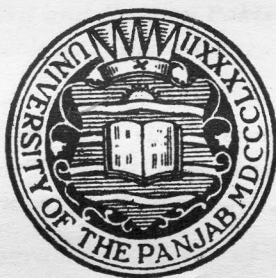


PAKISTAN GEOGRAPHICAL REVIEW



1952

VOL. VII

No. 2

ANNUAL SUBSCRIPTION

INLAND . . , Rs. 4/-

FOREIGN . . , Rs. 6/-

Contents

- | | Page |
|--|------|
| 1. <i>Possibilities of Reclaiming Swamps in Western and Eastern Pakistan</i> by Dr. Maneck B. Pithawalla | 58 |
| 2. <i>A Consideration of the Causes of Fluctuations in the Acreage of American Type Cotton in the Punjab (Pakistan)</i> by S. B. Whitehill | 70 |
| 3. <i>The Geographical Basis of Pakistan's Foreign Policy</i> by Fazlur R. Khan | 90 |
| 4. <i>Climatic Regions of East Pakistan</i> by Dr. Kazi S. Ahmad | 102 |

Editorial Board :

Prof. KAZI S. AHMAD .. Chairman
K. U. KUREISHY .. Editor & Manager
A. HAYE .. Associate Editor
Mrs. R. M. DURRANI .. " "

Contents

Page	
1	Possibilities of Reclaiming Swamps in Western and Eastern Pakistan by Dr. Monck B. Paterson .. 28
2	A Consideration of the Causes of Fluctuations in the Average of American Type Cotton in the Punjab (Pakistan) by S. H. Winters .. 70
3	The Geographical Basis of Pakistan's Foreign Policy by Iqbal B. Khan .. 90
4	Climatic Regions of East Pakistan by Dr. Kazi Ahmad .. 102

All communications to be addressed to the Manager
Geographical Review, Department of Geography
University of the Panjab, Lahore.

POSSIBILITIES OF RECLAIMING SWAMPS IN WESTERN AND EASTERN PAKISTAN

MANECK B. PITHAWALLA

With the tremendous growth of population all over Pakistan, the increasing demand of food grains and the pressing needs of rehabilitation of refugees, more and more land is expected to be brought under cultivation. In almost every province of the dominion, there is a very high percentage of wastelands, desert lands and swampy areas, which are required to be reclaimed and brought under the plough.

Kinds of Swamps.

Swamps are generally of three kinds :—

- (1) Those formed in coastal plains of former sea floors, now slightly uplifted as in the Netherlands, *the low countries*
- (2) Those formed in broad glaciated areas as in the Great Lakes Region of Canada and the Baltic plain,
- (3) Those formed in flood plains and deltaic regions with their basins formed by old river-channels and natural levees, as in Bharat and Pakistan.

Nature of Swamps in Pakistan.

Most of the Swamps, belonging to Pakistan, fall under the category 3. Only those portions of the coastland, forming Makran in Western Pakistan and Naokhali Chittagong in Eastern Pakistan can be said to belong to the category 2. But these are very minor areas. Most of the swampy areas in our country belong to the deltas of the two river systems, the Indus system and the Ganges-Brahmaputra system. These lands are never stabilised, as they are growing continuously due to the silt and sand deposits at every flood time.

A. Conditions in Western Pakistan.

The coastal swamps of Western Pakistan are restricted to (1) an extremely narrow strip of land on the Makran coast and (2) the Indus delta land, eternally growing at a rate of about 3 yds. per year. The former is only the shore-facies of the mainland, while the latter is a new land reclaimed from the sea, and absolutely flat, thousands of square miles, in extent even beyond Tatta, at times being covered up by the waters of the high-tide. Many of the outlets of

the Indus have become the inlets of the Arabian Sea, which is being over-powered by the great river.

This is a tropical Monsoon land, but as Sind is "Between the Two Monsoon" and escapes the influence of both, it hardly gets 7-8 inches of rainfall annually. Even this rainfall is irregular and variable and winter showers are scarce. Consequently, the delta is a dry-land and very little vegetation, in the form of mangroves, exists. Few palm trees can also grow under these conditions.

(i) **The Makran Coast.**

This is only a narrow strip of land, cut across by several dry-river-beds and having shallow bays and back-waters of the sea. It resembles the West coast of India, except in the matter of rainfall, which is hardly 3 inches for the whole year. Faulting has taken place but the coast-line is not broken so as to afford good natural harbours. It is most suitable for fishing and least for agriculture. Fresh water is a scarcity. Unless the drainage of the Baluchistan plateau is properly developed, there are no chances of making reliable ports on this coast.

(ii) **The Indus Delta.**

A great peculiarity of the Indus delta is that there have been frequent hydrographical changes. The Indus, an enormous river, 1,600 miles long, has no fixed course which has altered often since the days of Mohenjo Daro and even during historic times and it is still altering in the delta. The distributaries and the mouths have often changed, even the two present main discharging channels, the Ochito and the Haidari, in the delta, have had their directions, forms and sizes changed. There is no stable settlement, not even a village, in the delta land. There is no Rotterdam or Amsterdam possible here. The soil is highly plastic, there being considerable quantities of *silt* carried by the river from long distance, covering soft sedimentary rocks, while crossing the young Himalayan ranges at first, and the Tertiaries and post-Tertiaries of the lower reaches. This silt is deposited ultimately in the river mouths. Shah Bandar, Keti Bandar, Lari Bandar and Ghora Bari, erstwhile good river ports on the Sind coast, are no longer flourishing.

The port of Debal (Daibal), which was conquered by the Arabs, has not yet been finally discovered on the Sind Coast. Nor is there any trace of Patala, which was established by the Greeks at the head of the Indus delta in the 4th Century B.C. A study of the old maps of Sind enables us to discover that, while the Indus has westered in Sind (through a distance of about 30 miles) it has

eastered in the delta proper on the country. The result is that the eastern half of it is more swampy, marshy and boggy today than the western one. There are innumerable small and large channels, ox-bow lakes, cut-offs, etc., found in the former, while in latter area the land is more or less stabilising and more rice fields exist. But the soil is too soft and slippery due to the silt, and heavy floods are too frequent to allow any engineering works, like dikes, to be built on it safely. The poor cultivators, however, make good use of the mud and erect low mud-walls for enclosing some of the Indus inundation waters for irrigation and preventing any tidal waters from entering the fields. Fortunately here in this delta, the sea acts as a cushion for the river inundation and lifts up the fresh water into the pockets of the rice fields at high-tide. The mud-walls erected round the fields, actually act as small dikes. Thus, it is their cheap indigenous method of reclaiming the Indus delta-land and the swamps.)

