows that the existing net-work of medical and para-medical personnel—midwives, health centre staff, and rural health workers—are particularly effective in promoting family planning programmes.

The countries of Asia and the Far East need more information about the characteristics and trends of population, in order to provide an adequate basis for economic and social planning. In some of them, no census has been taken in the last 20 years or more, and even the present size of the population is only vaguely known. The majority of them do not have accurate national records of births and deaths, so that the levels and trends of fertility, mortality and natural increase of population are unknown, and can only be estimated with a considerable margin of error. Information concerning the currents of internal migration is lacking and grossly inadequate in nearly every country of the region. There are important deficiencies in information on such questions as age structure of the population, economic activities, and the numbers and characteristics of families or households. The development of demographic research as an indispensable tool for sound economic and social planning should go hand in hand with the improvement of demographic statistics.

In almost all ECAFE countries, there are persons with suitable academic background for training in demography, but in most of these countries it is necessary for such persons to go abroad to complete demographic training. There is need throughout the region for more courses dealing with population questions at different levels, varying from general orientation courses to highly specialised professional training, and designed for persons with different academic backgrounds such as economics, sociology, statistics and public health.

A clearing centre is needed within the region to facilitate and regularise the exchange of publications, and early steps should be taken for making available the unpublished documents relating to the collection and analysis of demographic material. There is strong support for establishing a journal of demography with a specific regional scope and orientation.

The need for formal demographic training can be met in part by expanding facilities and curricula at existing Universities and demographic Institutes, so that they can handle more trainees from other countries and give training at higher levels. It would also be desirable to encourage an exchange of professional demographers and demographic technicians within the region and to expand technical assistance in demographic statistics, research and analysis. It would be worthwhile to explore the possibility of organising one or more inter-disciplinary teams of experts with experience in the region, which could visit the various ECAFE countries, to conduct lectures and discussions and provide consultation on the manifold aspects of demography. In addition, the starting of a demographic centre of research and training within the region would help to meet a real need.

Thus, the programme of the Seminar, not merely included the technical problems in the field of Population Studies, but also several of the broader aspects of the intricate relationships between changes in the size, composition and distribution of population, and changes in the economic and social situation in various countries. It also provided an opportunity for government officials and others working in the field of economic and social development to exchange information and points of view on national and regional problems of population and the means of improving demographic research.

The Seminar has done an extremely useful piece of work in bringing to the forefront the poverty of demographic information now existing throughout the region, without which there can be no assured success, even for those economic and social development plans which most of the countries are now launching upon.

A HISTORICAL GEOGRAPHY OF CHOTA NAGPUR*

By

PRADYUMNA PRASAD KARAN,

Indiana University, Bloomington, Indiana, U.S.A.

Chota Nagpur is the easternmost continuation of the plateau of Peninsular India. For centuries man has used this segment of earth's crust. The first inhabitants of the plateau were driven from the Ganga Plains by the Aryans. They practised hunting and migratory agricultural economy. Later on the primitive folk were forced to retreat further into the forests by sedentary agricultural people. The latest episode in the occupancy of Chota Nagpur began at the close of the nineteenth century with the gradual exploitation of some of its vast and most important mineral concentrations. Besides Damodar coal, Singhbhum iron ore and Hazaribagh mica Chota Nagpur has reserves of bauxite, manganese, fireclay, limestone and rare-earth minerals. The exploitation of the mineral wealth and the consequent industrial development has changed, and is still changing the face of Chota Nagpur. Some of the effects of this change can be seen today in the modern cultural landscape expressed in the chimneys and headgear of collieries, blast furnaces and coke ovens, pit heaps, quarries, engineering works and modern factories, flat-roofed bungalows, clustered bazars, railway sidings and the sprawling towns. The development of mining and manufacturing has not only modified the physical landscape but also the settlement pattern and the old pattern of human occupation. This is well illustrated in the decline of old trade centers on the roads like Chatra, Gola, Barabazar and Hunterganj, and the rise of new trade centers on the railways like Dhanbad, Purulia, Tatanagar, Kodarma, Ghatshila and Dalmia nagar.

The purpose of this paper is to examine the geography of the area at the beginning of the twentieth century. It is essentially a horizontal cross section of the conditions at a distinct period, but in some cases the pattern is traced from the preceding period. A particular importance is claimed for the geographical survey of the region at this period. If seen in the context of the mid-twentieth century developments the geography of Chota Nagpur at the beginning of the twentieth century assumes a special meaning. It illustrates the magnitude and variety of changes that can be brought about in an isolated, forested, and hilly region by modern industrial and mining developments within the span of less than fifty years.

REGIONAL SETTING

Chota Nagpur is the region of plateaus, hills and intermontane valleys which occupy the southern half of the state of Bihar. Towards the north this upland region descends gradually to the Middle Ganga Plain, while to the east and

* Historical Geography includes the study of the evolution of the geographical landscape within the period of human history, and the study of the geography of certain areas at specific times. The object here is to present a picture of geographical conditions of Chota Nagpur at the beginning of the twentieth century.

Professor Norman J. G. Pounds of the Indiana University's Department of Geography is responsible for developing my dual interest in historical geography and the geography of heavy industrial areas. Pounds work on the Ruhr (*The Ruhr: A Study in Historical and Economic Geography*. 283 pp. Indiana University Press, Bloomington, 1952), inspired me to attempt this study on Chota Nagpur industrial district.

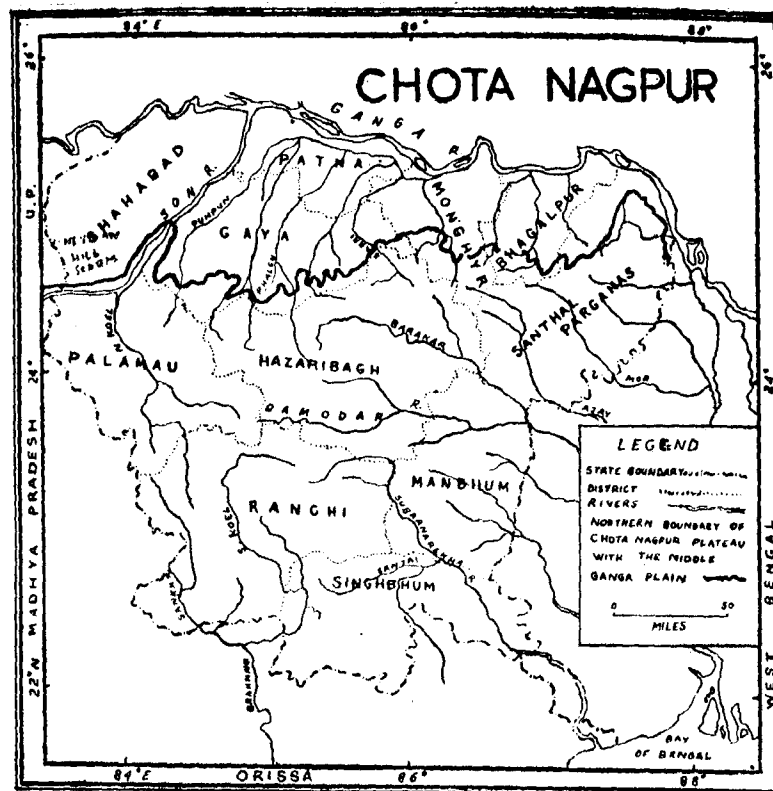


Fig. 1. Location Map

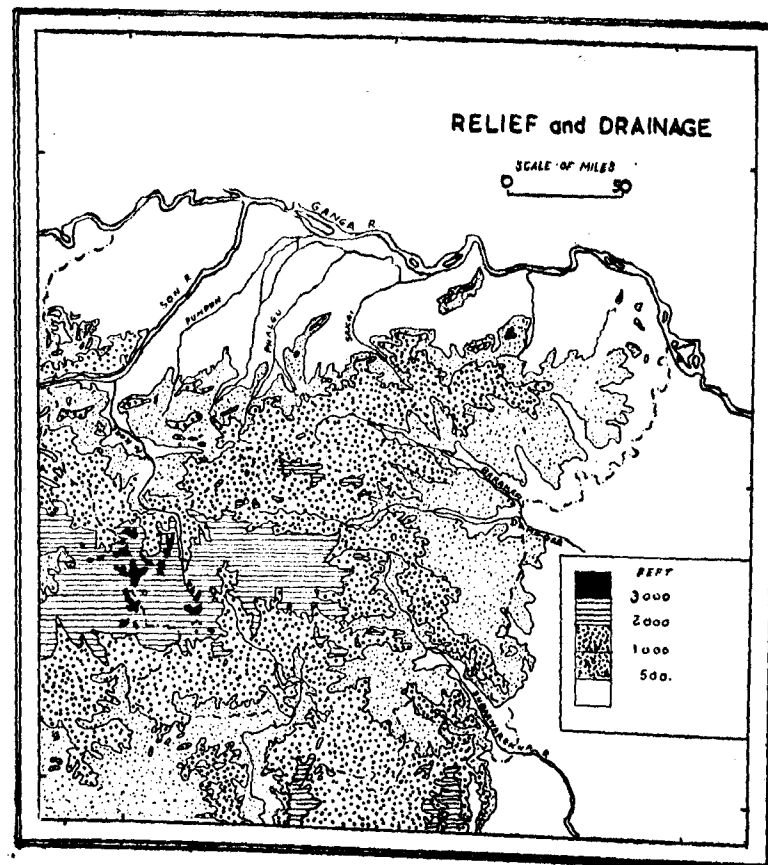


Fig. 2. Relief and Drainage

south-east its river valleys merge imperceptibly in the Lower Ganga Plain. The Son valley separates the region from the flat-topped plateau of the Vindhyan Mountains, and the complex hilly, isolated and highly forested country towards the south west delimits Chota Nagpur from the Central Highlands of India. The region has distinct geographic personality which distinguishes it from the neighbouring areas. The area comprises the administrative districts of Ranchi, Palamau, Hazaribagh, Manbhum, Singhbhum, Santhal Parganas and very small areas of Shahabad, Gaya, Monghyr and Bhagalpur districts of Bihar. (Fig. 1.)

Physiographically, much of the area is made up of Archaean gneisses forming peneplains, and bisected by the faulted belt of the Damodar basin with its rich Gondwana coal. South of Damodar is the Ranchi Plateau with two peneplains: at elevations of 2,000 feet from Lohardaga eastwards for sixty miles, and above 1,000 feet sloping down to south-west, and eastwards to Manbhum plain. Towards the west of Ranchi Plateau are many isolated mesas 'pats'—relics of a higher peneplain at an elevation of about 3,000 feet. North of Damodar, lies the Hazaribagh plateaus at about 1,300 feet. The Ranchi and Hazaribagh plateaus are rather open with broad and meandering valleys. In the north-east Chota Nagpur upland extends up to the highly dissected Rajmahal Hills overlooking the narrow plain south of the Ganga.

FOREST LANDSCAPE

Although deforestation had taken place even before the beginning of the present century, the area was still largely covered by forests (Fig. 3). Forest landscape was representative of a large area of Chota Nagpur. The extent of deforestation has been described by V. Ball of the Geological Survey of India as follows: 'The useful timber found in Manbhum is very limited in quantity, the forest covering but a small part of the area. Already contractors and their agents have reached the hills on the Dhalbhum frontier and at the rate at which Sal is now being cut for railway sleepers the supply can't last for many years'. As is clear from the map the extent of deforestation was greatest in the eastern part of Chota Nagpur bordering the Lower Ganga Plain. The demand for pit props for collieries and sleepers for railways coupled with the growth of population and the good means of communication in the eastern part made the destruction of jungle almost inevitable. In the western part of the country the practice of *jhuming* (shifting) cultivation by the aboriginals was responsible for jungle destruction to a great extent. On account of the paucity of jungle the eastern part of Chota Nagpur has been described by Ball as presenting a barren and desolate appearance. Singhbhum, Ranchi, Hazaribagh and Palamau had an extensive vegetation cover at the beginning of the twentieth century, and these areas were described as wooded country by the officers of the Geological Survey of India. It is estimated now that more than fifty percent of the forests have disappeared since 1900.

MINING INDUSTRY

Coal:—Of all the minerals worked in Chota Nagpur coal was the most important at the beginning of the twentieth century. Although coal was known to occur in this region long before European trade began to open up the country, and a certain amount was obtained for use in Calcutta from the Raniganj field during the latter part of the eighteenth century and nineteenth century, it was not until 1890 that coal mining became important in Chota Nagpur. In 1890 the East Indian Railway (E.I.Ry.) instructed their mining engineer to carry out an examination of the Jharia coalfield. As a result of this investigation it was found there were 18 seams in all. It was estimated that seams

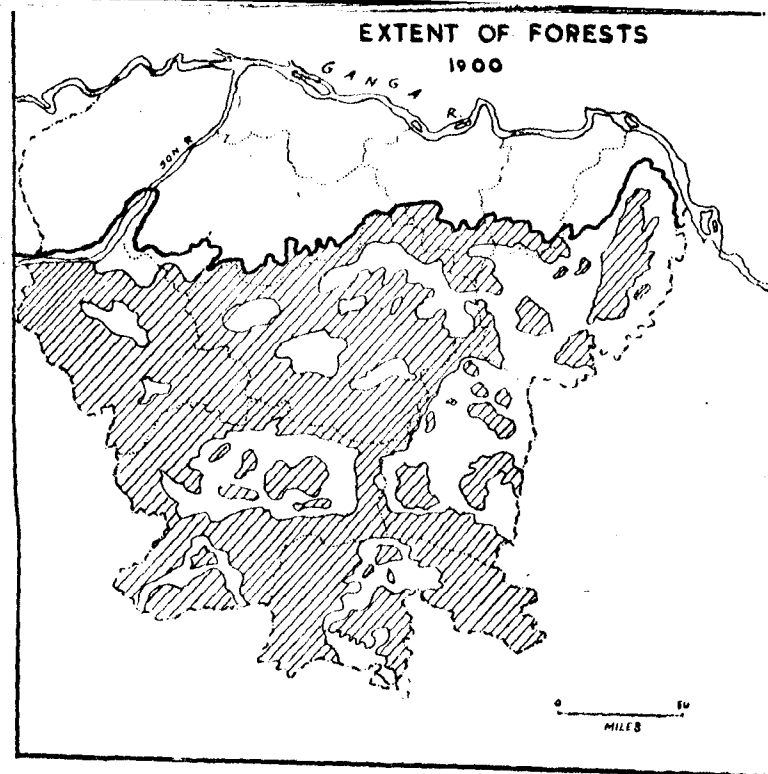


Fig. 3. Extent Forests about 1900

(Compiled from the information contained in District Gazetteers, Settlement Reports, Old Survey of India maps, and the report of the Conservator of Forests, Bihar)

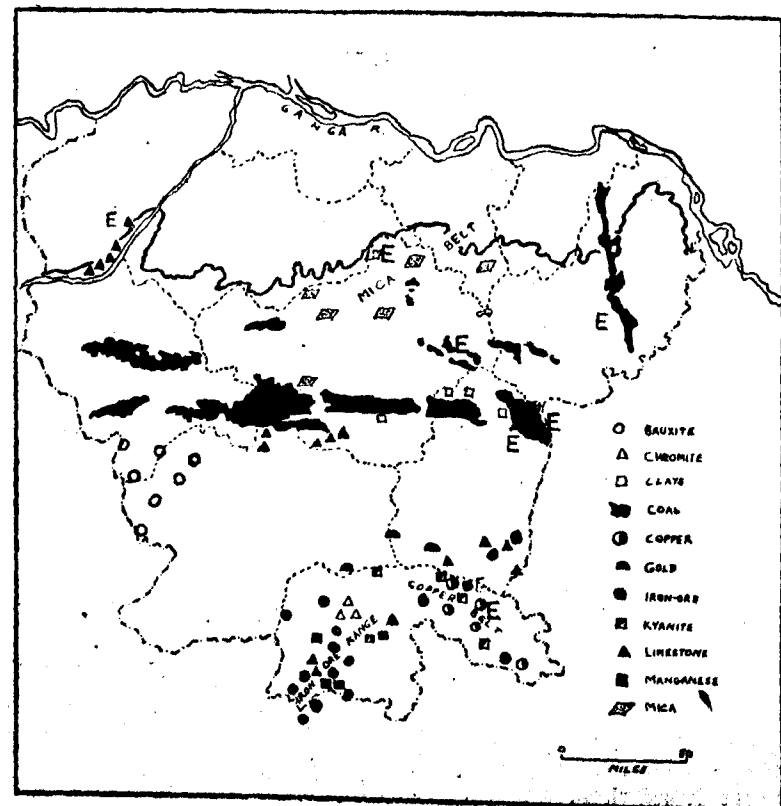


Fig. 4. Mineral Resources of Chota Nagpur.
Deposits exploited at about 1900 are marked "E"
(Based on reports of the Geological Survey of India, Calcutta)

12 and 13 allowing for losses alone contained 864 million tons of coal¹. The East Indian Railway impressed by this investigation sanctioned the construction of a line to Katrasgarh in 1892 and there was a rush to secure leases for coal lands in the field, largely in Katrasgarh area. The Katrasgarh branch line was opened in 1894, and another branch southwards from Kusunda to Pathardih was opened in 1895. These railway facilities had an immediate effect on coal production. In 1894 the output from all coalfields in Manbhum which includes part of the Raniganj field west of Barakar river was 128,686 tons. In 1895 with the opening of the railway to Katrasgarh, the output from Manbhum rose to 1,281,294 tons—the increase being largely from the Jharia field. In 1901 the output of coal from Jharia was roughly two million tons with prospects of a steady increase. The Bengal-Nagpur Railway entered the area in 1904 and crossed the Damodar river to continue their line to Gomoh.

During the nineteenth century the Raniganj field was the most important producer of coal in India; in 1900 out of a total Indian production of 6.12 million tons the field raised 2.55 million tons. Towards the end of the century, however, the potentialities of the Jharia field became increasingly realised and, with the extension of the railway from Barakar to Dhanbad and southwards across the area to link up with the Bengal-Nagpur line, the output from that field increased at a great pace, and by 1906 it exceeded that of Raniganj field².