B. Conditions in Eastern Pakistan.

The case of Eastern Pakistan is, again, different. Although Bengal consists almost entirely of the delta formed by the Ganges, the Brahmaputra and the Meghna, the eastern section is a land of very powerful and live rivers, while the western section is one of dead or dying rivers. A small replica of West Bengal exists just in the neighbourhood of East Bengal. Naturally, therefore, we expect more swampy areas in the Eastern Section than in the Western. At the same time, the sea has won mastery over the delta-land in the S. E. part of it and caused an estuary in the mouth of the Meghna, in conjunction with the Swatch of No Ground, in the N.E.-S.W. direction, in a kind of submarine canyon. The active or new delta is in this direction, with a fertilising silt, containing much humus and nitrogen, while the moribund old Ganges-delta, is in the west, with a low and flat alluvial plain, in which land-building is still continuous. Towards the south, the delta is greatly dissected by numerous channels and the soil does not contain enough organic matter and nitrogen to bear heavy crops, as in other areas. In fact, in East Bengal, different kinds of soils and texture are due to the sifting action of the river-waters and the different proportion of sand and silt, and hence the different types of crops, particularly the many varieties (as many as 500) of rice alone.

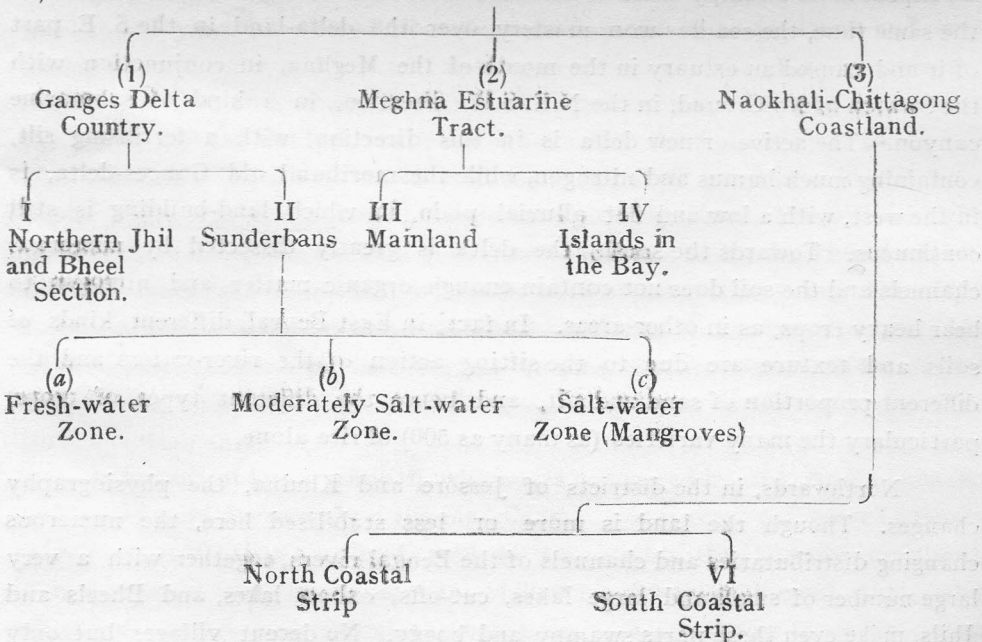
Northwards, in the districts of Jessore and Khulna, the physiography changes. Though the land is more or less stabilised here, the numerous changing distributaries and channels of the Bengal rivers, together with a very large number of small and large lakes, cut-offs, oxbow lakes, and Bheels and Jhils, make even these parts swampy and boggy. No decent villages but only

farm-houses can exist under these conditions, and they frequently get surrounded by water and turn into "islands".

Towards the south-east, there exists only a narrow strip of coastland, alongside the Chittagong Hill Tracts. Instead of aggradation, degradation is going on due to the enormous activity of the Meghna. Eastern Pakistan is a tropical monsoon land, through which the storm tracks pass, and the rainfall is heavy (100" inches average for the province) for nearly eight months, May to October, including the share from the retreating monsoon towards the end of the season, and the Nor-westers, from mid-March to mid-May. The rainfall increases as we go from east to west and from south to north. The averages are 156" at Cox's Bazar, 109" at Chittagong, 95" at Srimangal, 73" at Narayanganj and 67" at Bogra. The humidity is also high, ever 75% for most of the year, and the heat of summer is excessive, with the result that the area becomes extremely marshy and malarial. The Ganges, the Bramaputra and the Meghna river systems are enormously big and they bring tremendous quantities of silt and sand and drop them into the marshes.

Thus the coastland in Eastern Pakistan can be divided into definite parts from the point of view of physiography and with reference to the nature and extent of the swamps :

(i) TABLE SHOWING DIVISION OF EASTERN PAKISTAN COASTLAND



(ii) DIFFERENTIATION BETWEEN THE SECTIONS

In the first place, three distinct parts can be made of entire coastland in Eastern Pakistan, *viz.* (1) The Ganges Delta Country, which contains the celebrated Sunderban forests in the South, and the Jhil and Bheel areas in the north, which are now mostly cultivated land, (2) The Meghna Estuarine Tract, which includes the large and small islands off the coast, and (3). The Naokhali-Chittagong Coastland. These sections can be subdivided into two each, according to the nature of the soil, the type of natural vegetation growing and the use which the land is put to.

The reclamation work, if any, in connection with these sections and sub-sections will be different in all of them, as they will present certain facilities or difficulties in the process. At the same time, it is to be seen whether it would be advisable to reclaim the entire land or parts there of, under the present circumstances and in accordance with the economic evolution of Pakistan.

(1) Ganges Delta Swamps.

This is an area of nearly 2,700 square miles of mangrove and tidal forests, covering a large part of the Khulna district (Khepupura), east of the Madhumati river. The rivers included in it are all tidal, the whole getting covered up daily at high-tide, upto a distance of 50 to 60 miles northwards. The waters got drained again at low-tide through the numerous channels *viz.*, The Rainmangal, Sibsa, Pussur, Burishwar, Tetulia, Haringhate, Bhairab, Kabadak and Madhumati rivers. It is entirely a store-house of timber, too dense and too full of ferocious animals, including man-eaters and rhinoceros, for human beings to enter.