Meanwhile, the relatively small, though important, Giridih coalfield lying north of Jharia and some 23 miles west of E.I.Ry. main line had been receiving attention and mining had actually commenced on a very small scale as early as 1857. With the establishment of railway connection with the main line in 1871, the output of the good quality caking coal of this field increased rapidly. By 1890 the total tonnage from the field had exceeded the $\frac{1}{2}$ million mark and during early years of the present century some $\frac{3}{4}$ million tons of coal were produced annually.

Towards the west in Palamau district coal was apparently mined at Rajhara in the Daltonganj coalfield as far back as 1842. In 1901 railway connection was established with the E.I.Ry. main line via the Son valley, prior to which date the coal had been despatched in boats down the North Koel river. With the construction of the railway the output increased in the early years of the present century to some 70 to 80 thousand tons.

From the Rajmahal Hills an output of about 8,000 tons is recorded as far back as 1858, and some 28,000 tons and 45,600 tons during the following years. After that, the output fell rapidly and ceased in 1863 for about a quarter of the century. From 1890 onwards small tonnages are recorded. Mining had practically ceased at the beginning of the twentieth century chiefly due to the opening of the large Damodar valley coalfields.

At the beginning of the present century the coal production of India had reached a total of about 6.1 million tons of which nearly 5 million tons were obtained from the Jharia, Giridih and Raniganj fields in Chota Nagpur. From 1897 onwards an appreciable foreign trade was developed. This trade reached $\frac{1}{2}$ million mark in 1901. During this period by far the greater part of the coal was used for steam-raising by the railways. The development of the Jharia and Raniganj fields had, however, given some encouragement to the iron

¹Records of the Geological Survey of India, Volume XXV 1892, pp. 110-113.

²E. R. Gee, Coal. Bulletin of Economic Minerals, Geological Survey of India, No. 16. Page 122. (1948) Calcutta.

industry and, in 1889, the old iron-works at Kulti (near Asansol, West Bengal) were completely remodelled and absorbed a share of the caking coal. The greater portion of the labour employed during this period, as also at the present day, were the aboriginals of Chota Nagpur. Regarding methods of mining the habit of exploiting the seams at their outcrops by means of incline or quarry-working was in general practice. The practice, combined in the old days with a complete disregard for the importance of adequate coal barriers, has doubtless resulted in the loss of large areas of many seams at and near their outcrops, as a result of fires or flooding. However, underground working by 'pillar and stall' was common in some mines. In 1901 Government provided for the control and inspection of mines.

IRON

Iron ores have been worked in India for probably 3,000 years or more. That iron making was practised all over the country is attested by the fact that there is scarcely a district outside the great Indo-Gangetic alluvial plains where ancient slag heaps are not found. The indigenous industry must have been once flourishing wherever there was ore and plenty of forests to supply the necessary charcoal for iron making. It was only during the nineteenth century that the industry fairly rapidly dwindled and almost died out, partly because the forests were disappearing and mainly because mass-produced iron from Europe became available in large quantities at cheap rates. Even at the beginning of the present century there were a number of furnaces scattered over Chota Nagpur, and rest of India, each manufacturing 2 or 3 tons iron per year. The iron makers used to get their ore from almost any source in their vicinity. The ore may be rich pieces of hematite or magnetite forming the 'float' around larger deposits; magnetite sands from rivers and streams; pellets of ironstone derived from lateritic deposits; or even the richer ferruginous sandstones or shales.

The ore was gathered, beaten up to the size of coarse sand and winnowed in the breeze or washed in a stream to separate the associated gangue. The furnaces were built of locally available clay and smelting was done by methods handed down through generations, with the help of the members of the artisans family. The fuel used was charcoal prepared from certain selected jungle woods available locally. No flux was used, though occasionally the ore itself might have contained some calcareous material or was partly a carbonate. The smelting process entailed enormous waste of iron ore, fuel and time. Much iron passed into slag as no flux was added for slagging. The iron in the furnace attained a plastic state without becoming fluid. It was taken out and repeatedly heated and hammered to separate the grains of ore and slag from the iron. The furnaces were three and a half feet high, circular in cross-section and 1 foot in diameter. They were either cylindrical or tapering towards the top. The furnace was worked with two goatskin bellows in order to produce a continuous blast of air.

Various attempts were made to establish a modern industry. Most of these did not materialise and some stopped due to adverse circumstances. The sole survivor was the Bengal Iron Works formed about 1874 at Kulti on the eastern fringe of Chota Nagpur. Iron ore, frequently formed on the surface, usually on hill slopes of Singhbhum was worked in places. Four iron mines at Turandih, Talsa, Kudaha and Hakagara in eastern Singhbhum worked by the Bengal Iron Works, later known as Bengal Iron and Steel Co., were producing annually about 7,641 tons of ore in the quinquennium ending 1904-1905. No machinery was employed; the mines were merely surface working; the

ores being found at depth of 2 to 20 feet. The number of persons employed daily was about 500. It is significant to note that vast rich deposits of south-western Singhbhum were not even known to exist at this time.

MICA MINING

Mica was used for ornaments and surface deposits have been worked since ancient times. The modern commercial exploitation was started by the Europeans about 1870. At the time electricians were searching for an insulator and it was found greatly superior to the asbestos previously employed. After a few years some Indians took up mica mining, and later on two Europeans established themselves and the mining developed rapidly. The progress made will appear from the rents paid to the Government by the lessee which amounted to Rs. 285 in 1887, to Rs. 8,029 in 1892 and Rs. 30,736 in 1914.

The early mica mining was greatly facilitated by a particular physiographic factor which helped to detect the veins. The streams flowing down from the high and uniform mass of gneiss have carved out deep channels or ravines in the heterogenous and irregular formations of soft schists and hard granite exposing the mica bearing veins. The mines at the beginning of the present century were all concentrated along the exposed veins. There was deplorable lack of roads in the mica belt and the mica was carried from the mines almost exclusively by pack bullocks or as head loads.

COPPER

The occurrence of copper in Chota Nagpur was first reported in 1833. In 1854 a full account of the copper veins and old mines in Singhbhum was published in the Journal of the Asiatic Society of Bengal. In 1857 mining commenced at Landu and Janjora, and raw ore was turned out at the rate of 1,200 to 1,800 cwts. a month, and delivered in Calcutta by way of Purulia and Raniganj. But due to the poverty of the ore, flooding of the mines, and want of labour the work stopped by 1870 and all operations had been discontinued. At the beginning of the present century only one copper mine at Matigara was being worked. Later geological investigations revealed the existence of a copper belt in Singhbhum and mining again revived during the first decade of the twentieth century.

LIMESTONE

The Son valley in the districts of Shahabad and Palamau have immense resources of limestone. The publications of the Geological Survey of India contain description of the quarries of this area during the last decade of the nineteenth century. Earlier, in 1869, Mallet described the quarrying and lime-burning industry here and the transport of lime via the Son river and the Ganga.³ Since those days the industry gradually increased in the Son valley. The construction of the railway passing through Dehri-on-Son led to further development of limestone quarries at the beginning of the present century. However, Dalmianagar, the present industrial centre was an unknown spot in 1900.

Other principal minerals of Chota Nagpur like the manganese, chromite, kyanite, bauxite, china clay and fire clay were little used in 1900.

³ F. R. Mallet: *The Vindhyan Series, Memoirs of the Geological Survey of India*, Volume VII, Part 1.

MANUFACTURING INDUSTRY

Hitherto Chota Nagpur remained industrially one of the most backward regions in the whole of India. Practically the only manufacturing industry consisted of cocoon rearing and lac production. Both of these were on a limited scale and carried on mainly in the cottages.

The cocoon rearing industry, which has almost declined now, was very important in Singhbhum. Singhbhum and its neighbourhood have, indeed, been described as the heart of the tusser-rearing industry of India. The best cocoons and the largest quantity were produced in Singhbhum and sold in Chaibasa *hat* (market). The industry was chiefly carried on by the Hos, a tribe, as a subsidiary occupation to agriculture. From the cocoons very fine quality of tusser (a kind of silk) was produced. The handloom industry—still important in the villages—produced coarse cloth and pieces of cotton cloth.

A large trade was carried on in raw lac—a resinous encrustation produced by an insect which sucks the juice of plant and transforms it into resin. The insect under natural conditions is found on a number of trees but mainly on *palas*, *kusuo* and *bair*. The trees on which lac is grown are called its hosts. Twigs and branches containing encrustations of lac are cut and scraped and converted by grinding and cleaning into lac. Shellac was made in small quantity from lac by melting. The shellac manufacturing was carried on in cottages containing one or two *bhattas* (kilns). The most important markets for raw lac were Garhwa and Daltonganj.

Besides there were several rural industries carried on a cottage basis to meet the simple demands of the population. These included oil-pressing, brick making, potter's earth industry and several other miscellaneous activities.

The position of Chota Nagpur with respect of industries was beginning to be transformed by the erection of the large Tata Iron and Steel Works near Kalimati (modern Jamshedpur). The company was registered early in the twentieth century (1907), and as a site for the new works an area of about 20 square miles of land had been acquired at the junction of the Subarnarekha and Kharkai rivers on the Bengal-Nagpur Railway. The installation of this work marks an important stage in the development of Chota Nagpur. Hitherto, the only successful iron smelting works in India, conducted on European lines, have been those belonging to Bengal Iron and Steel Company at Barakar on the eastern outskirts of Chota Nagpur. The production of the latter company was limited to pig-iron, although an experiment was made in steel manufacture in 1906. The Tata Company, however, had proposed to make steel production its chief object. This work was designed to include blast furnaces and large steel rolling mills, and it was estimated that the plant would require a labour force of about 3,000 men, over and above the thousands of labourers that would be employed at the collieries, limestone quarries and iron mines.

TRANSPORT

Towards the latter part of the nineteenth century Chota Nagpur consisted largely of a chain of self-contained villages averaging a population of 500. The economic activities were very much restricted, and the few existing roads were in disrepair and had reached a deplorable state. So far as can be ascertained the only all-weather metalled road was the Grand Trunk Road, others were no better than mere fair weather tracks. The only way by which a

traveller could go to Calcutta, before the advent of the railways, was the G.T. Road and the only means of conveyance were the relays of carriage provided by various contractors. The following account of the condition of roads in the western part of Chota Nagpur by V. Ball of the Geological Survey of India gives a vivid picture of the deficiency of communication in the last quarter of the nineteenth century. "Of pukka-bridged roads there is not a single example in the whole area. The few roads that do exist are little better than mere fair-weather tracks. Of these the principal are from Daltonganj to Ranchi, and from the same place to Dehri on the Son. But the others are practicable for carts, and the remainder can only be used by pack-bullocks and elephants.... Carts find their way along the above mentioned roads into Daltonganj; the average rate of progression of these carts were under three miles a day. The export trade in grain is wholly carried on by means of pack bullocks."

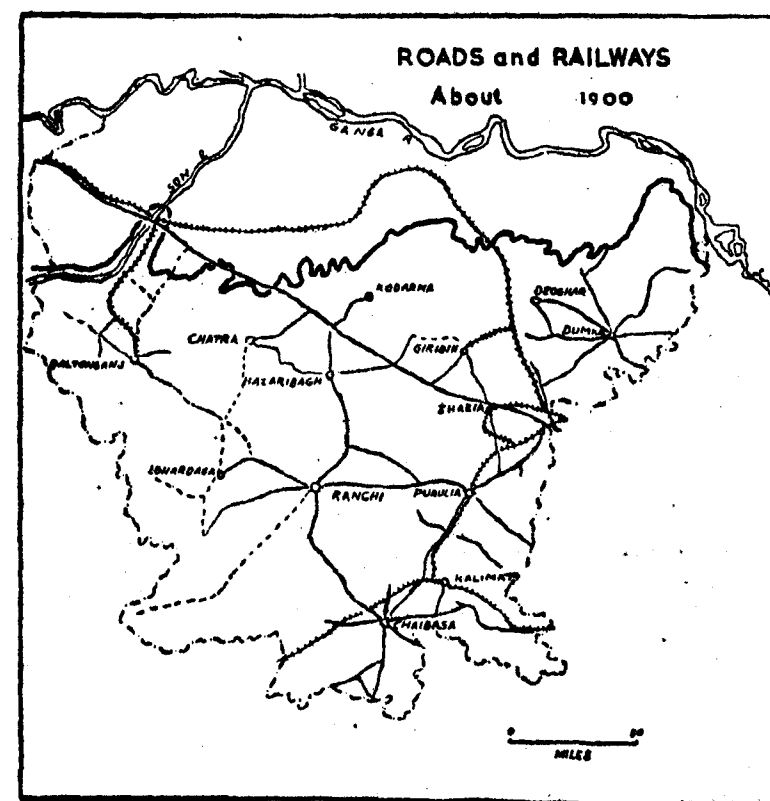


Fig. 5. Communications about 1900
(Based on the District Gazetteers of Chota Nagpur)

As a whole the plateau was not yet sufficiently provided with roads. Most of the roads were unbridged, cut up by numerous streams, big and small, which when in flood held up traffic effectively till the flood subsided. Wheeled traffic was not used in many parts for want of suitable roads. The Grand Trunk Road was the only highway cutting across the plateau.

Chota Nagpur, however, has natural advantages for road building. The ground is stable and building materials are easily available. Rapid develop-

ment of roads began in the first decade of the present century, so much so that the modern system of roads is a creation of the last fifty years.

The idea of constructing a railway from Calcutta towards northwest occurred as early as 1841 but the railways did not reach the outskirts of Chota Nagpur until 1870. The contention centered round the choice between the river route via Rajmahal and the direct route via Raniganj. It was natural to follow the trade route which lay along the Ganges river, but the necessity of more direct route between Upper India and the port of Calcutta was soon perceived and in 1871 the railway passing through Madhupur was built. This line was extended across the Son valley in 1900. The railways also reached the Giridih coalfield in 1871. In 1894 the railway extended up to Jharia coalfield. Earlier Purulia, Sini and Chakradharpur were connected with Asansol by railway. In 1901 Daltonganj was connected with the main line of the E.I.Ry. at Son-East-Bank, which resulted in much accelerated production of coal in the field. The absence of the railways was conspicuous in the mica belt of the north, western section of the Damodar valley coal fields and the iron ore area of Singhbhum.

The railways followed the terrain of the country. The main line of the E.I.Ry. from Asansol to Madhupur takes advantage of the Barakar valley, the railway from Son-East-Bank to Daltonganj runs along the North Koel river, while the line connecting Calcutta with Nagpur via Kalimati (present Tata-nagar) follows strictly the valleys of the Subarnarekha, the Sanjai and South Koel rivers. There was a large vacant space with no railway facility, and this included the whole of Ranchi and Hazaribagh districts, large part of Palamau and the Rajmahal hills. It is important to note that while the coal mining area, the Jharia coalfield, had experienced some railway development, the mica mining area in Hazaribagh had no railway.

There is no river on the Chota Nagpur plateau in which boats can ply with ease as most of the streams have rocky beds with rather abrupt slopes. However, boats used to ply across the relatively big rivers like the Damodar, Barakar, and Son, Kasai and Subarnarekha. There are references in the memoirs of the Geological Survey of India to the transport of coal on the Damodar before the construction of the railways. The competition of the railways after 1894, the opening of mines away from the river, the lack of other bulky commodities for transport, the gradual silting up of the river, all combined to bring transportation on the Damodar to disuse. The Son was utilised to transport limestone. On the Barakar there was considerable traffic to and fro, but the opening of the railways reduced its importance.

POPULATION AND SETTLEMENT

The population of Chota Nagpur area in 1901 was 6,710,166. The density as a whole was 181 persons per square mile, but varied considerably from region to region. Manbhum had the highest density, 314 persons per square mile, twice that of Hazaribagh and Ranchi, more than twice that of Singhbhum, and just 2½ times that of Palamau. Even in Manbhum, generally speaking, it was greatest in the north, and gradually decreased in the south. Topchanchi which includes a considerable portion of the Jharia coalfield had as many as 417 persons per square mile. Immediately south of the coalfield area and of the Damodar river were Chas with 427 and Raghunathpur with 400 persons per square mile. The main reason for the relatively high density of population in both these thanas was, perhaps, the fact that they contain much more comparatively level ground than any other part of Manbhum and offered attractions in the way of cultivation. The 1901 census figures, however, show

that the tendency to increase of population in these areas disappeared in the last decade of the 19th century; and indicate, perhaps that the limits of easy cultivation have been reached. Within the coalfield area Jharia and Topchanchi thanas accounted for over 44 per cent total increase of population. These thanas contained the bulk of the collieries, most of which were opened out for the first time during the last few decades of the 19th century. Outside the coalfield area in Manbhum district Purulia, Manbazar and Chandil were the regions in which there was greater increase in the decade ending 1901.

Towards the south-east Singhbhum experienced 12.5 per cent increase in the decade ending 1901. This increase was obviously related to the opening of the Bengal-Nagpur Railway. The tracts which showed the greatest development of population were Chakradharpur and Manoharpur, through which the railway runs. Then comes Ghatshila which was tapped by the railway. The population densities in thanas Chakradharpur and Ghatshila were 171 and 190 persons to the square mile respectively, while there were 49 to the square mile in Manoharpur to the west where there were extensive forests.

On the Ranchi plateau the population was dense on the north-east—the most dense in thanas Ranchi 367, Silli 324, and Bundu 321 to the square mile. The growth of population in ten years ending 1901 was small—only 5.2 per cent in Ranchi district—as a result of several years of bad harvests and general depression, actual famines prevailing in some parts in 1897 and 1900.