(I) The Jhil and Bheel Section.

This is a definite zone of more or less stable land, but with numerous water-logged areas, called Jhils and Bheels among the swamps found in Eastern Pakistan. Since they are expanses of water connected with the river systems and coastal lowlands, they are shown in this section. They are more inland than coastal. For instance, the Chalan Bheel, situated in the northern Doab (Rajshahi Distt.), was an enormous lake 400 sq. miles in area, but it is now reduced to 100 sq. miles after being gradually reclaimed. Other well-known Bheels are, Dakatia (Khulna Distt.) Madaripur (Faridpur Distt.) Holse, Kopcha, Arool and Julsee Beels. The Provincial Government have already started with a scheme of reclaiming them *e.g.* the Dakatia Bheel in Khulna during the

next dry season, at a cost of Rs. 3,88,000. It is divided into 12 reaches and the work will be carried out stage by stage under a definite plan.

The Bheels are the biggest towards the north and become gradually smaller as we go southwards. In fact, they are spread all over Bengal, as fresh-water lakes in the first instance. Jute grows in such *fresh-water* expanses, to an extent of 5 to 10%.

But there are Jhils and Beels in the Sundarban area also and are, therefore, invariably saline.

Formation of Jhils and Bheels.

Changes of level and changes in the hydrography are expected in Bengal, which lies in an earthquake zone, *viz.* the Assam (Dibrugarh) earthquakes. Again, since there is actually a mountain of forests resting on plastic clay and quick sand, in this area, there may be slow subsidence under gravity in certain weak spots, *e.g.* the large Beel in the 24 Parnaganas and north of Khulna upto Faridpur and Bakarganj. In these areas, they become excellent fishing ground and are a great economic asset of Pakistan.

In winter, generally, when the level of water goes down and the fringes of these lakes are cleared and by the time summer arrives, Boro rice crops are raised. This is another economic adventure in the Beels and Jhil areas to be kept in view.

II. The Sundarbans.

After partition, are found nearly 2/3 in Pakistan (area 1,573 sq. miles) and 1/3 in Bharat (area 743 sq. miles). These are generally divided into three zones ;

(a) *The fresh-water zone.*—From the Cobadak forest station to the mouth of the Khatka Khal. The silt deposited is fresh every-time and the best type of trees *viz.* (Sundri-beautiful), a gregarious shade-bearer having a heavy crop, Ganga (20% to 50%), Goren, Hantal and Pussur. The best Sundri tree grows on moderately moist land, well drained at each ebb-tide between dry land, on the banks of larger streams and the Beel areas, and free from weeds. In the river flood-plains, there is a frequent over-flow of water, and as the levels are flat, the rivers lose their carrying power and deposit the load. The ground at once becomes swampy, because the soil contains excess of moisture. Here the excess water stays on, as there is practically no thorough drainage, no percolation and not much evaporation.

In fact, these flood plains must be counted as parts of the river valleys subjected to over-bank floods and include the natural levees and low swampy slopes of thousands of acres.

The soil is generally saline, with white sodium chloride efflorescences. The wood is A class of fine red colour, tough and hard, and the tree stands 40 to 50 feet high with a girth of 3 to 4 ft. The growth is slow but the timber is good and suitable for making boats, carts, handles etc. The twigs and branches are used as fuel. The total yield is estimated to be nearly 25,000 tons per year.

(b) *The moderately salt water zone.*—Towards the sea-face and around moribund rivers. The water is less saline in rains than in the dry season. While the Sundri tree still persists in this zone, the Gangwa is predominant and the Goran has an under growth.

(c) *The Salt-water Zone.*—Having practically all sea-water, throughout the year. The soil is harder and the Beel areas are larger. The Gangwa persists here in company with the Goran and the Hantal. Small vegetation and scattered creepers, like Saticornia, grow in such salt marshes.

N.B.—In the Whole Sundarban area, the growth is such that there is no breathing space and owing to suffocation, the roots (pneumatophores) grow up in the air. Passage through such a vegetation is impossible.

The Mangrove Section.

Near the banks of the waterways a good deal of soft tidal-mud is deposited as they go under water at every tide and here the mangroves thrive. In mud—banks and flats, the rhizophoracea and other smaller trees take root, while the heritiera forest thrives in salt as well as fresh-water, in salt-water marshes and fresh-water marshes respectively. The area covered by mangroves alone, is nearly 500 sq. mile.

The mangroves are a substantial source of fuel in Eastern Pakistan. A great land-building activity is carried on here by nature. Any tract, reclaimed from the sea, has a tendency to be soon covered up with vegetation, forests of reeds etc., thriving in saline waters, are a constant menace to human occupation.

(2) The Meghna Estuarine Tract.

As we move towards the east, the Sundarban forest zone is greatly reduced in size. There is less and less vegetation, the soils become loamy,

mixed with sand, and become fertile. The rivers become most powerful; so does the sea and makes inroads into the south-east pocket actually causing an estuary in a large delta-land.

(iii) *The Bakarganj area*, in which there is 80% of arable land found and in which rice crops and betel nuts, are grown, is an unbroken plain, with a network of fresh-water streams, which become tidal. The north-west subsection is somewhat marshy, as a continuation of the Bheel area of the Faridpur district and only a small portion in the S.W. corner is a wood land. There are jungles here of grants and estates.

(iv) *The Islands off the Coast*, virtually belong to this section, as they are some parts of it eroded by sea into blocks of delta-land and dissected by the Ganges-Meghna distributaries. Millions of tons of sand and silt are deposited on these islands, called Chars. They are helped in the formation of island by the sand-bars, existing before their birth. The larger ones are called Bhola Shabazpur, Hatia and Sandwip. As they grow older, people inhabit them and grow rice, as is the case with Bhola. At least three years are required for such a deltaic island to stabilise and to become suitable for cultivation and occupation.

These and other islands, off the Bengal coast, can be contrasted with the zees of Holland.

(3) **The Noakhali-Chittagong Coastland.**

This is mostly an unbroken coast, belonging to the mainland with a distinct slope, and stretching from the Chittagong foothills to the Bay. Some deciduous trees are found but no mangroves. The whole area is, again, crossed generally east-west by strong and gushing rivers, though short in length, e.g. the Fenney, the Karnaphuli, the Sangre, and the Matamahari. In this respect, this coast resembles the West and East coasts of Bharat. There are a few islands also off the coast e.g. Kutubdia and Maiskhal which are quite different from the Chars, and are actually inhabited by the Chittagong people. They may also be coralline in character. Among the channels, into which the sea is making inroads, are, the Sandwip, the Karnaphuli, the Kutubdia and the Maiskhal channels, generally lying between the islands, and the mainland.

This coastal area can be subdivided into (v) the *North Coastal Strip*, which is broader, more or less connected with the Meghna estuary and the forested Chittagong hills and in which coconut trees grow (vi) the *South Coastal*

Strip, which is narrow and on which there is the full brunt of Monsoon with greater rainfall. This Chittagong area is definitely marshy and malarial.

The density of population is also greater here than in (v). Both these subsections are almost devoid of big marshes and are submitted to intensive rice cultivation. The soil, a heavy clay impregnated with salt, is called Mahina. Away from the coast it gets into sandy loam. It admits even of cultivation of sugarcane and bananas. There is hardly any cultivable wasteland, about 5% in this section.

A. Possibilities of Reclamation in Western Pakistan.

It has been shown that there are few chances of reclaiming land in the Indus delta on a scale in vogue in western countries. Bicides, a continuously growing delta is hardly of any value, vast areas of good earth in the valley proper still lying as waste land, which can be utilised with less labour and more profit by modern means than the coastal swamps. Even the desert land in the Thar area, below the contour of 250 feet, can be reclaimed at a cheaper rate, as in the Khairpur State, than the delta. Both the lower Sind and the Upper Sind Barrages are not yet constructed, but when they are ready, they will help irrigate millions of acres of cultivable land, which would yield not only rice in some parts but such good money crops as Sind and American cotton; and at the same time, there will hardly be any fresh-water left to be carried to the farthest parts of the delta land, so that even if this swampy area is reclaimed, there will not be enough water left to go to irrigate it. The point to be remembered here is that the rainfall being extremely scanty, irregular and variable in Sind, any reclamation, that is desired, should be made very continuously and integrated with the human requirements and the economy of the province.

How much of the inland as well as marine fishery would suffer as a result of swamps reclamation is also to be seen. The cry in Sind is not more food grains, like rice, but more oil and other fish products. Fishery on the Sind and Makran coasts is yet unexplored. The problem requires a simultaneous inquiry into this important aspect of our economy. The swamps of Las Bela and Makran are worth considering, e.g. Miani Hor, and the small deltaic parts of the main rivers, the Dasht the Hingol and the Porali. Draining of these areas is not impossible. But this part of Pakistan is extremely backward and neglected and the population is negligible. However, when the Baluchistan regional schemes, are carried out, the reclamation of these swamps will be automatically dealt with.

While dealing with the problem of swamp reclamation in Western Pakistan, we cannot lose sight of the enormous work we are called upon to do in regard to the water-logged areas in the Punjab and Sind, including the States of Bahawalpur and Khairpur. The causes of these artificially produced swamps, due to over-irrigation in un-suitable soils, are indeed different, and so the methods of their reclamation will be different. Draining them, for instance, would come under the purview of engineers, and in this connection the experiences of Holland may be profitably utilised.

B. Reclamation and its limitations in Eastern Pakistan.

Before considering the question of reclamation of swamps in these areas, it is necessary to refer to the complex nature of their economic structure. It is in these areas that we have the most vital parts of the forest resources (hardly 6% of the land area is so covered), some of the richest fishing grounds and the wildest of animal life of Pakistan and economy which we can ill afford to disturb or destroy at the present moment for the sake of getting more land for cultivation. Jute, the Golden Fibre of East Bengal, would rarely grow without swamps with knee-deep fresh water in them. Many a Bheel and Jhil will have to be left alone for this very reason. At the same time, Pakistan needs a planned programme for the industries, new and reliable harbours, grasslands for the cattle wealth, and, above all, fish and fish products.

(1) I—Northern Jhil and Bheel Section.

It has been already shown that natural reclamation has been taking place, though too slowly, in this Section. Older Bheels and Jhils are getting reduced in size, as the delta advances in its growth southwards, and even while they are in their present state, they have a certain peripheral area, suitable for cultivation during winter and early summer for Boro rice. In the Pabna district, for instance, there are found innumerable temporary huts built in swamps and villages, besides the fields, are small and greatly scattered.

It is, no doubt, worth considering how soon and safely several of these fresh-water lakes in the Ganges Delta Country can be reclaimed by modern methods. One solid advantage of this would be the malaria-control. At any rate, no great dikes are required here as in the Netherlands, and due to the low velocity of wind in Bengal, viz 3 to 5 m.p.h., there are few chances for windmills either. Tubewells can be used, if power is possible, for draining the Bheels and Jhils and the drained liquid can be thrown back into the river channels through artificially cut canals in between them. But motive power

is already a big problem in Eastern Pakistan and until the Multipurpose Karnaphuli Project fructifies, there will be no chance for economically draining and reclaiming the swampy parts in this Section.

(1) II—The Sundarbans Section.

Not only the physical difficulties of access into these mountains of forests, not only the plastic nature of the soil and the chaging character of the hydrography itself, but also the complexity of the economic side must compel us to pause and wait for better times. It has been pointed out already that as the delta grows more and more towards the south, the northern edges of the Sundarbans can be and are being cleared for cultivation.

The Forest Department is loathe to consider any scheme of deforestation or reclamation not only in the Sundarbans but also in other parts of the delta, rather they would create new forests for balancing the economy of the country. So also the fishery department will never agree that long stretches of the outlets of the rivers and the inlets of the sea should be so reclaimed, that the fishery resources are adversely affected. Protection of wild life, which too is so scarce in Pakistan, is another demand. It is to be investigated how far this balance between forestry, fishery, wild life and rice cultivation should be maintained. It is a problem worth inquiring into.

(2) III—The Bakarganj Strip of coast-land is not rich in Sundarban forests and cultivation has already been started here, where palm trees, bamboo trees and coconut trees grow well, adding to the economy of the State. Some of the marshy areas can be reclaimed on a small scale, by enclosing individual marshes by means of mud banks, and flooding them at high-tide. This would result in deposition of more and more mud within the enclosures. Such a process may be allowed to continue, until the land is built up to a desired height, when further entry of salt water is to be prevented. Afterwardeds, the rains of several seasons should wash out the salts in the soil and carry them into the drainage channels on lower levels. By such a effective drainage, vegetation would start growing and rice cultivation can follow. It would be cheap and reclamation, natural different from the method proposed by foreign engineers.