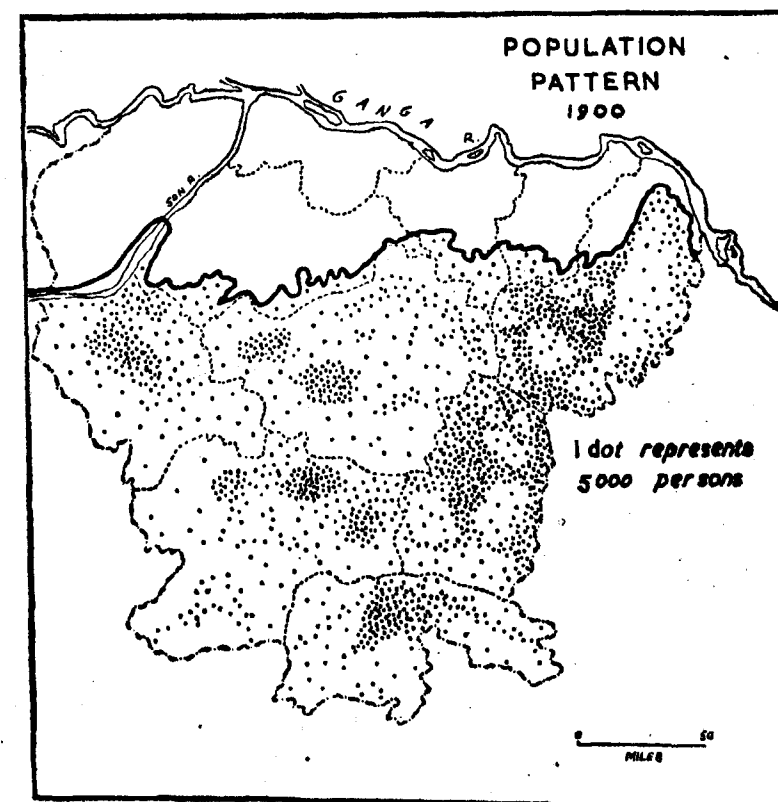


Fig. 8. Population Pattern about 1900

(Source of data: Census of India, Tables for Bihar 1901 and the District Gazetteers)

North of the Damodar in Hazaribagh district the increase of population occurred chiefly in Giridih subdivision where coal mines were being developed. Actually during the span of thirty years between 1881 and 1911 Giridih gained fifty per cent owing to the development of coalfield and the growth of the new town. Bagodar exhibited 22 per cent increase due in part to the opening up of the area by the Grand Chord Railway. The increase in Kodarma was 19 per cent and was due to the development of mica mines. Chatra and Chauran, important trade centres, suffered decrease of population by the gradual curtailment of their trade as a consequence of the advance of railways. To the west in Palamau population was dense in the valleys of Son, Koel and Amanat, where there is the largest proportion of land fit for cultivation. The density for the district as a whole was 126 per square mile less than that of any other district of Chota Nagpur.

Generally speaking, where mining had made but little headway, the distribution of population seemed directly related to the natural facilities available for cultivation. The most important single factor is not rainfall or the facilities for irrigation but the relief of land which determines both the extent of land available for cultivation and the agricultural productivity of the soil. The two most populous districts in Chota Nagpur were Manbhum and Santhal Parganas—the districts where percentage of cultivable land to the total area is the highest. In Manbhum in addition there were the newly opened coalfields.

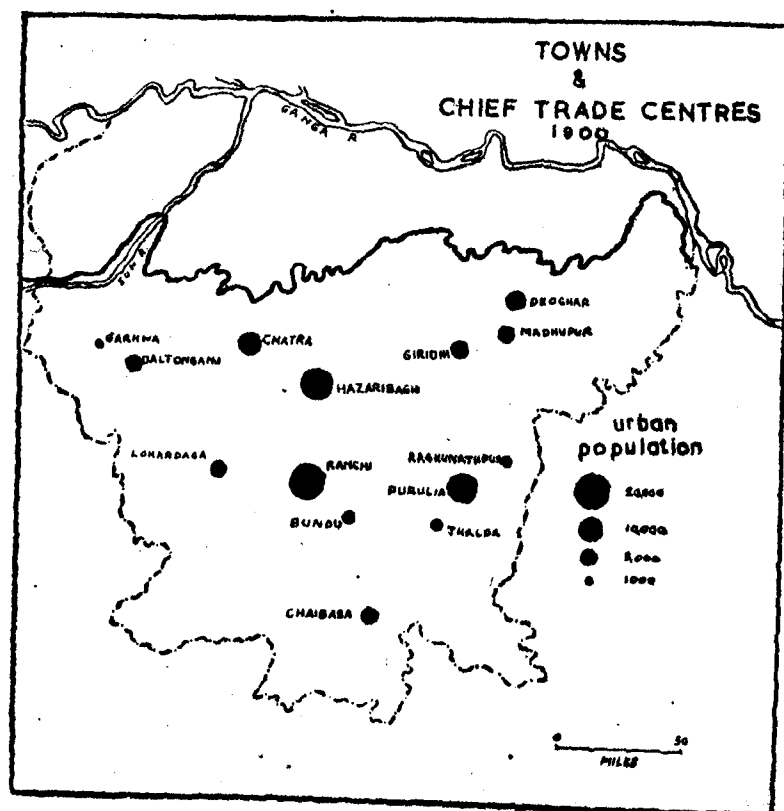


Fig. 7. Towns and Chief Trade Centres about 1900

(Source of data: Census of India, Tables for Bihar, 1901 and the District Gazetteers)

The population was rural and lived in villages. The villages were generally built on a ridge or near the crest of a slope. Usually they consisted of a cluster of mud-huts huddled together in the most perfect disorder. The houses were of mud with a roof of tiles or thatch as most of them are even today. In the central Ranchi plateau where people were more prosperous and jungle products less easily available, tiles had displaced thatch, but in the more jungly parts thatched houses were common, and often a wall of saplings plastered over with mud or cowdung replaced the mud wall. In the coalfield region there were several large villages—Jharia, Sijua, Katras and Pathardih, and there were other areas in which people were concentrating such as Jealgora, Jamdoba and Mahuda. All these have now grown into large and thriving mining and industrial centers.

Towns were few. They served merely as large trading centers on roads or railways or both. The chief urban centers at the beginning of the twentieth century were Ranchi, Hazaribagh, Purulia, Giridih, Chatra, Chaibasa, Deoghar and Daltonganj. Most of these towns were overgrown villages, the growth being gradual. Due to certain locational advantages, the village continued to expand in extent and population and became a convenient center for itinerant merchants and rural artisans. This led to further growth, and the dividing line between village and town passed where, owing to the increase of traders and manufacturers not dependent on village lands, the village takes on an urban character.

CONCLUSION

Chota Nagpur, which is today by far the most important mining and industrial area of India, was preparing for large scale modern developments at the beginning of the twentieth century. Its vast mineral resources, iron and mica, were little used. The coalfield, however, had been exploited and was beginning to attract industrial development. The iron smelting industry for which this part of India is most noted today was practised largely on a domestic basis. But a beginning towards modern iron industry was made by the establishment of the Bengal Iron Works on the outskirts of Chota Nagpur, and the Tata Iron and Steel Works were being planned. The relative backwardness in mineral and manufacturing industry was mainly due to the lack of knowledge of the resources and the inaccessibility of the area.

Despite the progress which was being made in coal mining industry Chota Nagpur remained in every sense rural. Forest landscape was representative of large areas. Agriculture was concentrated in valleys and was scattered on the plateau surface. On the good soils of the Damodar valley the settlement pattern was predominantly one of nucleated villages, between which the scattered cottages of the miners were beginning to spread in the eastern part. Coal mining was obviously a rural pursuit. Mines were dotted about the countryside. The mining areas round Jharia and Giridih were at this time developing a scatter of miner's settlements. They tended to develop into small towns but were as yet large villages. Outside the few urban areas like Ranchi, Hazaribagh and Purulia, Chota Nagpur remained at this time essentially a region of small and scattered villages. The cities remained small and largely agricultural in their interests. The greatest urban developments were Ranchi, Hazaribagh, Purulia, Giridih, Chaibasa and Deoghar.

Although small increase of population was noted in the coal mining area it was not until 1915 that the increase of population in the area became phenomenal. The coal mines and other small works employed in the main,

persons taken wholly from the farms and the villages where there was surplus of labour. On the whole employment in the mines and factories formed an insignificant fraction of the population. There were, for example, no more than about 3,000 persons employed in mining, and those employed in industries numbered very much less than this.

SELECTED BIBLIOGRAPHY.

1. District Gazetteers of Ranchi, Hazaribagh, Palamau, Manbhum, Singhbhum and Santhal Parganas. Published 1910.
2. *Settlement Reports of Chota Nagpur districts.*
3. *Census of India: Tables for Bihar, 1901.*
4. *The Jharia Coalfield* by C. S. Fox, *Memoirs of the Geological Survey of India*, Volume LVI (Calcutta, 1930).
5. *The Economic Geology and Mineral Resources of Bihar Province* by J. A. Dunn. *Memoirs of the Geological Survey of India*, Volume LXXVIII (Calcutta, 1942).
6. Coal by E. R. Gee. *Records of the Geological Survey of India*, Volume LXXVI (Calcutta, 1948).
7. *Report on the Mica and the Mica Industry of Bihar and Orissa* by S. K. Roy. *Department of Industries Bulletin No. 4* (Patna, 1932).
8. *Report on the Copper Industry in Bihar and Orissa* by R. B. Woakes. *Department of Industries Bulletin No. 3* (Patna, 1932).
9. *Tasar Silk-worm Rearing* by M. N. De. *Department of Industries Bulletin No. 17* (Patna, 1926).
10. *Notes on Lac Cultivation in Bihar and Orissa* by J. H. Lyall (Ranchi, 1929).
11. *Iron-ore, Iron and Steel* by M. S. Krishnan. *Bulletins of the Geological Survey of India No. 9* (Calcutta, 1954).

THE PORTS OF ANDHRA — AN ECONOMIC REVIEW*

DR. V. V. RAMANADHAM,

M.COM. (Hons.), Ph.D. (Andhra), Ph.D. (Lond.), Assoc. Inst. T. (Lond.)

and

MR. R. KRISHNAMURTY, B.COM. (Hons.)

Andhra is one of the few States of India having a coast line. The length of the coast line is about 600 miles, compared to the total coast line of India of about 4,000 miles. It extends between the Ichapuram taluk in the Srikakulam district and the Sulerpet taluk in the Nellore district.

1. MARITIME OPENING

A maritime opening confers certain advantages on the region. Firstly, the area possesses relatively favourable conditions of climate and, other things being equal, has better chances of rainfall and moderations in weather conditions than the interior areas. The coastal areas are likely to be more healthy; and the density of population is generally higher.

We may analyse the maritime influence on the different districts of Andhra by considering the area and population coming under it within a range of 25 miles or 50 miles from the coast line.

Of the total area of about 63,000 sq. miles of Andhra, about 18,300 sq. miles come under the 25-mile zone of maritime influence. In other words, a fourth of the area enjoys this influence. About half of the total population of the State occupies this maritime area. Thus the density of the closely maritime areas is high. The 50-mile area covers nearly half the area of the State and supports about 75% of the total population. Once again the conclusion that the areas far away from the sea contain a proportionately small number of people.

There is one obvious point. The Ceded Districts, with some exception of Chittoor, do not come under maritime influence even within the 50-mile line. The very low densities of population in these districts are not, therefore, accidental. They are partly a result of their location; and the scanty rainfall in those areas is also a part of the explanation.

The second advantage derived from a maritime opening is that certain relatively gainful occupations could develop in the region concerned. There are opportunities for the rise of tertiary occupations like exporting, importing, forwarding, warehousing, the carrying trade, and seafaring. A part of the population may shift itself from the most basic occupation of agriculture and derive higher incomes thereby. Where this happens there tends to prevail a healthy, though not exclusive, occupational disparity between the immediately coastal places and those lying beyond.

* This is based on a Chapter in Dr. Ramanadham's forthcoming book *The Economy of Andhra*.

TABLE 1

MARITIME INFLUENCE DISTRICT-WISE

Districts	Total area in sq. miles	Area under maritime influence		Total Population	Population under maritime influence	
		Within 25 miles	Within 25-50 miles		Under 25 miles	Within 25-50 miles
Srikakulam	3,890	1,940	1,720	21,23,100	11,20,200	9,37,200
Visakhapatnam	5,180	2,160	1,510	20,72,700	14,30,800	7,59,800
E. Godavari	5,680	2,360	1,820	24,14,800	19,99,500	3,42,300
W. Godavari	3,100	1,000	1,160	16,97,700	7,05,400	7,42,000
Krishna	3,500	1,320	630	17,79,500	7,55,600	3,59,200
Guntur	5,770	2,320	720	25,50,000	12,86,400	5,08,700
Nellore	7,960	5,640	2,320	17,95,600	14,16,300	3,89,400
Chittoor	5,890	1,740	1,440	11,05,900	6,65,000	4,50,900
Cuddapah	5,930	..	750	11,61,700	..	1,17,100
Anantapur	6,710	..	..	13,61,600	..	..
Kurnool	7,840	..	..	6,43,600	..	..
Bellary (only Adoni, Rayadurg and Alur taluks)	1,950	..	..	4,29,500	..	..
Total	62,900	18,270	12,080	1,91,35,700	93,79,200	46,06,600

Apart from offering immediate advantages of export and import for the State, the maritime opening enables it to take the place of the intermediary in respect of the trade of the neighbouring interior States with the outside world. This is both a privilege and an obligation on the part of the seven maritime States of India. The fact that a good proportion of the foreign trade of India originates in or is destined to the interior States like Hyderabad, Madhya Pradesh, Uttar Pradesh, Bihar, Assam and the Punjab adds great weight to this point.

In the context of the ports of Andhra this point is of particular value. The major port of Andhra, namely, Visakhapatnam, has so far served the needs of Madhya Pradesh more than those of Andhra. It is not that the latter are neglected but that the former have given the real support for the business of the port. The manganese and other materials of Madhya Pradesh seeking exportation pass through the port of Visakhapatnam. The present trends of development in the Madhya Pradesh and in the wider context of Indian economic development are likely to add to the responsibility of Visakhapatnam in this respect. More will be said of this while discussing the hinterlands.

Fourthly, the maritime opening holds some natural possibilities of industrial development for the State. The port may develop ship-building and salt works. In both these respects Andhra has been at an advantage, in that it has not only made good progress with the salt industry, sending out a net surplus of the product to the other States, but secured for the port of Visakhapatnam the only modern shipyard of India. The shipyard is of great value, in that, apart from the direct employment opportunities it creates and the consumption expenditure it consequently gives rise to in the neighbouring area, it promotes the rise of subsidiary processes which further the prospects of employment and industrial development.

Fifthly, a long coast line renders the conditions of transport easier for the State if there is proper planning. It need not suffer from the problem of traffic congestion on the main mode of transport, namely, the railways, for, coasters can come to the rescue. Theoretically the coastal districts of Andhra enjoy this advantage. As these are the very districts where the density of traffic is high, Andhra has a naturally favourable means of solution. In actual practice, however, the conditions are less admirable. The means of coastal transport are not well-developed; and most of the traffic is obliged to fall back on the railway. Here is therefore a natural opportunity which remains to be exploited to the fullest advantage of the State.

Lastly, the coast line of Andhra has special significance in being centrally placed on the east coast of India. This has commercial as well as strategic implications. In any scheme of the naval defence of India Andhra has to play an important part, as it possesses the locational advantage of being sufficiently away from foreign frontiers on either side. There is already a naval base, to which certain other establishments like a naval school have been added consequent on the partition of the country.

Before we proceed further it would be relevant to observe that, despite all these favourable conditions, the coast line of Andhra has not attained enough development yet. The reason is three-fold. Firstly, the port of Madras, with all its commercial attractions, has eclipsed the potentialities of the Andhra ports, particularly because the major port of Andhra is so far away from the most productive parts of the State. Secondly, there is a coastal railway which is aligned exactly in the same way as the sea shore is, with the result that the possibilities of coastal trade have been truncated. This may be contrasted with the coast line of Bombay, which for most part is not occupied by a closely parallel railway line. Lastly, India's foreign trade has all along been more with the West than with the East; and most of the traffic that had the option between Visakhapatnam and Bombay or that had even a slight advantage in the direction of Visakhapatnam, found some justification to route itself towards the Western ports.

The net outcome of the above discussion is that the coast line of Andhra has, potentially, a variety of natural and economic advantages, which yet remain to be tapped in full.

Let us compare Andhra with the other maritime States of India in respect of ports. Each of the States, excepting Orissa, has one major port, while the spread of the intermediate ports, minor ports and sub-ports is dissimilar.

Andhra has a small number of ports, compared to Madras, Saurashtra and Bombay. Yet there are three points of interest. Firstly, compared to the other States, a larger proportion of the ports declared open are in actual operation. Secondly, the existence of a few ports prevents the dissipation of trade movements over a large number of small and perhaps inefficient ports.

TABLE 2.

DISTRIBUTION OF PORTS.