THE ISLANDS

(2) IV—The Islands.

Nature is also helping us in reclaiming the land on new-born islands, off the coast. On all mud-flats even a few scattered plants or creepers start growing without much difficulty, the soil being so rich in humus and nitrogen. Soon the

islands turn into grass land, with scattered betel-nut trees, and ultimately cultivation is secured by the people. In fact, this kind of Char cultivation is an ancient art in Bengal and under the present economic stress, It is doubtful if any expensive and upto date scientific methods of reclamation can be borrowed. A period of 3 to 5 years would be necessary for the stabilisation of these swamps e.g. Rabnabad islands and Donmanick islands.

(3) V & VI—Noakhali-Chittagong Coastland.

Except the entuarine areas, there are no real marshes or swams on this coast. The land is generally dry and fit for tilling. Any sand-bars or delta deposits that may be in the Karnaphuli, the Sangre and the Matamuhari rivers, are to be dredged and the harbour facilities are to be improved. In the actual improvement of Chittagong, which however is not a sea but a river port, there will be some scope for reclamation, for which the services of Dutch engineers, with their experience of this kind of work, will no doubt be needed. But that is a separate problem, for investigation.

N.B.—In the matter of reclomation of swamps, a new theory is advanced in Germany. A certain type of plants of the family of Sun-flower, having a tendency of sucking much water and transpiring it quickly and in large quantities, is introduced into swamps. The seeds are broadcast from the air and the vegetation is allowed to grow freely without hindrance. Such an experiment should be tried in the Bheel areas at first.

A CONSIDERATION OF THE CAUSES OF FLUCTUATIONS IN THE ACREAGE OF AMERICAN TYPE COTTON IN THE PUNJAB (PAKISTAN)

S. B. WHITEHILL

The acreages of American cotton sown within the area that is now known as Pakistan Punjab, have undergone, during the last 18 years considerable variations, and it is the object of this paper to consider the causes that lie behind these changes, and to deduce whether or not there are any factors that can be attributed to these variations throughout the period.

The method that will be employed in this brief consideration will be that of briefly reviewing each cotton season individually, pointing out the causes of the variations, and then a formulation of conclusions from this survey will be made. Historically the period under consideration divides itself into 4 sections (1) 1932 until 1939 *i.e.* end of the Depression until the Second World War. (2) 1940 to 1945 *i.e.* the period of the War. (3) 1946 to 1947. The interlude. (4) 1948 to 1950. Post Partition.

The first period, viewed from the aspect of the international position of cotton, was one of recovery after the crisis of Depression, only to be overshadowed in the latter years by the threat of World War. One of the prime features of the World economic crisis was the heavy fall in international trade, the volume in 1932 being only a little over one quarter that of 1929, and cotton, being one of the primary commodities, suffered accordingly. The Worlds textile industries had reduced their consumption considerably* and this in its turn caused prices to drop heavily†. The recovery after this world-wide

*Consumption of cotton in :—

Date	U S (1000 running bales).	Italy (Metric tons)	France (1000 bales of 478 lbs net)
1929	6106	229,364	1220
1930	5263	191,433	1168
1931	4866	173,254	941

† Course of prices 1929-1931

	Jan.	Feb.	Mar.	Apr.	May	June	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1929	8.5	8.5	8.7	8.3	7.7	7.8	7.6	7.8	8.1	7.9	7.6	7.5
1930	7.1	6.4	5.9	6.2	5.8	5.6	4.6	4.5	4.8	4.7	4.7	4.1
1931	4.1	4.8	4.9	4.5	4.2	3.9	4.2	3.6	3.5	3.9	4.5	4.7

Source. The Bombay Cotton Annual 1932-

Sources for*

World Cotton Production and Trade, International Institute of Agriculture, Rome 1936.

United States Department of Agriculture
 Associazione Cotonijia Italiana

crisis was at first slow, but between 1935 and 1937 the tempo quickened.

The dominating factor in the world's cotton trade was the United States cotton harvest. This was due to its preponderant size, and to the policy of the United States government towards that crop, for the world's cotton export trade always reacted to the expansion or contraction of cotton acreage sown in the United States. So dominant was the United States production in this period, that, if her production was high, and a large part was likely to be available for export, cotton prices would fall in all exporting countries. This period witnessed great efforts by the government of the United States, by means of its Agricultural Adjustment Acts, to curtail production within the United States, in order to maintain cotton prices at a reasonable level. But the weakness in this was that unless every cotton exporting country agreed to restrict its acreage, whenever the United States purposely reduced acreage, other producers would increase theirs. It was in this way that the percentage contributed by the United States in world cotton exports fell, while that of India, and resultantly the Punjab rose. The United Kingdom by increasing its imports from within the Empire, in accordance with the policy agreed to at Ottawa*, played a large part in this enlargement of India's cotton exports.

It was during this pre-war period that the quality of Punjab American cotton was being energetically improved, and it slowly established itself as a comparable cotton to U. S. Middling. At first it had to be mixed with U.S. cotton, but the proportion of mixing fell as the quality improved. A further important factor in this period was the expansion between 1932 and 1937 of Indian cotton mill consumption, which involved an increased consumption of Punjab American cotton, especially by Bombay Mills.

Against this general background each commercial season will now be considered.

Commercial Season 1932-33.—The acreage of American cotton in the Punjab† rose slightly compared to the previous season, the increase being 25,460 acres under irrigation and 47 acres in the unirrigated tracts. (The total unirrigated area sown to American cotton was barely .2% of the irrigated area) and yet this increase took place at a time when there was a general reduction in the acreage of cotton sown throughout the world, due to the fact that despite

*The Imperial Economic Conference was held in Ottawa in August 1932 at which the Ottawa Agreements were entered into bringing into existence Imperial Preference.

† Punjab will refer only to that area now lying within Pakistan and known to day as Pakistan Punjab, unless otherwise specified.

a reduced acreage sown in the previous season in the United States, its yield had been very high (See table I). This superimposed upon a world textile industry of reduced activity, brought about by the Depression, resulted in very low prices for U. S. cotton. But the prices for Punjab Desi kapas had been even less attractive than those offered for Punjab American in the 1930-31 season, being on an average Rs. 3 per maund lower. In September 1931 prices of all types of Indian cotton had recovered slightly when India went off the Gold Standard, in effect devaluing her currency, and the effects of this lasted into the sowing season of 1932, which was sufficient to influence the farmer in the Punjab.