Name of the State	Total No. of ports declared open	Intermediate ports	Minor ports	Sub-ports	No. of working ports	Major port
Andhra	7	2	2	3	5	Visakhapatnam
West Bengal	..	..	..	..	..	Calcutta
Orissa	9	..	3	6	3	
Madras	48	5	11	32	25	Madras
Travancore-Cochin	9	1	1	7	6	Cochin
Sourashtra & Kutch	67	6	10	51	36	Kandla
Bombay	87	4	40	43	80	Bombay
	227	18	67	142	155	

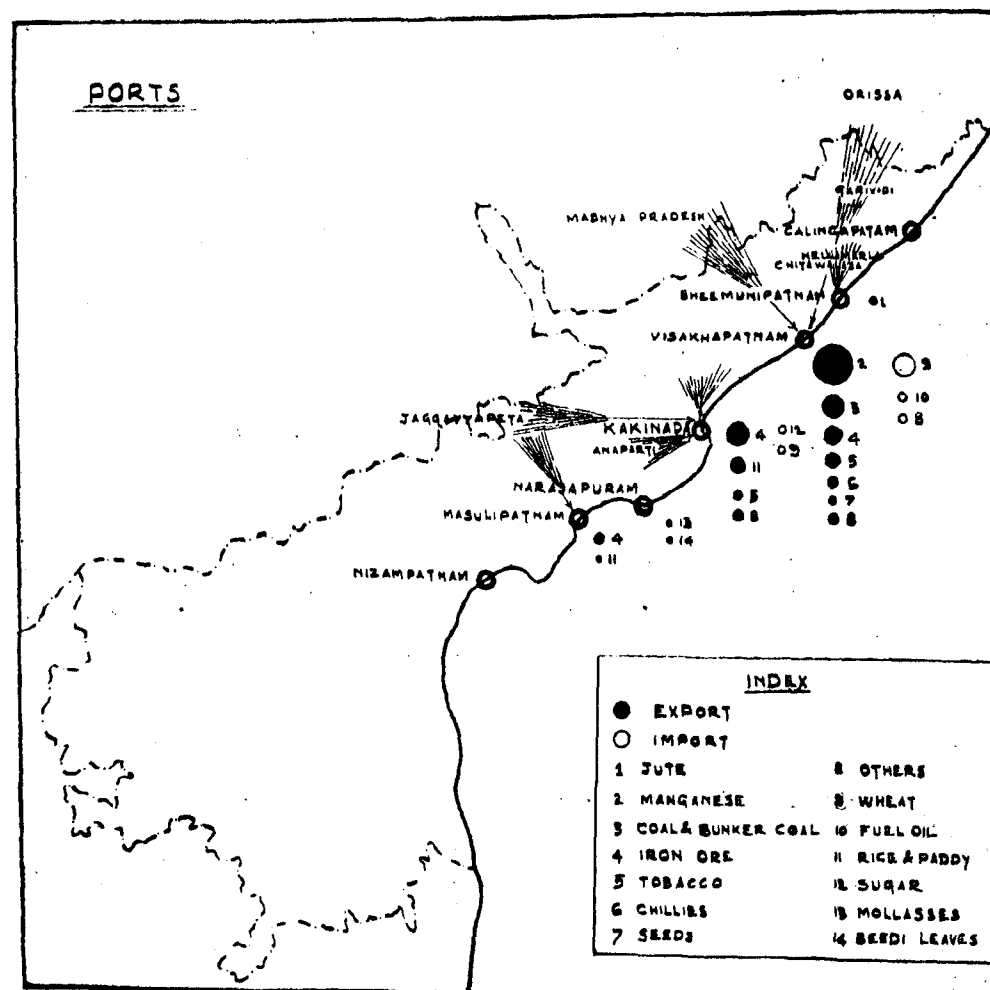
and harbours. There is the further advantage that the State can formulate a rational port policy, not subject to fissiparous political agitations demanding several diverse port developments. In other words, the effort of the Government can be concentrated on the few chosen places.

Thirdly, the port structure of Andhra is more favourable than that of West Bengal and Orissa. There are two intermediate ports in Andhra, Kakinada and Masulipatam, while there is none in the other two States. In fact West Bengal has practically no other port than Calcutta. In any scheme of port development it is necessary to have, besides a major port, certain intermediate ports which would be in the nature of the second line of commercial defence; and in their absence the gulf between the best conditions of shipping trade and the next best would be so wide that trade would gradually divert itself to an alternative mode of transport. Thus it may be concluded that the few ports and the port composition of Andhra are favourable points in the development of policy on ports and coastal trade.

2. PORTS.

Though any natural creek on the coast line could render it a harbour and enable boats to touch it, ports are more well-defined and, as they presuppose the provision of facilities for loading and unloading, embarkation and disembarkation, are naturally fewer in number. Administratively ports have to be distinguished from the other coastal spots, so that the ports alone may receive financial aids from some governmental authority, while being brought under some desirable system of public regulation. The complication of customs

makes the need for port definition even more significant. In India ports are classified into two kinds, major and minor. Apart from the largeness of trade characterising major ports, they may be understood as "ports which are directly under the Central Government"; and all the other ports "which are under the direct administrative control of State Governments go under the classifica-



tion of minor ports." These may be divided into intermediate, minor and subports. The data relating to the facilities available at the different ports of Andhra, as well as the number and tonnage of ships touching them are tabulated below. (See page 128)

Visakhapatnam is a natural harbour, the only one of its kind in India. On one side it is protected by a hill stretching into the sea, known as 'Dolphin's Nose'. Ten berths are available for ships coming in, though they are not all utilised equally well throughout the year.

The following figures indicate the traffic handled at the different ports and the number of ships touching them, foreign and coastal, for certain years covering the period between 1937-38 and 1953-54. (See page 129)

¹Report on the Survey of Minor Ports in India. 1952, p. 2.

PORT FACILITIES

Name of the port under classification	No. of ships touching		Tonnage of the ships		Port facilities
	1952-53	1953-54	1952-53	1953-54	
Major Port					
Visakhapatnam	606		21,76,165		Ten berths, wet Docks, Bundon & jetties, wharves, etc.
Intermediate Ports					
1. Kakinada—Vessels	123	123	99,392	3,15,913	Well protected roadstead in Kakinada Bay, the anchorage being 6 miles off shore. Jetties alongside Kakinada canal where loading and unloading is done. It has 3 dredges, 2 cranes, 1 tug, 21 launches, 49 lighters and barges, one small workshop—Ample privately owned godown—Godavary spit provides protection during cyclones.
Sailing	18	11	1,466	644	
2. Masulipatam Steamers	9	7	28,925	24,595	Open roadstead 5 miles off coast. Wharves at head of a tortuous creek. 1 hand crane, 1 small-launch, 20 privately owned lighters.
Minor or Sub-Ports					
1. Calingapatam	—	—	—	—	(Closed down in 1955 June) (Opened only in June 1955 instead of Nizampatnam)
2. Bheemunipatnam	3	7	10,109	22,231	
3. Yenam (Data not available)	—	—	—	—	
4. Narsapur Sailing vessels	6	7	688	709	
5. Nizampatnam	—	—	—	—	
6. Kandulera	—	—	—	—	

PORTS BUSINESS.

Name of the port	Year	Traffic			Shipping touching	
		Imports	Exports	Total	Foreign	Coastal (Ships & crafts)
1. Visakhapatnam	1952-53	1,52,550	10,47,740	12,00,290	476	98
2. Kakinada	1937-38	2,81,15,025	90,25,602	3,71,40,627	90	110+8
	1938-39	1,18,58,088	1,98,55,236	3,17,13,324	114	110+14
	1949-50	5,868	58,587	64,455	56	37+19
	1953	12,510	81,240	93,750	..	..
	1954	7,345	3,48,293	3,55,638	..	..
3. Masulipatam	1937-38	6,062	1,22,790	1,28,852	57	33+35
	1938-39	5,770	1,85,192	1,90,962	68	32+24
	1949-50	733	30,547	31,280	..	20+31
	1952-53	..	46,982	46,982	9	+8
	1953-54	..	46,823	46,823	7	+7
4. Calingapatnam	1937-38	955	19,040	19,995	12	105
	1938-39	356	18,500	18,856	9	104
	1949-50	..	2,340	2,340	..	1
	1952-53	..	..	..	..	..
5. Bheemunipatnam	1937-38	..	31,356	31,356	20	6
	1938-39	..	46,970	46,970	24	2
	1949-50	..	4,834	4,834	2	7
	1952-53	..	1,059	1,059	..	2
	1953-54	..	818	818	..	7
6. Narsapur	1952-53	..	210	210	6	64
7. Nizampatnam	1953-54	..	335	335	7	97
	1952-53	..	..	..	..	..
	1953-54	..	..	..	..	..

3. IMPORT-EXPORT RELATIONSHIP.

One of the outstanding inferences from these figures is that there is no balance between imports and exports at any port. It would be better to employ the words "incomings" and "outgoings", since they cover both coastal and foreign trade. The incomings were practically nil during the recent years at Masulipatam, Calingapatnam, Bheemlipatam, Narasapur and Nizampatnam. At Kakinada these were about 2% of the outgoings during 1953-54; and at the major port of Visakhapatnam the ratio was as 1:7. The reasons for the lack of balance between the two sides of trade are as follows:

(a) The supply potentialities of the Andhra ports are higher than the distribution potentialities, even considering that a good part of Madhya Pradesh offers itself as the hinterland of Visakhapatnam. As the exports are mainly in the nature of primary exports they seek the nearest port, as far as possible, in order to secure the greatest economy in the cost of transport; whereas the import requirements, which are ubiquitously spread over an area, have greater choice of port.

(b) There is yet little industry in the neighbourhood of the ports, requiring the import of raw materials. Tobacco, cotton and jute are the only raw materials needed and are transported to the industrial centres by rail. The transport of iron materials for the shipyard likewise takes place by rail, from Jamshedpur to Visakhapatnam. Only a part of the local requirements of the State are obtained by the coasters. Even the consumer goods enter the State by rail from the important centres of importation, namely, Madras, Bombay and Calcutta. And Madhya Pradesh, which uses Visakhapatnam for part of its export, needs it far less, if at all, for the sake of her imports. The latter are obtained through Bombay or Calcutta.

(c) Most of the main markets, in terms of population and purchasing power, lie far away from the major port of Visakhapatnam. The markets are essentially in Krishna and Guntur; and in respect of the further southern and south western districts Visakhapatnam compares poorly with the alternative of Madras. The markets in the immediate neighbourhood of Visakhapatnam are relatively poor—for example, Srikakulam, Visakhapatnam, parts of Orissa and Madhya Pradesh (which are on the verge of development just now.)

(d) It is uneconomical for shipping to distribute small-sized shipments at each of the ports from Masulipatam right up to Bheemunipatnam. Apart from this, the well-established import houses and wholesale traders located at Madras offer a strong temptation to the merchants of the Andhra towns to place bulk orders at Madras. Even though most mercantile houses of Andhra are located round about Vijayawada, Visakhapatnam, which is as distant as Madras, appears to be a poor rival to it. If the port of Masulipatam were a better and busier one, the case against Madras would have been real. Herein lies the most serious limitation on the expansion of the incoming trade at the ports of Andhra.

(e) In recent years, many kinds of imports have depended on the securing of permits and licences from the Union Government. Some regional offices which issue the permits are located at Madras. Importers naturally consider it an advantage to concentrate their whole range of activity at Madras where they must set up an office or arrange with some one else for procuring the required licences. As far as the system of licensing continues and the regional offices remain at Madras, the city offers a strong attraction to importers.

(f) All traffic diversions are dependent on the co-operation of shipping interests. If considerable quantities are bound for the ports of Andhra as a result of the diversions, ships would have an automatic attraction to touch them; but this is doubtful. As long as Andhra (and India itself) does not attain self-sufficiency in their shipping requirements this limitation is all the more real.

The above analysis is purposeful in that a greater balance between the incomings and the outgoings would make the ports more economical for the traffic using them. The handling capacity provided at the ports would be more fully utilised with the result that the overheads could be spread over a larger volume of traffic. Apart from the port dues being lower for this reason, the shipping freights may tend to be lower under conditions of a reasonable degree of import-export balance. At present ships come almost empty for taking in the outgoing traffic. If they could often enter the port with traffic to be unloaded, the freights on the outgoing traffic could be lowered. Whether we think in terms of foreign trade or of coastal trade, this would operate as an important stimulant to traffic. It is, therefore, in the broader interest of the State, if not the country as a whole, that the relationship between the outgoing and the incoming traffic should be improved in favour of the latter.

The position of Madras is at once different. During 1953-54 the incomings were more than thrice the outgoings, 1.57 million tons as against 0.47 millions. The diseconomy of an excess of incomings over outgoings is no smaller than that of the outgoings exceeding the incomings. The data of Madras should prompt us to enquire whether a part of the incoming trade relating to Andhra could be diverted from Madras to the Andhra Ports, such that the position of both Madras on the one side and the ports of Andhra on the other would improve simultaneously from an improved export-import relationship.

Let us examine this possibility with reference to facts. The imports from abroad were about one million tons in 1953-54, while the exports to foreign countries were about 400,000 tons. Most of the food grains and coal which came into Madras belong to the category of coastal trade. It is difficult to isolate the figures of trade meant for Andhra from the total import figures of Madras. The main (classified) items are as follows:

TABLE 5.
OTHER IMPORTS AT MADRAS.

	(000 tons)
Asphalt	18
Hardware	22
Machinery	19
Iron and steel manufactured	3
Railway stores	30
Papers, including old newspapers	24
Government stores	35
Hides and skins	13
Soda	12
Dyeing and tanning substances	14
Textiles	14
Metals	6
Chemicals	7
Cotton	4

The reasons for the large import of railway stores at Madras, meant for a wide system inclusive of Andhra, have not changed. The government stores may be imported at Madras or elsewhere at the option of the Andhra Government, in so far as its share of the import is concerned. However, there are two grounds against a diversion to the ports of Andhra: firstly, the Government Stationery Office is still at Madras and secondly, Madras is as well-placed with reference to Kurnool, the capital of Andhra, as any Andhra port is. Most part of the imports of hardware, machinery, hides and skins are meant for the needs of the residuary State; and the share of Andhra in the other imports like paper and textiles does not probably exceed a third or fourth of the total figures.

On the whole the share of Andhra in the imports of Madras may be estimated at no more than some 200,000 tons; and the divertible quantity should be still lower. This compares poorly with the excess of outgoings over incomings at Andhra ports totalling roughly a million tons. The conclusion is that while every possible diversion is welcome, it would not by itself radically improve the relationship between the outgoings and the incomings at the ports of Andhra. Other developments like the economic advancement of the Bhilai region in Madhya Pradesh and the steel plant area of Orissa, apart from the progress of the Srikakulam and Visakhapatnam districts, may be of help in this respect.

4. COASTAL TRADE.

There has been a gradual decline in the number of foreign-bound ships touching the ports of Andhra since the outbreak of the war. At the minor ports of Calingapatnam and Bheemunipatnam there was practically no foreign-bound vessel in the last two or three years; at Masulipatnam the number has declined from 68 in the last pre-war year (1939) to barely 7 in 1953-54; Kakinada continues to have a sizeable number of such ships still, though there has been a perceptible reduction during the last decade and a half; and Visakhapatnam is of course predominantly touched by foreign ships.

There has, therefore, been a gradual specialisation on the part of the smaller ports in coastal trade, while the major port of Visakhapatnam and the next one in importance, namely, Kakinada, have large foreign trade. Such specialisation is not uneconomical, subject to the comments made at the end of the chapter on Masulipatnam. The dissipation of foreign-bound vessels at all the ports raises the cost of organising the shipping facilities, apart from creating the problem of uncertainty of the required number of ships touching the respective ports at the required times.

It is interesting to find that Visakhapatnam handles the largest amount of coastal trade too. And most of this is on account of the needs of the other States rather than those of Andhra.

It follows that the coastal trade originating in or bound to Andhra is relatively low. In fact coastal trade on the East Coast is of minor importance in the all-India picture, for it is estimated that only about 5% of the Indian coastal shipping tonnage operates in the eastern waters. One reason for the paucity is probably the inadequacy of coastal tonnage. But the more important reason lies in the under-developed port facilities in Andhra (and in Orissa) and the competition of the parallel railway line.

It would be not only unwise but uneconomical in the long run to slip the natural advantage that Andhra has in its long coast line. As shipping is proverbially cheaper than railway transport, great benefits could accrue from this natural advantage. The fact that the coastal railway line is heavily congested, particularly round about Vijayawada and up to Visakhapatnam adds to the desirability, if not the urgency, of developing coastal trade in the area. Certain measures of augmenting railway capacity are now under consideration, for example, double tracking. It has to be kept in mind that such measures entail rigid and almost irrecoverable investments, which it would be safer to postpone, if possible, without harming the interests of trade movements. Improvements in coastal shipping would offer a valuable alternative, in so far as certain traffic movements are concerned, without implying a high degree of specificity in investments. Except for the improvements at ports, there is hardly any irrecoverable investment at all. The track is given by nature and the ships are the most mobile form that capital could take.

This is not a case against railway improvements at all. On the other hand, the suggestion is that the economic opportunities available in the sphere of coastal shipping should be utilised in full before rigid cost consequences of other transport developments are courted. When the latter become unpostponably necessary, the coastal shipping tonnage could be contracted without much difficulty, to give place to railway services.

At the level of policy the suggestion calls for co-ordination between the Union Government and the State Government as the former is in charge of railways (and the port of Visakhapatnam) while the latter is responsible for the minor ports. All developments in the field of coastal shipping depend on the State Government's action, whereas the success of such action is conditioned by the Union Government's railway decisions. As the two sides proceed with developmental policies in their respective fields, conflicts are bound to arise. It is therefore necessary to aim at a co-ordinated policy for rail and coastal transport. Andhra is one of the areas where the need for such policy is the most urgent. (The all-India Committee recently set up for this purpose is a step in the right direction.)

The chances of coastal trade at the ports of Kakinada and Narasapur would improve greatly from canal developments in the areas concerned. These would cheapen the interior communications supporting the ports. As the inland waterways are a State subject, a co-ordinated policy of canal and port development ought to be easy to evolve.

The role of coastal shipping would expand if private capital and initiative flow into that line rapidly. The Andhras are the least enterprising in this respect in the modern items. Now that the Government has adopted the policy of offering partial capital to private industrial floatations, coastal shipping may find some incentive to develop, if it is brought within the purview of that help. The possibilities of giving assistance to this new line of business under the State Aid to Industries Act may be explored into. In any case the development of coastal trade would depend, to no small extent, on the improvement of the terminal facilities at the ports, which call for outlays by the State Government.

In view of the recent reservation of coastal shipping for the Indian interests it should be possible for the Union Government, in consultation with the State Government, to direct some coasters to touch the ports of Andhra. However, this can only be a temporary method. In the long run the ports ought to offer sufficient traffic to attract the ships without the need for direction.

5. INDUSTRIAL BASIS OF PORTS.

As first step in the analysis of the traffic and the hinterland of the ports of Andhra, let us examine whether they are supported by any industrial fabric in their immediate neighbourhood. The concept is significant in that a local industrial basis would offer stable conditions of traffic, in that the productivity of the area as well as the purchasing power of the people is high. The following figures indicate the extent of industrial development in the taluks in which the ports are located.