The augmented Punjab American acreage was in fact absorbed by increased exports, particularly to the United Kingdom and Japan. The United Kingdom was one of the first textile producing countries to recover after the Crisis, and in pursuance of the then recently declared policy at the Ottawa Conference, there was a tendency to draw larger quantities of cotton from within the Empire, as well as the desire of the United Kingdom to make itself more independent of the American raw cotton market. Japan, with its peculiar industrial structure, which was adapted to the production of cotton goods for markets of low purchasing power, weathered the Depression best of all the industrial nations, and was able to absorb increased quantities of Punjab American cotton.

However, the Punjab farmer did not, nor does he to-day, try to forecast whether or not world cotton production will increase, and thus affect his future prices. In this respect he sees only the price that he obtained in the previous season, and if that has been good he will consider increasing his cotton acreage. Whether or not this is the only factor that he considers will be seen in the years to follow. Nevertheless, even if prices have been extremely attractive in the previous season, the additional acreage that can be sown under American type cotton is not unlimited. If American acreage is to be increased in unirrigated areas, it will call for very favourable climatic conditions at the time of sowing, which all too often does not occur, and these conditions must prevail throughout the season, American type being less hardy than the Desi varieties. Unirrigated American type cottons success is dictated by a far from reliable climate.

Nor is it possible to increase the acreage that is planted under cotton in the irrigated zones to an unlimited extent. In the first place, although the climatic factor has been minimised, it has not been eliminated by irrigation

farming, even with regard to sowing. Any shortage of canal water during April or May (*i.e.* due to the late snow melt) may have a detrimental effect upon the acreage that could be sown, as it would hamper the preparation of the land for sowing, or cause the seeds to fail in germinating. Furthermore a certain amount of cotton is sown immediately after wheat. Of this practice Sir William Roberts says* "Some cotton (also) follows wheat, though, this is known to be a bad practice, because there is very little time left for cultivation; the wheat is harvested in the latter half of April and cotton is sown by the end of May or the first half of June". Wheat sown land is rarely completely cleared until the beginning of May. It means that there is not sufficient time to fully prepare the land for American type cotton. Desi varieties can be sown later than the American types of cotton, and are therefore better suited to following wheat. In addition this practice is very exhausting upon the soil, unless quantities of fertiliser are used, and this is very rarely the case.

Usually American varieties of cotton are sown on lands which were previously sown under winter fodders, gram, toria, sugarcane or lying fallow. This would be a part of some form of rotational system. Secondly in each rectangle or square it is not advisable to sow in Kharif more than 7 or 8 acres under cotton, as the intensity of water issued to that land unit will be only sufficient to fill the needs of the cotton crop and perhaps an acre of some other crop such as fodder. To sow more means that the yield will be reduced, by having to literally "stretch" the water over a greater area. A farmer usually must sow some fodder in Kharif to feed his cattle, especially in the Canal Colonies, where the cattle are all stall fed. Fodder requires nearly twice as many irrigations as American cotton.† Therefore it is not possible to exceed the above mentioned limit of cotton acreage within a square or rectangle, with the existant water supply, when other crops, such as cane, maize, pulses and fodders have to be sown. Only by the breaking of virgin soils, through the extension of irrigation, can the upper limit of American type cotton acreage that could be sown, be increased. However this upper limit would only be approached in a year in which highly attractive prices had been prevailing. Therefore, although the total acreage of all types of cotton fell in the Punjab in 1932, due to the poor prices of the previous season, and as no other Kharif crop offered a more

* A Text Book of Punjab Agriculture—Sir William Roberts & S. B. S. Kartar Singh. Page 121.

†Number of watering includings Rauni—Cotton-8 Berseem 16 according to the Punjab Irrigation Research Institute.

attractive return, the acreage under Punjab American rose slightly, as it would bring a better return than the Desi type of cotton.

Commercial Season 1933-34—The acreage sown under Punjab American (sometimes termed Upland type) cotton again rose; that under irrigation by 31,121 acres and unirrigated by 1,243 acres. The climatic aspect of this season had been favourable, and all the canals were running satisfactorily. The prices received for the Upland type of cotton in the previous season had improved slightly, due to the increased export demand already noted. Of the crops that compete for the use of land in the Kharif, sugarcane had fallen, but the price of bajra and maize had risen in the previous season. It is to be found, therefore, that underlying the overall increase of acreage under Punjab American, there were in fact small reductions in its acreage in Shahpur, Gujrat, Lyallpur and Jhang, due to local demand for other crops. In Lyallpur and Jhang it was bajra and maize that increased in acreage. However the financial return per acre from these crops can rarely, if ever rival cotton in the majority of the Canal Colonies.

It was really but a small increment in area sown under American type cotton, after a season when no crop stood out as offering lucrative return. Though all commodity prices may be poor, the Punjab farmer is less affected by slump conditions in agriculture than many other cotton growing communities, as his pattern of cultivation is of necessity diverse. Thus he will always be able to produce for himself the bulk of his wants, and have some crop that is in local demand, which bring in some cash. He will not suffer the devastating financial ruin that befalls farmers in countries which are able to practice monocultivation of cotton.

Commercial season 1934-35—Punjab American cotton acreage continued its slow but steady increase, irrigated advancing by 30,313 acres, and unirrigated 1,986 acres. The prices in the previous season had been distinctly poor, even when compared to 1932-33, due to a combination of factors, including the devaluation of the United States dollar, an increased United States crop, the closure of Mills in Bombay caused by strikes, and the depressing effect on the prices of all types of Indian cotton during the period of the Japanese boycott of Indian short staple cotton. And yet it was in face of these low prices that the total acreage of Punjab American rose. In fact the price of all Kharif crops had been poor, cane being the only one to appreciate, and this was by a very small margin. It was a case once again of choosing the lesser evil and a number of Districts increased their American acreage in place of Desi, due to its

slightly higher price. One or two Districts registered a small fall in cotton, due once again to local demand for some other crops, such as in Shahpur maize and bajra acreage rose, while in Lyallpur the Desi cotton area increased.