TABLE 6.

NUMBER OF INDUSTRIAL WORKERS.

Visakhapatnam		Kakinada		Masulipatam	
Transport and		Sugar	836	Manufacture of	
Transport		Fibre works	467	scientific instru-	
equipment	3,930	Rice	406	ments	600
		Engineering	300		
		Tobacco	207	Rice mills	414
		Tile works	196		
		Coach building	129		
		Oil Mills	105		
		Brass vessels	104		
		Manufacture			
Total	3,930		2,750		1,014

The percentage of industrial workers at the ports to the aggregate number in the State is low, compared to certain other ports in the country. Calcutta, including Howrah, has 20% of the workers of West Bengal; Bombay, including the suburbs, contains about two-fifths of all workers of the State total; whereas the figures relating to Visakhapatnam, Kakinada, and Masulipatam are 5.5%, 3.8% and 1.4% respectively.

Thus the industrial basis of the Andhra ports is not significant. The figures in fact lend a more favourable impression than is the case in reality. On analysing the first five industries at Visakhapatnam-ship-building, jute, rice and miscellaneous foods, jute presses and personal services, we find that the export-import prospects are linked only with jute and jute presses. The other industries are of a purely local type. Of the first five industries of Kakinada, namely, sugar mills, cotton textiles, knitting, spinning and weaving mills, miscellaneous industries like tobacco and personal services, there is some prospect of traffic emanating from the sugar and tobacco factories. With regard to sugar at least there could be coastal trade, provided that the factory at Samalkot produces far beyond the local needs of consumption. There is little to say about the first five industries of Masulipatam, namely, rice mills, chemicals, personal services, printing and publishing, and textiles.

TABLE 7
TRAFFIC AT VISAKHAPATNAM PORT

Imports	1951-52 (tons)	1952-53 (tons)	1953-54 (tons)	Exports	1951-52 (tons)	1952-53 (tons)	1953-54 (tons)
Wheat	2,20,640	1,18,770		Manganese ore	6,20,330	6,78,366	
Fuel oil in bulk	21,380	14,360		Bunker coal	95,720	1,07,780	
Machinery & spare parts	4,010	4,340		Iron ore	..	54,370	
Gunnies	1,880	3,350		Tobacco including cigars	47,500	46,780	
Electric goods	3,970	2,940		Coal	66,900	34,700	
Asphalt, bitumen etc.	4	2,160		Chillies	1,870	28,840	
Iron and steel	1,440	1,330		Seeds other than grains	5,460	15,060	
Rice	1,470	380		Oils other than petrol	4,480	4,860	
Tea	1,560	240		Jaggery	1,080	3,220	
				Grams	150	2,470	
				Jute & hemp	28,280	2,245	
				Sugar	168	2,904	
				Military cargo	6	1,828	
				Bones & bone meal	1,460	1,138	
				Cashew nuts	..	1,290	

6. THE TRAFFIC OF PORTS.

The above discussion shows that the ports are characterised by 'primitive' hinterlands in the sense that their industrial basis is undeveloped. The traffic handled at Visakhapatnam in the last three years is as follows: (See page 135)

The imports do not need much comment, except that wheat is likely to be a declining import in the long run. The port is essentially a manganese port and exports, besides manganese, some bunker coal meant for ships using the other ports. The other important constituents of the outgoings are iron ore, tobacco, chillies and seeds.

It is now clear that the prosperity of the port depends essentially on Madhya Pradesh. The future seems to hold greater prospect for Visakhapatnam in view of the economic developments taking place in the area of Madhya Pradesh forming the hinterland of Visakhapatnam. This area is rich in timber, manganese and other minerals. Further the completion of the Hirakud project at Sambalpur and the two steel plants at Rourkela and Bhilai are sure to add to the traffic prospects of the Visakhapatnam port. The separation of the railway lines serving the whole of this area and their demarcation as the South Eastern Railway from August 1955 is of great significance in this connection. This railway would, in the natural course of managerial behaviour, be interested in enriching itself with as much traffic as possible; and wherever a maritime outlet is necessary the railway would first look to Visakhapatnam, which is already under its own management. If there is one railway system in India which can be described as serving a somewhat homogenous group of areas and which could gain from a homogeneously concerted rail-cum-port policy, it is the South Eastern Railway. It is no exaggeration to observe that the progress of this railway system is bound to constitute the strongest foundation of success for the port of Visakhapatnam.

Thus Visakhapatnam is destined to be a port more in all-India interest than for the immediate needs of Andhra. The future developments in the Andhra hinterlands of the port are not likely to make a spectacular addition to its business. If anything, the ferro-manganese plant would use up a part of the manganese that is otherwise exported. Likewise the proposed wagon-assembling plant at Visakhapatnam would make demands on railway transport but not on the services of the port.

There is, however, one development inside the Andhra hinterland of the port, which is likely to help in its prosperity. The Caltex Oil Refinery, the second of its kind in India, is located at Visakhapatnam. Most of the crude oil enters through the port of Visakhapatnam and the refined oil may likewise be carried by coasters to the other ports of India. Since the Refinery at Trombay could serve the purpose of the West Coast of India, the Caltex Oil Refinery may specially serve the needs of the east coast with great efficiency. Now it is possible that even West Bengal becomes an importing hinterland of Visakhapatnam. (These developments, however, depend upon the availability of the oil tankers among the coasters.) It would be preferable to encourage bulk movements by sea as these would be less expensive than by rail, considering that petrol is an important element of the costs of motor transport. Any step that would reduce the cost of petrol is therefore welcome from the broader standpoint.

The trade at Kakinada is mainly characterised by the export of iron ore, though the quantity has been fluctuating from year to year. These come from Jaggayapeta in Krishna district.

TABLE 8.

TRAFFIC AT KAKINADA PORT (TONS).

Imports	1953	1954	Exports	1953	1954
Sugar	..	4,100	Iron ore	42,320	2,46,100
Wheat	12,209	3,070	Rice & Paddy	10,460	39,690
Tiles	190	180	Tobacco	9,291	9,722
			Palmyrah fibre	5,750	5,530
			Crushed bones	3,040	2,120
			Turmeric	2,830	1,190

The future prospects of this port depend on the following factors:

(a) The iron ore exports may decline if the proposed iron works near Vijayawada materialises. In any case it may not be long before the present rate of exportation of iron ore is brought under stringent regulation by the Government.

(b) The coastal trade in certain heavy commodities like rice may be expanded, as also in sugar. But this may entail some diversion of traffic from the railway and would depend upon rail-cum-port policy.

(c) If the canals supporting Kakinada are improved, communications in the hinterland become more favourable to the port.

(d) The prospects of petrol coming in from Visakhapatnam.

The trade of Masulipatam is mainly related to the export of iron ore and to the coastal shipments of rice. Locationally the port is ideal; it would be impossible to revive the prosperity of the port without a good deal of deliberate encouragement by the State Government.

It may be an interesting digression to look back to the relative position of the ports of Andhra some fifty years ago. The value of import and export trade in 1903-04 is shown below:

TABLE 9.

RELATIVE POSITION OF PORTS.

Name of the Port	Imports (value in Rs.)	Exports (value in Rs.)
Calingapatnam	12,000	6,00,000
Bhimunipatnam	9,79,000	32,27,000
Visakhapatnam	5,00,000	17,00,000
Kakinada	38,73,000	1,87,32,000
Masulipatam	7,11,000	10,31,000
Nizampatnam	230	5,300

Kakinada was the most important port, with Bhimilipatam coming next, though at a great distance. Visakhapatnam was not very superior even to Masulipatam at the time.

There are two points of interest : one, that even fifty years ago the ports of Andhra were exporting rather than importing ports ; and second, that the conditions of transport and the primary industries of those days favoured Kakinada as against Visakhapatnam as the premier port of Andhra. The relative barrenness of the immediate hinterland of Visakhapatnam must have been a definite handicap to it.

7. DEMARCATION OF HINTERLANDS.

From the angle of policy it would be necessary to evolve some clarity on the following questions. (a) To what extent is each of the ports to serve the needs of foreign trade and to what extent should it look to coastal trade for its prosperity ? The answer naturally calls for an all-India outlook as well as consultations with the Union Government. (b) What are the hinterlands which each of the ports is expected to serve ? Here again co-ordination with railway policy and consultation with the neighbouring States would be a pre-requisite. It is possible that a certain area might constitute the hinterland of one port in respect of its coastal trade potentialities and for another port in respect of its foreign trade. (c) What is the extent of development on which public aids may be conferred at each of the ports, with a view to enabling them to discharge the aggregate foreign-cum-coastal transport needs of the areas supporting them ? Unmethodical developments would result in under-utilisation at certain ports, as at Masulipatam, and congestion at others, as at Visakhapatnam.

The demarcation of the hinterlands amongst the different ports is automatically carried out by the relevant economic forces and in a strictly *laissez faire* economy no external direction is necessary in this respect. But we are confronted with two new circumstances. On the one hand there is a considerable amount of deliberate planning (by the Government and the public authorities), which calls for some planning in respect of the ports, for the very success of the over-all plan. On the other hand, certain ports which ought to play a greater role in the future have declined so badly that a fresh lease of life has to be injected into them through external assistance.

The demarcation of the hinterlands among the ports in respect of the coastal trade is a matter of detail depending on the nature of transport connections with the ports concerned. It may be expected that uneconomic hauls would not be common in this field, as the specifications of port facilities are not so exacting as in the case of foreign trade. If the Government could, by some kind of direction or otherwise, create conditions for the regular touching of each port by a certain number of coasters, trade may then be left to find its right outlets.

Under such improved conditions it may be expected that the present anomaly of overlapping hinterlands may correct itself to some extent. For example, there would be no need for a part of the iron ores of Jaggayyapeta to go as far as Kakinada, without seeking the nearer port of Masulipatam. In the context of the three ports, Visakhapatnam, Kakinada, and Masulipatam, the prospects of competition in respect of the coastal traffic would be less between Visakhapatnam and Kakinada than between Kakinada and Masulipatam. In the former case the line of demarcation is set by the gap in the

stages of economic development characterising the neighbourhoods of the two ports. In the latter case the under-developed nature of Masulipatam may continue to add to the advantages of Kakinada even with regard to the traffic away from it.

It is with regard to the foreign trade that more careful choices are called for. The main question is : what exactly is the hinterland of Visakhapatnam vis-a-vis Calcutta, Bombay and Madras ? The lines of demarcation will not be the same in practice as those drawn on theoretical assumptions of distance. These have to be qualified by the railway alignments marking the respective areas. On grounds of distance Visakhapatnam could serve within the limits of Puri, Nagpur, Kazipet, and Vijayawada as against the ports of Calcutta, Bombay and Madras. But the peculiarities of the railway set-up reduce this area to some extent, particularly in the directions of Khazipet and Nagpur. Added to this, there are the great attractions, apart from inertia, offered by the more developed ports. In these circumstances it would be worthwhile for the Union Government, in collaboration with the State Governments to specify, though very approximately, the area expected to be served by Visakhapatnam. That would indicate the extent of improvements necessary at the port of Visakhapatnam. As the Union Government is in indirect charge of this port, it would be to its own advantage to be clear on this point and to wield the railway rate policy most appropriately.

In other words, the influences or traffic routing derived from the former practices and malpractices of railway rating must yield to a more economic policy of traffic movements. However automatic in the long run, these may call for deliberate government action in the early stages.

8. MASULIPATAM.

Port location in Andhra is somewhat peculiar, in the sense that the busiest port is in one corner of the State in the neighbourhood of an under-developed region, while the most productive area, namely, the Krishna and Guntur districts, is provided with an opening that is least used, namely, Masulipatam. South of Masulipatam, there is practically no port of importance till we reach Madras. It appears therefore, that there is a *prima facie* case for the development of Masulipatam. The following grounds may be adduced in support of it :

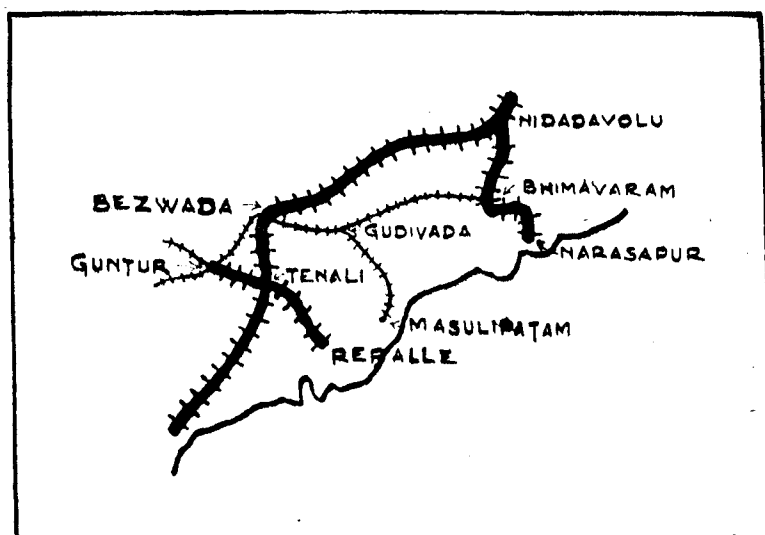
(a) It is centrally located in the Andhra area and serves particularly the ceded districts as well as the entire area south of it up to Madras. It agrees ideally with most parts of the ceded districts as it is the terminus of a trunk line on metre gauge traversing that area.

(b) The Nagarjunasagar project will usher in considerable prospects of agricultural and industrial development in an area, a part of which is already developed. The other part lying in the State of Hyderabad is potentially rich in several kinds of products. These areas would benefit greatly from an outlet nearby. It may be added that even otherwise the port of Masulipatam offers itself as the natural outlet for the south-eastern part of the State of Hyderabad, which is not maritime in itself.

(c) If the imports of Madras, belonging to Andhra, should be diverted to the ports of Andhra nearer their ultimate markets, Masulipatam offers itself as the best and most effective choice. No other port would offer any real advantage from such diversion.

(d) There is some social justification for its development in the fact that the town of Masulipatam has been a declining town in the recent times. The surest way of arresting this tendency is to improve the prosperity of the port, with its direct and indirect effects on consumer expenditures in the town proper.

We cannot, however, lose sight of certain serious limitations in its development. Finance is perhaps the least important in this connection. Firstly, Masulipatam can be of wider use, if it is provided with a broad gauge connection by rail. All the traffic that needs a transfer from the broad gauge lines serving the east coast of Andhra or the State of Hyderabad, is under a severe handicap. This must be removed if the port is to offer itself as an appropriate choice. It is, therefore, worthwhile investigating into the possibilities of connecting up Masulipatam by broad gauge with Nuzvid, or, alternatively, with Repalle. Perhaps the first one would be preferable because that would agree better with the traffic of Hyderabad. (See Map 2.)



The second difficulty is one of promoting the necessary enterprise at Masulipatam. The Government may explore into the possibilities of interesting the municipality in developing the port at least in the initial stages. (It would not be without reason to persuade neighbouring municipalities like Vijayavada, Guntur and Eluru to help in its development.) Municipal administration of ports is a popular method in America, though the limited finances of our municipalities would make it nearly an impossible method here. Under the circumstances of Masulipatam every quarter that may help in its development may be tapped.

Finally there are two serious limitations, namely, the hydrographic and climatic handicaps. Masulipatam is well-known for its vulnerability to cyclones. In fact the great cyclone of 1880 has given it a death blow. No development would be justified without a proper hydrographic survey. If the natural handicaps of the port could be overcome at reasonably low costs, it would be ideal to concentrate on the development of the port of Masulipatam.

HOW ARID IS AGRA?

By

SHYAM SUNDER BHATIA,
Panjab University College, New Delhi.

SUMMARY :

Aridity is commonly associated with low rainfall but actually it is caused when the rainfall is unable to meet the water requirement of evaporation and transpiration, together called evapotranspiration. Rainfall brings the water from the atmosphere to the earth's surface while evapotranspiration carries water from the earth's surface back to the atmosphere. The phenomenon of evapotranspiration is reverse of rainfall in the hydrologic cycle and it is only by a comparison of the two that we can determine whether or not a place is arid. The magnitude of aridity is given by an index which expresses the deficiency of water as a percentage of the water required to meet the needs of evapotranspiration. Use has been made of this concept to determine the nature and magnitude of aridity at Agra. It is found that the average annual water requirement of evapotranspiration at Agra is 137.8 cms. while the rainfall is only 67.7 cms. leaving a deficiency of 70.1 cms. The index of aridity for Agra is 50.1.

INTRODUCTION :

It is common to associate aridity with low rainfall but the latter is not a true indicator of aridity. Aridity signifies a deficiency of moisture and is caused when rainfall fails to meet the water requirements of evaporation and transpiration. The phenomena of evaporation and transpiration, together called evapotranspiration, are independent of rainfall and represent a process reverse to that of rainfall in the hydrological cycle. Evapotranspiration is the process by which water is transferred to the atmosphere from the surface of the earth. The rate at which evapotranspiration takes place depends, among other factors, upon the temperature of the air primarily. Temperature determines the capacity of the air to absorb moisture and thereby fixes the limit of maximum possible evapotranspiration, also called potential evapotranspiration. In other words, temperature determines the potential evapotranspiration which is a measure of the water need. When water need and rainfall of a place are compared, it is possible to know whether or not there is a deficiency of moisture. If the water need exceeds rainfall, there is a deficiency of moisture and the place is decidedly arid. The magnitude of aridity is indicated by an index which expresses the deficiency as a percentage of water need.

Now, rainfall can be measured by instruments but potential evapotranspiration cannot be measured because it represents water that would evaporate and transpire, if available. It has to be computed from temperature and in the present analysis, it has been computed according to Thornthwaite's method.¹

¹Thornthwaite, C.W. (1948) Geog. Rev. Vol. 38. Pp. 55-94.

WATER NEED AT AGRA :

The average annual water need at Agra is 137.8 Cms. but there are considerable variations from month to month. So great are the variations that the maximum need of a summer month is 23 times that of the minimum need in a winter month; the maximum need being in the month of June and the minimum need being in the month of January.

The water need in January is 0.9 cms. while it is 1.6 cms. during February; the need during the two winter months of January and February together being 1.8% of the annual water need. The need rises considerably during March, when it is 6.9 cms.; the need in the month of March being

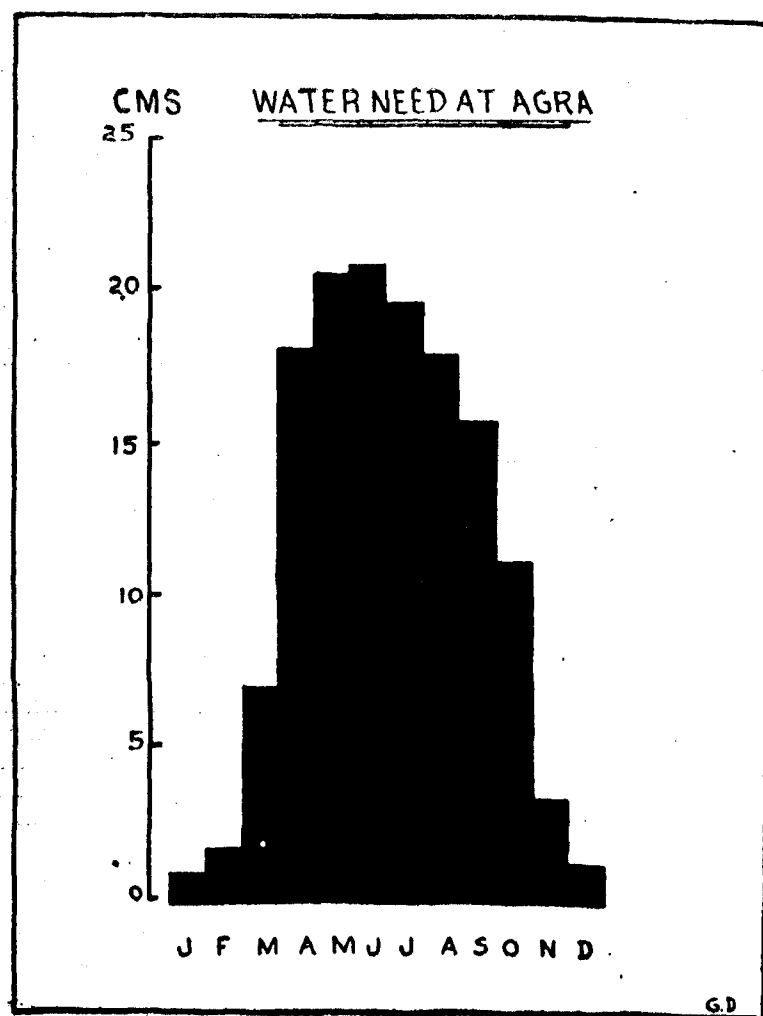


Fig. 1

more than six times the need in the month of February. The quick rise in water need during March is continued in April with increasing tempo and in the month of April, the water need is 2.6 times that of March, it being 18.2 cms. in the month of April.

The next three months (May to July) have the highest need in the year, with a peak in the month of June; the water need during this period being 44.3% of the year's total. The need slightly decreases during August and September though it is still quite high, being 17.8 cms. and 15.7 cms. respectively. During the half year from April to September, the water-need at Agra is over 80% of the annual water need. In October the need is still high but it rapidly decreases to 3.3 cms. in November and 1.2 cms. in December.

It is interesting to note that the water need during the period from November to February is only 7 cms. (about 5% of the annual) while in the month of June alone, the water need is 20.8 Cms. (15% of the year's total) i.e. the water need in June alone is three times the need during the four months period from November to February.

Water need at Agra is shown in Figure 1.

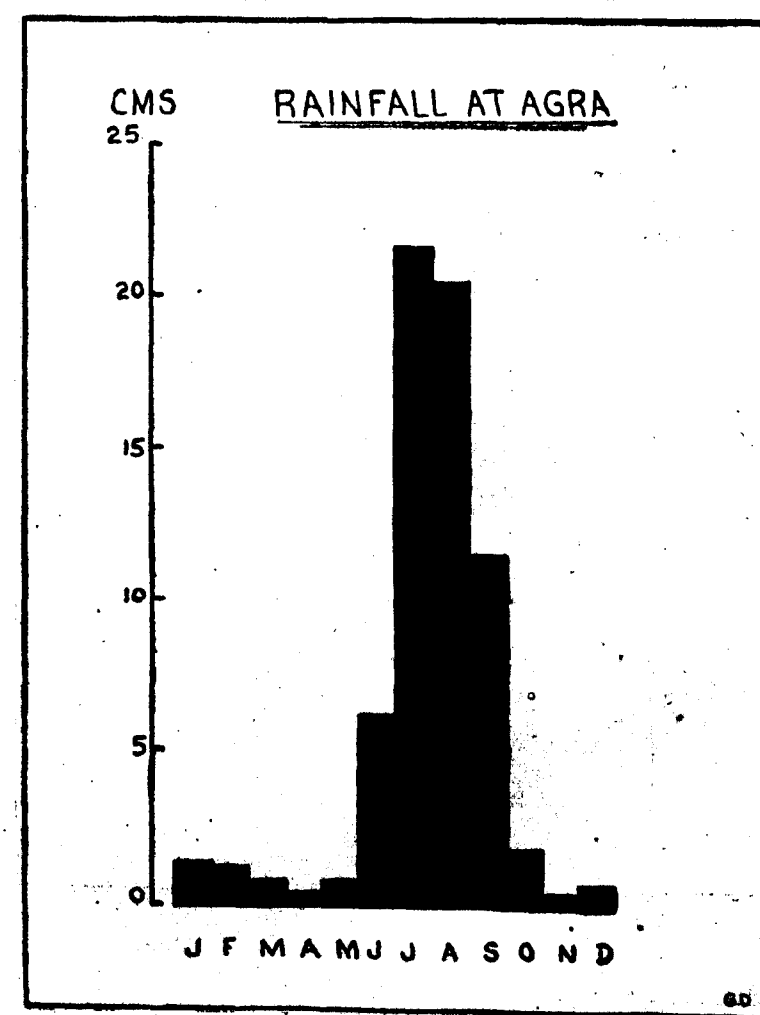


Fig. 2

RAINFALL AT AGRA

The average annual rainfall at Agra is 67.7 Cms. The rainfall is very unevenly distributed through the year and there are considerable variations from month to month; the rainfall of the wettest month being 72 times greater than that of the driest month of the year. The rainfall maximum occurs in the month of July with 21.7 cms., while the lowest amount is received in November which registers only 0.3 cms.

The rainfall at Agra is derived from two sources, viz. (a) the South-west monsoon, and (b) the Western disturbances. The amounts received from the two sources are very unequal and the total received from the Southwest monsoon during the period from June to September is about 18 times the amount

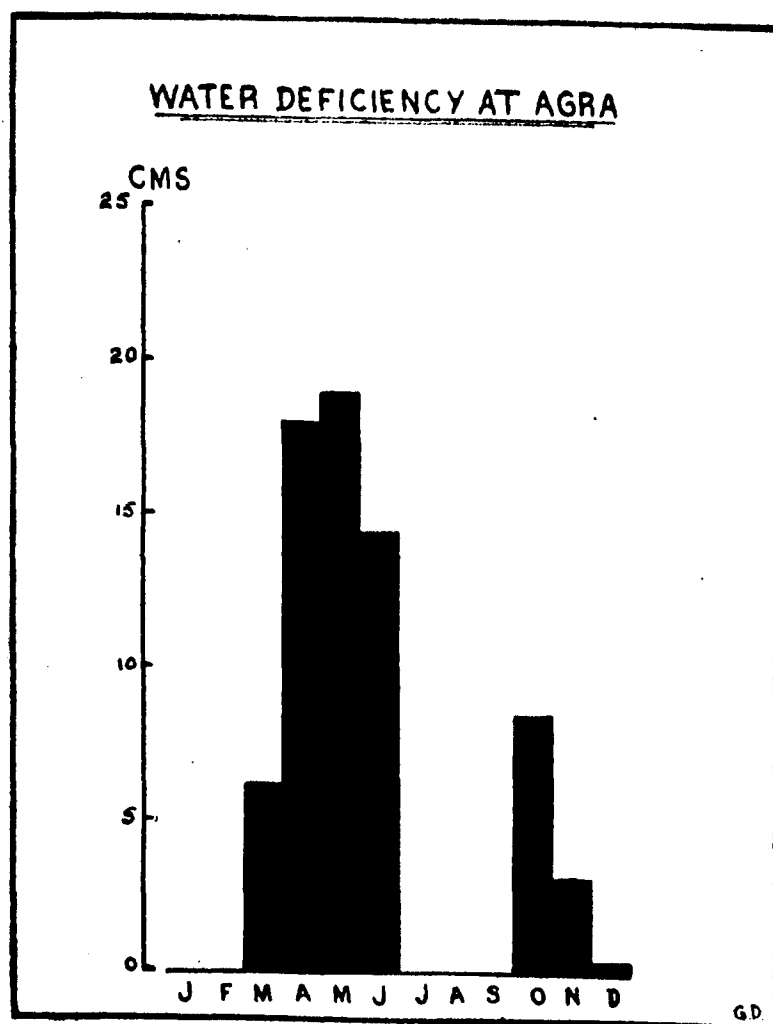


Fig. 3

received from Western disturbances during the period from December to February. The monsoon current arrives at Agra about the last week of June and retreats about the middle of September. As such, the rainy season at

Agra lasts from June to September, like most other parts of India and it is during this period that 88% of the year's total rainfall is received. The average rainfall in June is 6.2 cms. rising to 21.7 cms. in July and 20.6 cms. in August. With the retreat of monsoon in September, the rainfall decreases from 11.6 cms. in September to 1.8 cms. in October.

The Western disturbances give a small amount of rain at Agra in the winter season, when a dry season prevails over most parts of the country. During the period December to February, Agra receives a total of 3.3 cms. of rain, forming about 4.8% of the annual rainfall. The winter maximum of rainfall occurs in January which receives a meagre rainfall of 1.4 cms. followed by 1.2 cms. in February.

It is interesting to note that the meagre rainfall of 1.4 cms. in January is more effective than 6.2 cms. of rainfall in June. It is because in January the temperatures are at a minimum in the year, resulting in a very low water need while in June, maximum temperatures of the year are experienced resulting in a very high water need. The meagre January rainfall of 1.4 cms. gives 0.5 cms. for soil storage while 6.2 cms. of rain in June falls much short of the requirements of evapotranspiration of 20.8 cms., not to speak of any addition to the soil moisture.

Rainfall at Agra is shown in Figure 2.

ARIDITY AT AGRA :

A comparison of the water need and rainfall of Agra reveals that the rainfall exceeds the water need in only three months in a year viz. January, July and August. During the remaining nine months, the water need is in excess of the rainfall. Here it may be pointed out that an excess of rainfall over water need upto 10 cms. is retained in storage by the soil and any further excess flows away as run-off. The excess stored in the soil is evaporated or transpired when rainfall falls short of the water need.

The Table at the end shows that the small excess of rainfall over water need in January helps to ward off the deficiency in February. Similarly, the small excesses of July and August contribute to make up the deficiency in September. As such, two distinct periods of unequal water deficiency can be recognised; the deficiency in one period being 4.7 times the other. The two periods are: (i) a period of high water deficiency preceding the monsoons, and (ii) a period of low water deficiency following the monsoons. This may be seen in Figure 3. The period of high water deficiency lasts from March to June and corresponds to the hot weather season, when the temperatures are very high and the rainfall is scanty. During this period, there is a water deficiency of 58.0 cms. i.e. 82.7% of the year's total deficiency. The monthly maximum deficiency however occurs in the month of May when there is a deficiency to the extent of 28% of the annual water deficiency. The period of low water deficiency lasts from October to December and the total deficiency in this period is only 17.3% of the annual. During this period, the maximum deficiency occurs in October when the monsoons have completely retreated and the temperatures are still high.

Taking the year as a whole, the water need at Agra is 137.8 cms. while the rainfall is only 67.7 cms. leaving a deficiency of 70.1 cms. The water deficiency expressed as a percentage of the water need gives 50.1% as the index of aridity for Agra.

MOISTURE DATA FOR AGRA (In Cms.)

Item	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Yearly
Water need	0.9	1.6	6.9	18.2	20.6	20.8	19.6	17.8	15.7	11.2	3.3	1.2	137.8
Rainfall	1.4	1.2	0.8	0.5	0.9	6.2	21.7	20.6	11.6	1.8	0.3	0.7	67.7
Storage change	+0.5	-0.4	-0.1	0	0	0	+2.1	+2.8	-4.1	-0.8	0	0	..
Storage	0.5	0.1	0	0	0	0	2.1	4.9	0.8	0	0	0	..
Actual Evaporation	0.9	1.6	0.9	0.5	0.9	6.2	19.6	17.8	15.7	2.6	0.3	0.7	67.7
Water deficiency	0	0	6.0	17.7	19.7	14.6	0	0	0	8.6	3.0	0.5	70.1
Water surplus	0	0	0	0	0	0	0	0	0	0	0	0	0

INDIAN FISHERIES

By

K. H. BUSCHMANN, PH.D.

Indian Fisheries are still of comparatively minor importance in the economy of the country. There are, for instance, very few markets devoted exclusively to the sale of fish. The consumption of fish in India is generally low and only in Travancore-Cochin, West Bengal, and to some extent, Bombay Madras and Andhra does it reach significant proportions. India has five lakhs (500,000) of adult fishermen, but as the whole family generally takes part in the operations, the number of persons actually employed in fishing is much higher. The output per head is not great but in some places, especially on the West Coast, it is considerable.

MARKETING

Some of the fishermen do their own marketing. Their womenfolk carry the fish to the market and retail them there. The vast majority of the fishermen are dependent, however, on wholesale fish dealers. Here a local trader acts as a banker, i.e. at the beginning of the fishing season merchants enter into contracts with as many fishermen as possible undertaking to buy up their entire catches at definite fixed prices. These dealers advance the fishermen the money necessary for boats and nets. They also give the fishermen cash advances for incidental domestic expenditure, marriage, death etc. Some dealers own sailing vessels which they send out to sea to collect fish from the various fishermen with whom they have entered into contract and bring it to the landing site, leaving only a small amount of fish with the fishermen for their own consumption.

Sea fisheries are still more or less restricted to the 100-fathom line, since the craft employed are not, in fact, sea-going vessels. The coastlines of the West and East of India are about equal in length, but the area within the 100-fathom line is much less along the East Coast, perhaps no more than half of what it is on the West. This is one reason—another lies in the more effective gear and tackle used—why this coast accounts for four-fifths of the total marine catch of 500,000 to 600,000 tons. For the amount of fish caught in the different regions along the Indian coasts as well as the kinds of fish see map.

Inland fisheries have a comparatively high share in the total output—about one-third—which is all the more surprising when one considers how great a quantity is caught for home use by non-fishermen and therefore has no place in the statistics. The inland fisheries have the advantage of being much less affected by the dry or rainy seasons than the marine fisheries, which largely come to a standstill during the monsoons. Actually, inland, there is more fishing during the rainy than the dry seasons.

Many, especially those engaged in inland fishing, pursue it only as a subsidiary vocation, and on the Midnapore coast of West Bengal we have an example of people who indeed live ten miles inland and move to the coast for

fishing after having finished their winter operations in the fields, to return only when the monsoon sets in which renders fishing impossible and marks also the beginning of a busy agricultural season. Surprising for an outsider is the fact that all sizes of fish, however small, are caught and none spared. This migratory tendency is even more conspicuous in the Sunderbans, the Gangetic delta.

INGENIOUS DEVICES

Inland fishery of some kind is to be met with wherever there is a stretch of water. For fishing rivers, especially in the hills, which during the dry season have only a moderate and comparatively calm flow, special devices have been developed. For instance, the flow is held up with a small dam or weir, having only one opening at a certain height into which is fitted a basket trap with its narrow end sunk in the stream below, or a stone platform may be constructed beneath, covered round with stones. The fish coming downstream must necessarily fall into the basket or onto the stone platform, and the force of the running water and the weight of the other fish falling prevent them rising again.