Commercial Season 1935-36—The acreage of American variety of cotton sown in this season showed a marked rise as compared to the small increases of the past seasons. The irrigated area rose by 422,296 acres, and the unirrigated by 24,410 acres. The latter increase is in part a reflection of the favourable climatic conditions prevailing at sowing time in that season—note the particularly big increases in unirrigated area in Gujrat (915½) and Shahpur (7671).

But the climate is only an enabling factor. Price is the causal factor. The prices that were obtained in the previous season showed a marked improvement on past years, being about Rs. 7 per maund higher in January 1935 than in January 1934, and this led to an increased sowing of cotton in all Districts in the hope (or more likely the assumption) that prices would be maintained or even improve. The particularly large increases in Multan (108,420 acres) and Montgomery (140,058 acres) are also related to the full utilisation of new lands, that had been brought under the plough by the Sutlej Valley Canals, which had been coming into operation since 1933.

There were a number of contributory factors that caused the prices of Punjab American cotton to advance in the 1934-35 season. Indian cotton, which had always been quoted at a lower price in Liverpool to comparable United States cotton, rose much nearer to parity in consequence of the reduced quantity of United States cotton produced in that season, and a harvest factor in India working in favour of Indian prices. The passing of the Bankhead Cotton Control Act, (April 1934) in the United States, established a system whereby production quotas of cotton were now fixed by law. The Agricultural Adjustment Act of 1933 had resulted only in shrinking the area of cotton cultivated, whereas the new Act limited the actual production and cotton sales. It was in effect a price-raising policy, which was also to India's advantage. Added to this was the failure of the Broach crop, which pushed up the prices of Punjab American. Once again this serves to demonstrate the importance of the United States crop on the world raw cotton trade.

It is to be noted that the price of gur also rose, and remained higher throughout the previous season than in 1933-34, which would be an incentive to expanded acreage in the season under consideration and yet within the Province as a whole cane acreage fell, suggesting that cotton prices held the greater

attraction. The more so as canal water supplies had been adequate in all areas for the sowing of either cane or cotton.

Commercial Season 1936-37.—The area sown under American type cotton increased once again, although the increase was much less than that of the previous season. The irrigated American acreage had risen by 56,163 acres, whereas the unirrigated had fallen by 854 acres. The prices in the former part of the previous season had continued to be attractive, but a price decline started in the latter part of the season, due chiefly to the decision, in January of 1936 of the United States by the Supreme Court, that rendered a part of the Agricultural Adjustment Act invalid*. This caused confusion for a period in the world cotton market—fears of expanded U.S. acreage loomed up once again. However by April the market had steadied, and the prices for Punjab cotton showed an upward trend. Gur prices had fallen badly during the previous season, and cotton was therefore the crop offering the best potential return.

The sowing season had in most areas been favourable, aided by an early monsoon, and the supply of water in the canals had been quite adequate. The fall in the unirrigated area had been negligible, *i.e.* 854 acres, when compared to the total area of American cotton sown without irrigation, which was 86,592 acres. This small reduction was caused by local climatic differences. In Sheikhpura District the acreage of irrigated cotton sown fell by 7567 acres. This District had been suffering increasingly from waterlogging, and the area sown under rice, as a measure of Reclamation, rose by 26,962 acres, part of this increase being at the expense of cotton.

Commercial Season 1937-38.—The expansion of American type cotton acreage continued unabated, irrigated increase being 83,042 acres, whilst that in the unirrigated zones was 7,282 acres. Underlying this overall increase there were two areas which registered a small decline. Sheikhpura, where once again the Reclamation measures were responsible, and Shahpur, which showed a decline of 4% on the previous season.

The sowing season had been favourable in the areas where the majority of the unirrigated American cotton was normally sown—Gujrat, Gujranwala, Shahpur and Sheikhpura. Canal water supplies were satisfactory and it did but require attractive prices in the previous season for cotton, as cane prices had continued to be poor, and although some cereals had increased in price,

*In Jan. 1936 part of the original AAA was declared unconstitutional by the Supreme Court in the case of United States v. Butler.

the financial return per acre from them could not compete with cotton. The prices for cotton had shown a marked improvement in the first quarter of 1937, brought about by the growing rearmament in Europe, which led to a rise in all commodity prices ; a large consumption by U.S. cotton mills and estimates of a reduced all India cotton crop.

Commercial Season 1938-39.—The cotton market, and thus the prices of the previous season, were overshadowed by huge world cotton crops, particularly that of the United States ; a general uncertainty of the intention of the United States Congress with regard to the future restriction of cotton production, and the disturbed European political situation. A very large world supply of cotton was faced with an uncertain demand, in fact, a failure of the general business situation. The only counterbalance, so far as the Punjab crop was concerned, was its increased usage in home cotton mills. Gur prices had also fallen again in the latter part of the 1937-38 season, and, as a result the acreage sown to cane fell still further, despite the protection it was receiving against the sugar of other countries.*

And yet in face of this marked fall in prices, and the large drop in exports of Punjab American varieties, the overall American type acreage rose. That of the irrigated areas rose by 118,177 acres whilst the unirrigated acreage fell by 24,054 acres, due primarily to lack of rain at sowing time. Underlying this overall increase of irrigated area there were some contradictory trends. The acreage in Montgomery, Multan, Lyallpur, and Shahpur rose, whilst Gujrat, Jhang, Sheikhpura and Gujranwala declined. In those Districts where the irrigated area sown under American type increased, that under Desi variety fell markedly. It was in all probability a question of a choice of the crop that paid best amidst the general low prices that prevailed. In the Districts that showed a fall in American acreage, there was also a fall in the total irrigated sown, and at the same time small increases of crops in local demand, such as fodder.

Commercial Season 1939-40 and the Second World War.—The 1939 Kharif sowing was overlaid by a note of nervousness due to the impending shadow of war which was reflected in the continuous low prices that dominated the previous cotton season. And once again, to add fuel to the fire, was the

*The Government of India had since April 1932 imposed a Protective Duty upon imported sugar. However from 1934 onwards an excise duty on internal production was imposed.

continued uncertainty regarding the cotton policy of the United States government. Cane prices however had risen sharply in the previous season. The acreage of sugarcane does to some extent increase at the expense of cotton when gur prices are above normal, and cotton prices are below average. But if the prices of both are favourable, as was the case in 1936, cotton will show by far the greater increase, as it is less wearing on the soil, less labour demanding and it requires less water. It occupies the land for six months, whereas if cane is planted it means that the land is not available for any other crop for as long as fourteen months. Furthermore cane could not be sown after wheat, barley, or gram (if full yield is to be obtained) as it is planted in February or March. It will usually be sown after fallow or senji, the latter leaving little time for the copious preparations that must be made for cane. The decision, as to whether cane acreage is to be increased, has to be made at Rabi sowing in order that land will be available for it, *i.e.* not put under wheat, gram, or barley, whereas the decision about cotton acreage is not made until late spring.