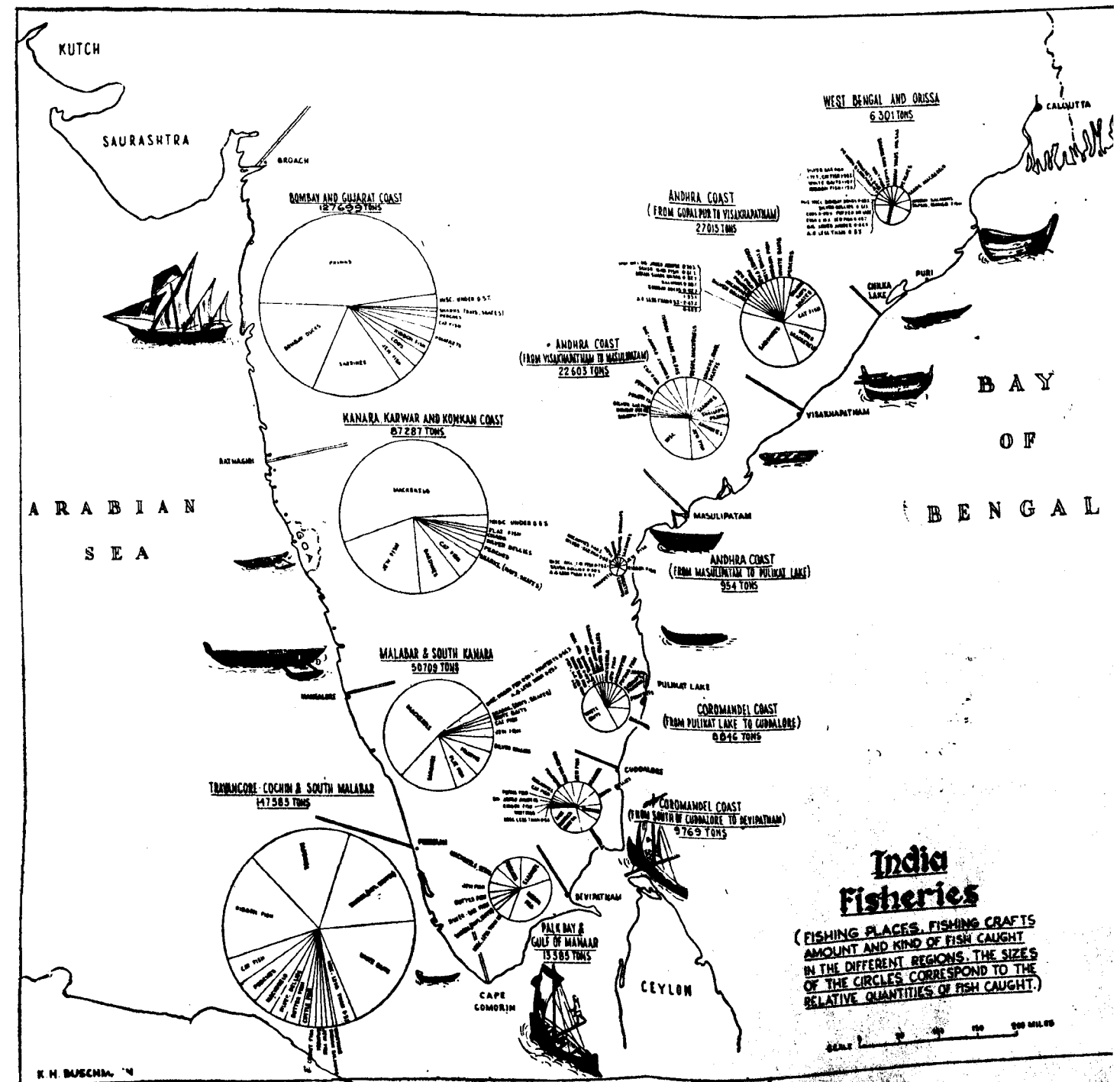
Where there is a river pursuing several courses during the rains, but only flowing in one bed during the dry season, nets are laid across a dry bed, the size of their meshes decreasing successively, and the water is then diverted into this and the fish caught. After some time the flow may again be reversed. Tanks, many canals and small, as well as some larger, rivers have water only during the monsoon and thus can only be fished in this season.

One method is more harmful than any other—poisoning. Being prohibited, it is less resorted to nowadays. A stretch of dammed-up or stagnant water is doctored with poisonous herbs, seeds, etc., the fish become stupefied, rise to the surface and can easily be caught with the hands. Likewise, I have observed people throwing clods of dark, non-poisonous earth into a stream and then catching the disturbed fish. They showed considerable skill in this.

Large is the variety of traps, stationary or otherwise, found throughout India. Only perhaps in the north-west are they less popular. They are fashioned of bamboo, or other material for making baskets and netting. Some are very simple and small, others impressively big, with inverted cones to make the entrance of the fish easy and their escape impossible. In the deltas of these various rivers and in the small channels of flooded rice-fields a number of traps may be observed, which catch often astonishingly small, indeed tiny fish. The use of traps is by no means confined to inland waters.

NETS

Nets may range from old bed sheets or saris to the bigger drift, cast, drag, and wall nets. Nets locally employed are, for example, the clap nets employed in the fishing of hilsa, when it swims up the river for spawning during the rainy season. The hilsa is at this time the fish supply of Bengal. The clap net has the shape of a big elliptical, or even rectangular, bag. The width varies from fifteen to two dozen feet and the length from twenty to three dozen, the size of the mesh being about two inches from knot to knot. The upper and lower jaws of the wide mouth are each attached to a bamboo pole which is bent outwards. The jaws are connected. The mouth, like that of a travelling bag or big purse, may be opened or closed as required.



In one variety, the lower bamboo of the mouth is firmly fixed to a long pole, which is led through the upper jaw by means of a ring. If a shoal of hilsa is sighted, the fisherman in a boat moving downstream presses the pole down and therewith the lower jaw of the mouth also. The mouth is now wide open and, as soon as one or more hilsa enter, the pole is suddenly lifted and the fish are caught. After emptying the net the operation is repeated. To reach greater depths, a long, strong rope is used instead of the pole. With this arrangement the lower jaw is weighted to keep it down.

THE KERALA DIP NET

Dip nets are restricted to Travancore-Cochin. They demand huge structures, fifty to sixty feet long. The nets work from a platform either on shore or in the water and reached by boat. At the end of this is the fulcrum, from which bamboo poles project towards the water, holding the net, which is kept extended by four bent poles, at each corner. Other long bamboo poles project from the fulcrum towards the land, and are weighted to ensure a proper balance to the net. A very long pole, finally, connects the ends of both projecting poles, passing from the 'net crane', where the net hangs down, to the end of the 'balance crane', where stone weights are attached. Such nets cannot be employed in shallow water.

Dip nets are used by day and night. At night often a powerful lamp is placed at the joint of the long bamboo poles projecting to the water, i.e., the net crane, and the four extending the net. If this is to be dipped, a stop holding the head of the balance crane is released, which allows the outer net crane to be dragged down, till completely submerged. After a certain time the procedure is reversed. By means of ropes tied to it the balance crane is drawn down and the net is thereby raised. Before it reaches its final height, the bottom is lifted by means of a rope and the fish are removed with small scoop nets.

Cast nets are operated from the banks of rivers, tanks, ponds and creeks, as well as from boats. They are called *pag* and *pagli* in Konkan, *yendi* or *kalibale* in Karnatak, *hath* or *mang jal* in Baroda, *khepla* or *bachari jal* in Bengal, to cite a few names and localities. The variety of names is often more baffling than that of the nets themselves. The cast net has its limitations in use, since it can only be profitably employed in shallow and clear waters, free from weeds and vegetation. All kinds of fish are caught with it. The mesh generally increases from half an inch square at the apex of the cone to one inch at its base. The weighted periphery has attached to it six to eight radial strings which meet at the top where they pass over into a thick hauling cord. Thrown, with an elegant movement, the net comes down as a perfect cone enclosing a certain area. When hauling, the radial strings close the net to form a deep circular pocket in which the fish are trapped.

In the *mang jal* of Baroda and *kattum vala* of Malabar the weighted periphery has a large number of short strings attached to it which are fastened at distances of about two and a half times their length. Thus a peripheral pocket is formed. The hauling rope attached to a central point at the apex is slowly drawn up after the net has been thrown, and the fish in the area gravitate into the peripheral pocket as the net is hauled.

• During the monsoon a peculiar method of drag-netting may be observed in the backwaters of Saurashtra. In order to make the greatest possible catch a straight fence consisting of several pieces of netting firmly tied together

end to end, each about two dozen feet long and twenty feet broad, is laid across a creek, and both ends of the composite net are firmly fastened to poles, one at either side near the bank.

At a suitable distance, a drag net consisting of the same netting with long ropes attached to the ends, is laid out, a thick rope holding it down. If the creek is narrow enough, the net is dragged from both sides of the bank, always with the current, since the fish have the habit of swimming against it. If the creek is too broad, *tindias*, dug-out canoes, are employed for the purpose. As soon as the drag net comes towards the fixed fence, both ends are drawn together and a ring is formed in such a manner that the fish are encircled and caught.

CURING

The methods of curing and preserving the fish along the Indian coasts are very similar throughout their length. There are only two ways, sun-drying with or without salting and wet curing. Sun-drying is more common along the eastern coast down to Point Calimere, from this point and up the western coast wet curing or a combination of both is more frequent.

Along the eastern coastal region of Bengal, Orissa and Andhra fishing is almost exclusively confined to daytime and the fish therefore are brought to the curing yards some time in the afternoon. Small fish, the size of the fish caught in this region is generally smaller than on the western coast, are gutted or left uncut and spread out on the sand, sometimes after having been salted beforehand. Medium sized fish are usually not cut into pieces as the large fish such as sharks or skates, but the flesh is always scored if it is fairly thick. Fish exceeding a length of four feet are usually slit from head to tail and deeply scored lengthwise in several places and salt is rubbed into the flesh.

The fish remain in salt for the night in round troughs of earthenware closed by inverting a second tub on it. In case the fish are too big, they are cut into pieces. The next morning they are put out to dry, wrapped up in mats and stored in shed for the night and spread out again the next day, this procedure is repeated until fish are dry; two days are usually sufficient.

Along the southern coast the curing is slightly different. The gutted larger fish, the back is entirely split and deeply scored by several longitudinal incisions, are removed to pits in the open air or under sheds, dug in the soil and lined with bricks and cement or with simple palmyra mats, these are three feet deep and three to four feet in diameter. In these pits the fish are placed in layers skin downwards, salt being rubbed into the flesh of each layer. The fish stay in the pit for one day and are then restacked in another pit. This procedure is repeated once or twice before they are laid out to dry in the sun until they are dry enough; during the night the fish are restacked in a pit.

Those fish along the upper part of the western coast meant for the Bombay market, as far as they cannot be delivered fresh, are salted in and repacked several times on the following days. For about a week afterwards the salted fish packed in layers are left undisturbed. This process is called 'wet curing'. After about a dozen days after having been caught, the heavy salting and pressure are considered to be sufficient to desiccate the tissues. The fish are then issued without any drying whatsoever, for the Bombay customers dislike dried fish.

HOOKS AND LINES

Besides nets and traps, hooks and lines are in use and different techniques have been developed. Across narrow gorges of mountain streamlets, a strong rope may be passed, held by a man on either side a depth of some five inches below the water. From this cord, hooks on short lines hang at regular intervals. Helpers drive the fish towards the line which is suddenly drawn up on both sides, so that those passing over it are pierced and taken.

At Mandapam, Ramnad coast, children or fishermen at leisure have a long line attached to a small "sailing vessel", formed out of two pieces of interconnected light wood, about seven to ten inches long, the 'sail' made from palmyra fronds. To the long line small strings are tied at regular intervals, each with a baited hook at the end. The small sailing device is allowed to drift out to sea. As soon as fish are caught the line is drawn in again. This operation is found along portions of the coast of Ramnad and other districts on a larger scale. Boats lay out long ropes with hooks and lines attached, the rope being kept floating.

Notable among the many devices for catching fish, in which the Indian fishermen and rural population show themselves so prolific, is *bush-fishing*. Flat stretches along ditches, irrigation canals, rivulets and rivers not exceeding a depth of three feet are fenced in with a wall or close hedge in which only a small opening is left. The enclosed area is then packed with all kinds of bushes and twigs and the fish from the deeper water come here for refuge.

At intervals ranging from a few days to a week or two, the aperture is closed and the bushes and twigs are thrown out, the fish being caught with scoop or cast nets. Sometimes the water itself is scooped out and the fish are left stranded and can easily be collected.

WALL NETS

When the depth of the water exceeds three feet, wall nets are used to encircle the area, or bamboo screens, with or without the use of bushes inside. A peculiar method of fishing is employed at certain places on the East Coast. At low tide a wall net is laid in a half circle on the shore and covered with sand. As soon as the tide is full, the net is raised with all speed, and kept in this position with a number of upright sticks, so barring the way seawards to the fish within the enclosure. When the tide subsides, the stranded fish are collected.

Similarly, during the dry season, when the sea is comparatively calm, at low tide, the people of the Andamans and more so of the Nikobar Islands place palmyra leaves, the lower ends weighted with stones, in a wide circle away from the shore at whose outer limit a basket trap is placed. As soon as the water rises, the palmyra leaves, whose tops are connected by thread, rise and form an apparently impenetrable fence. The fish within swim along seeking a way out, and are driven into the trap or into shallow water where they are speared. After about an hour, when the tide rises and the fish may escape over the fence, fishing is given up and resumed as the tide falls again.

Similar in use are the so-called 'scare lines' employed on parts of the Ramnad and Malabar coast. Here the ropes of a typical shore seine *ola vola* have attached to them bamboo leaves to 'scare' the fish into the bag. Likewise, on the Kayangulam lake about twenty-four miles north of Quilon, *veralis* are

employed—*verali* means "frightening". This device can only be employed in shallow water. Two men drag two ropes tied together, whose outer ends are generally fastened to a small boat in the water, thus forming a triangle with an open base. Palmyra leaves are attached to the ropes. The fish entering the triangle move towards the apex where they are caught in the mud by hand by the men sitting in the boat.

The use of spears is significant in some of the states, though the quantum obtained by this means is negligible. There are many types of spear in use, having either one or several points. The former are usually aimed at determinate fish and in some cases used as harpoons, while the latter are employed in clouded water, and are jabbed down in the hope of piercing passing fish.

Spearing in which great skill may be developed, is more successful during the cold season, when the fish are less active. In Assam I have seen spearing done at night by torchlight, the fish so attracted falling an easy prey.

In Travancore in places the *cross-bow*, an instrument which is still often seen at village fairs in Central Europe for shooting wooden 'birds' from high poles, is used though the skill displayed is far less than that of the Malabar fisherman.

FISHING CRAFTS.

The characteristic fishing boats of the Ganges and Bengal, the *dingis*, employed extensively for hilsa fishing, resemble in their generic features the larger freight boats. Peculiar to them are the comparatively low bow and high stern, giving the steersman a clear view. The mast, if any, is forward towards the bow, and the cabin, mostly absent with fishing craft, is just behind it.

Peculiar in form, also, are the coracles of the upper Tungabhadra and Kaveri (Cauvery) rivers. These are in chief employed as ferry boats, carrying several persons, but are also used for fishing mainly with cast nets. They are huge, flat baskets covered with hides to make them watertight. They resemble somewhat the *tigaris* of East Bengal—large earthenware pots, capacious enough to accommodate one person, which are not actually used for fishing but merely as a means of communication during the floods. In form more conical than the coracles, they are much smaller in size. More interesting even than the tackle used in inland fisheries is the great variety employed along the Indian coasts, and still more so the variety of craft.

MASULA

Along the open East Coast where a rough surf beats the shore, from Orissa to Point Calimere, Madras State, two types of boat predominate, each intended for a specific purpose: the catamarans consisting of a few logs tied together, and the big masula, named after Masulipatnam. It was here that the British first settled down in India.

In the year 1611 the British ship "Globe" under Captain Heppon touched Pulicat, Madras, the then chief port on the Coromandel Coast. The Dutch, however, had established already a factory here and built a fort and refused to allow the British to trade. A small agency was then established at the mouth of the Kistna or Krishna river, then the principal mart of that part of India. It was here that the British saw these peculiar fishing craft probably for the first time, and that is most probably the reason why the name

of the boat is connected with this locality. Twelve years later a factory was established and fortified at Armagon, a roadstead south of Masulipatnam and forty miles north of Pulicat. It was the first British fortification in India.

The 'masula' has a peculiarity in the fact that it is constructed without stiffening support within and without the help of iron nails. The planks, with dried palmyra leaves over the joints inside and out, are simply sewn together with coir. For all its size and apparent capacity the boat can load very little. In structure it is elastic enough not to be affected by the severe battering of the surf. It yields to pressure somewhat like a rubber ball, where a boat of strong but rigid build would be destroyed.

The masula is used for carrying the bulky shore seine, which cannot be accommodated on the small catamaran, to the calm water beyond the surf. As soon as the net is loaded, the craft is pushed out to the sea and rowed by men who sit crowded towards the bow. When seeing both the catamaran and the masula on the coast line one is surprised to discover that the catamaran is the sea-going vessel, going several miles out, while the masula, long and bulky, merely moves across the surf to lay shore seines.

The shore seine carrier consists of several connected portions. Chief of them is a bag having the form of a trapezoid, of very small mesh. This is twenty-four feet in length, one end, eighteen feet broad, being closed, while the other, half as broad, is open and connected with a wide conical hemp net, only eighteen feet long but sixty wide. On either side of this net a long coir rope is fastened. The end of one rope is left on the shore, while the other is brought back by the boat after the net has been laid. By these ropes, a dozen or so men on each draw the net in.

CATAMARAN.

"Katta maram" in Tamil means 'joined logs' and several types of catamaran may be distinguished, according to how many logs are used and how big these are.

It is south of the Krishna delta that this development of a simple float into a sea-going craft reaches its perfection. Of the main type there are several variations. It consists usually of five big, softwood logs, preferably bent, the best wood for which is obtained from Ceylon. They are tied together, narrowing towards the bow, where separate bow pieces are fitted, while the central logs project to form the stern. On the return from fishing operations, in which gill or drag nets are usually employed, the logs are untied and laid out for drying.

BALANCE BOARD CANOES.

As soon as we pass round Point Calimere into the Palk Strait, we are in another world. The boats used here are balance-board canoes. The masulas and catamarans disappear, the former only to be found again in a modified form, while the latter do not reappear till the southern part of the Gulf of Mannar is reached.

The Palk Strait and Bay boats of the so-called Muthupet type are usually plank canoes, thirty to forty feet long and three to six feet broad, with a crew of four to eight men. To give these sailing vessels more stability a long log is placed right athwart the middle of the boat, extending twelve feet on

either side. In addition to this a slide board ('kadapalakai') is used to prevent slipping. The boats usually leave the shore at 4 a.m., reach their destination at 5, stay for about two hours, trawl the nets and return with the catch. Particular fisher communities as a rule specialise in a particular kind of tackle.

As we go from the Palk Strait to the Gulf of Mannar, catamarans reappear, but they are of another design and do not attain significance till we reach the Tirunelveli (Tinnevely) coast, where the surf again is quite heavy. Here catamarans about twenty-two feet long—the so-called 'boat catamarans'—again dominate and at Cape Comerin they are the only craft in use. Boat catamarans consist of three logs only, the central one, which serves as a keel also, being of considerable dimensions, while the others are joined to its upper surface, thus forming a trough-like shape.

The northern part of the Gulf of Mannar is, however, really a region of smaller plank-built canoes, twenty feet long, three feet wide, and one and a half deep. When these have to go out a few miles, they are provided with outriggers and floats. A type of bigger plank canoe, about forty feet or more in length, six feet across, and four and a half deep, is typical of the Tuticorin region. But seasonal fishermen come up in these boats as far as Pamban island, whence the ferry leaves for Ceylon and where the famous Rameshwaram temple is situated. They settle here for certain periods, and their craft are far superior to those of the local fishermen.

"Tuticorin boats" are provided with a balance board, but unlike that of the Palk Strait boats it projects only to one side. The boats go out many miles in the evening to lay their gill nets, *vala valai*, made of fine cotton yarn of fairly big mesh, measuring almost four inches from knot to knot when fully extended. This *vala valai* is usually composed of about fifteen, sometimes twenty or twenty-five pieces, tied end to end. The whole net is two hundred or more feet in length, three dozen feet in breadth, and a thick cord with floats attached to it runs along the top, while the bottom is correspondingly weighted to form a kind of wall in the water after being shot.

It is indeed a picture of great beauty to see the whole fleet return in the early morning with their catch, at full speed, with full sails, the men standing on the extending boards (see sketch on map) to give balance, while the rays of the early morning sun are reflected from the glittering water. At Tuticorin itself these boats are not provided with balance boards.

NAKED DIVING.

Tuticorin is the centre of the pearl and chank fishery. Of these two the last is the more stable and undertaken every year, the pearls are fished this year (!) after an interval of over a quarter century. The fishing of pearl oysters as well as conch shells is done only by naked divers. The season for conch fishing begins late in November and ends in May with the arrival of the jelly fish.

It is very interesting and exciting to see the conch shell fishery done. There are about sixty boats, canoes employed. At seven o'clock in the morning most of the boats under an escort, the *parmandari*, sail out to one of the beds. In case the wind is unfavourable the boats are towed to motor launches and drawn out. There are several beds and only one of them is visited on one day. The decision which has to be visited is entirely left to the *parmandari*, the most experienced man in chank fishing.

Besides the local divers, many others from other coastal localities are attracted by the season. There are about six hundred and fifty divers in all of which less than two hundred and fifty are local. More than half of the divers are Muslims, just about one quarter Christians and Hindus constitute the smallest part with about one-fifth only. The 'foreign divers' are provided with accommodation by the Government, for the whole conch fishery is a Government affair, only a few beds outside the Tuticorin area are rented out to contractors, but their yield is comparatively low and unimportant.

The crew of each outgoing boat consists of fifteen men, the *samati* or owner of the boat and four *todais* who attend the ropes and ten divers. When the bed is reached the diver is let down by a rope to which a stone is attached, up to ten fathoms without any helping. As soon as he reaches the bottom, he leaves the stone and rope, these are pulled up again, and he tries to catch and collect as many conch shells as possible within the time he can stay down, usually one and a half minute. The diver has to search for the shells for they are buried in the mud. The divers themselves claim that they can stay up to five minutes under water, but this is not the case. But to stay down for more than two minutes, as many do, is already a fine achievement.

Occasionally it may happen that one diver is overestimating his ability with the result that he overstays his time. As soon as the boatmen see that something is going wrong, they hoist a black flag; rescue work is immediately undertaken and fishing stopped. Such incidents fortunately are very seldom.

If a man dies in action or is killed by a shark, compensation is given to his family. When the divers come up, they deliver their collections, rest for a few minutes while hanging on the poles which are placed athwart the boat for that purpose and dive down again. The largest catch of one diver in a single day amounted to 125 in the year 1953/54 and as many as 194 in 1952/53.

Sharks are the worst enemies of the divers. If a shark is observed in the sea a flag is hoisted on the boat seeing it. The very moment all work is stopped, the operation abandoned and the boats return. If a diver is hurt by a shark, a small donation is given and equally divided among Christians, Hindus and Muslims to perform religious ceremonies.

When the boats land again, at about 4 p.m., all chanks are delivered to the Government chank godown and are measured according to nature and size into four categories: full size, i.e., over two and a quarter inches in diameter, under size and wormed, and lastly small life chanks. The last are returned into the sea.

All chanks are taken from the divers, but they get paid at fixed rates according to number, for the undamaged full sized only, but these constitute by far the majority. One-sixth of the pay is kept back and is saved for the divers and paid out to them not before the end of the season. One million chanks is the general output of a year. In 1953/54: 899,494 full size chanks were fished, 83,790 under sized, 61,418 wormed, and 17,419 life chanks were returned to the sea. This year the number may be slightly less as the season commenced later than usual.

The chank fishery is a good income for the State as the State of Madras is able to sell the shells at a much higher price, about three times the rate paid to the diver and also realizes some amount for the undersized and damaged, i.e. worm-eaten conch shell.

There is perhaps one defect in the whole chank fishery and that is that the market is almost exclusively confined to Bengal. It is indeed curious that only here women have grown fond of chank ornaments and especially bangles, which play an important role for marriage ceremonies. A skilled home or cottage industry has developed on this raw material. A number of chanks are also used as blowing instruments, giving a deep sonorous sound, for temple services, or they are polished and ornamented with famous personalities, the national flag, gods and goddesses, known architectural achievements, animals, etc., and used as show pieces.

The habit of breaking chank bangles once a year which is still prevalent in rural areas, secures a lasting annual demand. There are, however, signs of tendencies in Bengal, especially in the urban areas to use bangles of other materials which are far cheaper than the comparatively expensive chank bangles. This may finally prove fatal for the conch fishing. For the time being, however, it is flourishing and the Government of Madras has no difficulty in selling the whole number of shells.

If one holds a chank with the apex facing to one, the opening, operculum, of the ordinary dextral type is on the left side. Once in a while, it happened last in 1948, a chank shell of the sinistral type, with the opening on the right side, is caught. This is considered to be a 'sacred chank' and fetches a very high price. The lucky diver is paid a sum worth a thousand chanks and a white flag is hoisted on the boat in question. Such a rare occasion is celebrated accordingly and a great feast is held.

In the same manner as the conch fishery the pearl fishery is undertaken. In comparison to the regular conch fishery the pearl fishery is characterised by its irregularity and uncertainty. There are long interim periods of no fishing, but none has yet been as long as the last one. Fishing is undertaken this year for the first time since as long ago as 1926 (!).

The home of the pearl oysters is in five to ten fathoms of water on the rocky stretches to be found on the narrow submerged shelf between the shore and the one hundred fathom line 'over-falls' in the Gulf of Mannar. (These patches of rock or *paars* are irregular and somewhat inconsistent in shape and are broken up by stretches of inimical sand.)

As the oysters are restricted to banks, pearl fishery is comparatively less dangerous than chank fishing, as the divers keep to the stone and rope with which they are let down and come up with it again. They thus remain in constant touch with the boat. This is possible as they have not so much to move about and around as they have while searching for chanks.

ON THE WEST COAST.

On the western coast, comparatively small, four-log catamarans predominate and are to be found as far north as Quilon, the upper limit for their contribution. Along the coastal stretch from Quilon to Cannanore the so-called 'odams' are met with—canoes made of mango or wild jack trees. They are seldom used with sails and then too these are small and ineffective. They do not therefore go far out to sea. The net used with them is generally, though not exclusively, the '*odam vala*' made of thin cotton thread with a mesh of about two and a half inches. The ends of the net are held each by one boat. These move first as far apart as the length will allow, then after some time, they meet, empty the net and begin the operation anew.

Most remarkable of all in the southern region of the western coast are the big dip nets extensively employed in the backwaters of Travancore-Cochin, mainly the latter. They are commonly called '*China vala*', which indicates that at some remote date they must have come from China, possibly introduced by the Portuguese. These majestic nets are found throughout the East, in Thailand and in the Philippines, for instance, where they are often employed from big floats. In India their distribution is conspicuously restricted to Cochin.

DUG OUT.

The Malabar Coast proper is the realm of the dug-out. This does not mean that dug-outs are not to be met with in other parts, but elsewhere they are usually smaller. The Malabar dug-out canoes are much superior to all others. Where the depth of the boat is insufficient, i.e., less than two feet, side planks of some six inches in depth are provided. Operating several kinds of boat seines, in pursuit of sardines and mackerel, these boats go a number of miles out to sea. Huge catches are made during the season.

RAMPANI BOATS.

At Karwar again we meet outrigger boats, with a float attached by two vertical poles running parallel to the side. The most conspicuous among them are the so-called 'rampani boats', which are to be met with as far south as Mangalore. These rampani boats are supposed to have been introduced by a Portuguese gentleman, Ramponi by name, specially constructed to take the huge rampani net, a shore seine and the largest of this kind of net to be found along the Indian coast.

This net is well suited to be employed along the sandy coastal stretches and is composed of about seventy-five pieces, each about thirty-six by eighteen feet big. At both ends of the composite net long and thick coir ropes are attached. While leaving the end of one of the ropes on the shore the net is laid out into the sea and the end of the other rope is brought ashore at a distance, then the net is hauled in by manual labour.

The boat itself measures a length of about ten fathoms, a breadth of about fifteen feet and a height of six feet. The lower portion is a dug-out, the upper portion consists of planks, sewn together. About a dozen people constitute the crew.

Along the Bombay coast the boats, *pattamars*, *machwas* and *hodies*, become statelier, big enough for many of them to have been mechanised recently. The *machwas* are characterised by a long projecting bow. They go many miles out to sea and to far-away fishing grounds and places along the coast. *Machwas* employ lateen sails on the main mast, which has a typical incline. Various nets are employed, suited to the conditions and to the fish intended to be caught.

STATIONARY OR STAKE NETS.

Remarkable in this region and more so along the Saurashtra coast are the big purse or bag shaped stationary or stake nets. They are usually made of hemp, the mesh which is 1.2 inches at the mouth diminishing gradually till at the end it is as tiny as a quarter of an inch. The fish caught are mainly Bombay duck, but many other varieties such as mullet and catfish are also caught.

Along the Gujerat coast these bag nets have their mouths kept wide open by ropes attached to a pair of big stakes, 125 feet long, driven into the muddy bottom of an estuary of the sea. The depth at which they may be used depends on the length of the stakes available. Along the Saurashtra coast these nets are employed in deeper waters, being mainly anchored to piles of stones forty-five feet apart. The mouth is kept open with two barrels used as floats. During the monsoon, fishing along the coast comes virtually to a standstill.

Saurashtra has been famous for its sailors and in times of unsettled government the coasts swarmed with pirates. These sea fishermen put boldly to sea and secure their fish by trawling. (They occasionally harpoon porpoises and let their boats be dragged by them. When the animal is exhausted it is secured to the side of the craft and its liver is taken out. The oil is employed as varnish to protect the sides and the bottom of the boat.)

THE INDIAN GEOGRAPHICAL JOURNAL

CONTENTS

VOLUME XXX — 1955

Nos. 1 & 2 — January — March and April — June

	PAGE
SOME NOTES ON THE REPRESENTATION OF THE DENSITY OF RURAL HABITATIONS	
—By Edgar Kant	1
A TWO YEARS' OBSERVATION OF THE ERRAKUPPAM RESER- VOIR, MADRAS	
—By S. V. Ganapathi	9
THERMAL SPRINGS OF INDIA	
—By S. Krishnaswamy	26
THE HYDROGRAPHY OF THE CAUVERY BASIN: ITS GEO- GRAPHICAL SIGNIFICANCE	
—By Dr. G. K. Ghorl	45
NOTES AND REVIEWS	51

No. 3. July — September

A STUDY OF JUTE CULTIVATION IN WEST BENGAL	
—By Bireswar Banerjee	65
SUKKUR AND ITS ENVIRONS—A GEOGRAPHICAL STUDY	
—By Akhtar Hussain Siddiqui	79
AGRICULTURAL PATTERNS OF DHARWAR DISTRICT	
—By L. Y. Kulkarni	88
THE DISTRIBUTION OF RAILWAY COMMUNICATION IN WESTERN INDIA	
—By V. S. Ganathan	95
ABOMINABLE SNOWMAN	
—By Rev. Swami Pranavananda	99

No. 4. October — December

SEMINAR ON POPULATION IN ASIA AND THE FAR EAST

—By Dr. George Kuriyan 185

A HISTORICAL GEOGRAPHY OF CHOTA NAGPUR

—By Pradyumna Prasad Karan 109

THE PORTS OF ANDHRA

—By Dr. V. V. Ramanadham and R. Krishnamurty .. 123

HOW ARID IS AGRA

—By Shyam Sunder Bhatia 141

INDIAN FISHERIES

—By Dr. K. H. Buschmann 147



1700-1125 51E
 1700-303-4

SELECTED LIST OF BOOKS IN STOCK

(Terms: 11 annas per shilling and Rs. 5 per dollar net,
postage or freight extra.)

COGGIN BROWN AND DEY : India's Mineral Wealth, new rev. ed. published in November 1955	Rs. 30-0-0
SPATE : India & Pakistan, 1954	65/-
SHARMA : Location of Industries in India, 3rd rev. ed. 1954	Rs. 10-8-0
DAYAL : Bihar in Maps, 1953	Rs. 5-12-0
CHATTERJEE : Bengal in Maps, 1953	Rs. 10-0-0
DESHPANDE : Western India, 1948	Rs. 8-0-0
SESHAGIRI : Bombay Karnataka, 1949	Rs. 2-0-0
PITHAWALA : An introduction to Kashmir, 1953	Rs. 12-0-0
THOMAS : India's Basic Industries, 1948	Rs. 16-0-0
Indian Geographical Society Silver Jubilee Volume, 1951	Rs. 15-0-0
KURIYAN : Geographical Analysis of the Hydro-electric power development in India, 1948	Rs. 3-0-0
THIRUNARANAN : Site and Situation of the Madras City	Re. 0-4-0
PRAKASA RAO : Atlas of Andhra Desa	Re. 1-8-0
STAMP : Asia-An Economic and Regional Geography, 1952	35/-
CRESSEY : How Strong is Russia, 1954	\$ 3.00
SPENCER : Asia, East by South, 1955	\$ 8.50
Atlas of France, Vols. 1 & 2 with cardboard cover one set	Rs. 177-14-0
RUSSEL SMITH AND OGDEN PHILIPS : North America, 1952	\$ 10.00
ROBEQUAIN : Malaya, Indonesia, Borneo and the Philippines, 1954	30/-
Diercke Welt Atlas, Georg Westermann Verlag.	30/-
CARTER : Land Forms and Life, 1950	6/6
DURY : Map Interpretation, 1952	15/-
SYLVESTER : Maps and Landscape, 1952	25/-
A set of 27 sheets of O. S. and Bartholomew to be used in connection with the above 3 books on Map Interpretation.	168/3
ALICE GARNET : Geographical Interpretation of Topographical Maps, Text 10/6, Maps 15/-	Rs. 3-0-0
BHATIA : Elementary Map Work,	25/-
MONKHOUSE & WILKINSON : Maps and Diagrams, 1952	21/-
AUSTIN MILLER : The Skin of the Earth, a practical Geography Course, 1953	9/-
DEBENHAM : Map making, 1954	2/6
STRAHLER : Exercises in Land Forms, 1952	30/-
MONKHOUSE : Principles of Physical Geography, 1954	17/6
LAKE : Physical Geography, 1955	26/-
WOODRIDGE AND MORGON : Physical Basis of Geography, 1954	12/6
CARSON : The Sea Around Us, 1953	18/-
SVERDRUP : Oceanography for Meteorologists, 1952	21/-
AUSTIN MILLER : Climatology, 1953	4/-
LE GROS CLARK : History of Primates, 1954	30/-
GOBLET : Political Geography and the World Map, 1955	12/6
STAMP : Intermediate Commercial Geography—Part 1, 1954	8/6
THATCHER : Economic Geography, 1952	8/6
CRONE : Maps and their Makers, 1953	12/6
CONO : Handbook for Geography teachers, 1955	56/6
CRESSEY : Land of 500 millions—A Geography of China, 1955	15/-
HUMLAR : Atlas of Economic Geography, 1955	

MAHALAKSHMI BOOK DEPOT

26, Nattu Subbaroya Mudali Street, Madras-4.

THE INDIAN GEOGRAPHICAL SOCIETY

1955

PRESIDENT :

DR. GEORGE KURIAN, B.A., B.Sc., Ph.D. (LOND.),
Professor of Geography, University of Madras.

VICE-PRESIDENTS :

DR. MISS A. R. IRAWATHY, B.A., (Hons.), B.E.D., PH.D. (LOND.),
Principal, Queen Mary's College, Madras-4.

MRS. R. RADHA, M.A., L.T.,
Queen Mary's College, Madras-4.

SRI A. TIRUMALAI AIYANGAR, B.A., L.T.,
Sir M. C. T. M. High School, Madras-7.

SRI G. NARAYANASWAMY AIYAR, M.A., L.T.,
Government Arts College, Coimbatore.

SRI C. RAJAGOPALAN, M.Sc.,
Dr. A. C. College, Karaikudi.

SECRETARY :

DR. V. L. S. PRAKASA RAO, M.A., D.Phil.,
Senior Lecturer in Geography, University of Madras.

ASST. SECRETARY :

MISS RUKMINI NAGANATHAN, M.A.,
Queen Mary's College, Madras-4.

TREASURER :

SRI M. P. RAJAGOPALAN, B.A., L.T.,
Sir M. C. T. M. High School, Madras-7.

EXECUTIVE COMMITTEE :

SRI S. V. GANAPATHY, B.A., M.Sc., A.R.I.C., (By the General Body).
MISS A. VASANTHA, M.A., (By the Council).

MEMBERS OF THE COUNCIL :

SRI P. G. DOWIE, M.A.,
 „ V. S. GANANATHAN, M.A., L.T., M.A., M.A.A.G.,
 „ K. V. SUNDARAM, B.SC., (Hons.),
 „ U. JAMAL MUHAMMAD, M.SC., L.T.,
 Miss B. D'SILVA, M.A.,
 „ A. VASANTHA, M.A.

[illegible]