Just as cotton acreage cannot be expanded within a rectangle beyond eight acres, similarly cane acreage cannot be expanded in irrigated areas above two acres with the existing intensity of water. Cane requires three or four times the quantity of water that cotton needs, and if more than two acres were sown no other Kharif crop could be sown, as the water intensity in the Canal Colonies will not permit it. Furthermore a marked change in acreage sown to a particular crop would have a dire effect upon any system of rotation. And the farmer never likes to put all his eggs in one basket, besides the fact that he must wait well into the Rabi season before any return is evident from sugar cane. The competitive power of sugar cane for land that might be put under cotton is thereby limited to those occasions when cotton has been very unremunerative, whereas cane has been most attractive, and then it is far from being an acre for acre exchange.

It was not surprising that American cotton as a whole decreased in 1939, and in the irrigated areas its place was taken to a certain extent by cane. The fall in irrigated American area was 117150 acres. The period between 1940 and 1945 inclusive will be considered as a whole for the trends here are dictated, whether directly or indirectly, by the War plus the ever present water factor. Out of the welter of events that affected Indian cotton as a whole, two

stand out in respect of the Punjab. Firstly Desi cotton acreage fell considerably during the War, in part due to the loss of its main markets,* but also to a campaign to grow more food which succeeded to a fair measure, due to the rising prices that were received for cereals and other food crops, including sugar. American acreage, after 1940, rose once more in response to a greatly expanded demand from Indian mills, which so far as the Punjab American crop was concerned largely replaced its reduced export market. The difference in price between Desi and American type widened very considerably between 1939 and 1945, which must in part be related to the improving quality of the American varieties. The expansion of cotton acreage (American type) was very noticeable in the Multan District during the war, this being facilitated by bringing under irrigated cultivation new lands in connection with the Haveli Project.

After the 1942-43 season the consumption of Punjab American cotton in Indian mills declined. The price trend was downwards from mid of 1943 until the latter part of 1945, with but occasional short lived recoveries. It is therefore not surprising that acreage reductions occurred in 1944 and 1945 as can be seen in table 5. The high prices being obtained for cane and food crops offered an attractive alternative to a cotton of diminishing price. There was a genuine need for food crops, which quite naturally led to these increased prices.

Commercial Season 1946-47.—The planted American type acreage fell once more, the irrigated by 26,167 acres and unirrigated by 5274 acres. This decline in cotton acreage continued in spite of the fact that cotton prices rose appreciably during 1945-46 and this upward trend had not stopped at sowing time. Already due to the War some European countries were short of Dollar exchange, and needing raw cotton for their still reviving textile industries looked for alternate sources to the U.S. Total Mill consumption in all India had declined in the past season, but its buying of Punjab American varieties had however increased. The United States crop in the previous three years had been smaller than any in the past fifty years, exports as a result being small, whilst at the same time U.S. mill consumption was running at a high level. All would suggest an excellent market for Punjab American, and the prices were already high.

*Particularly Japan.

The weather at sowing time had not been advantageous to sowing in unirrigated areas, and here the total sown area of all crops fell. In Montgomery the irrigated acreage fell due to insufficient canal water. Lyallpur, Jhang and Sheikhpura also registered a decrease in the area sown to American type under irrigation, as well as the total irrigated sown, but there is no report of their canals being short of water. In fact the Chenab Canal, which feeds Lyallpur, an area of decline, also fed Gujrat, where the irrigated area sown and that under American type cotton increased. The only common factor is that in those areas of decline there was a reduction in the total area sown, whilst Gujrat, Multan and Shahpur had an increase of total irrigated sown as well as of cotton.

Commercial Season 1947-48.—The Kharif of 1947 was sown at a time when Zamindars and tenants felt the shadow of impending communal disturbances and political upheaval. This caused the farmer to turn to the type of crop that required the minimum of labour and irrigation. In addition the supply of canal water in the Dipalpur, Mailsi and Pakpattan Canals was insufficient. The total area sown in Kharif and the total area under American variety decreased, this decrease in cotton being spread generally over all the important Upland type cotton growing areas.

Commercial Season 1948-49.—This season marked the beginning of a new era in the development of Upland cotton cultivation. The sub-continent had now become two separate economic units, and the importance of Punjab cotton to West Pakistan was far greater than it had been to undivided India. It was the primary commodity that West Pakistan had to offer in world trade. The seasons that follow have proved highly fortuitous to a new country which needs to sell its marketable commodities to the maximum, so that it can build up its balance of foreign exchange in order to buy capital goods.

The effects of Partition were noticeable as late as the Kharif of 1948. The refugees had as yet not settled down completely in their new lands. Many were not in a financial position to bring all their land into use, and many were unfamiliar with the practices of irrigation farming. There was therefore a fall in the total irrigated area, despite the satisfactory supply of water in all canals at sowing time. American cotton acreage decreased in every District, although prices had not been bad in the previous season. Oddly enough, in face of the contraction of total acreage sown, that of sugar cane increased slightly.

The prices of gur had been very high in the previous season, due to the restriction upon its import from India, and many of the refugees were more accustomed to cane cultivation than to Upland cotton. In some cases Desi acreage rose at the expense of American, in order to help meet the shortage of cloth by increased use of village hand looms. In general there was an overall decrease in American cotton acreage resulting directly, or indirectly, from Partition.

Commercial Season 1949-50.—The major consideration in the international cotton market in the previous season had been the growing dollar crisis. The industrial countries of West Europe and India were finding their reserves of dollar exchange to be running down too rapidly, and policies of buying within the sterling area were brought into effect. This meant that the increased U.S. crop that was available for export in the 1949-50 season, did not tend to lower world cotton prices, as a large percentage of her buyers, including India itself, were looking to non dollar sources such as Pakistan. The local *kapas* rate in the previous season had as a result improved markedly, and American acreage in the season under consideration rose by 86,895 acres. This increase was shared by all Colony District, except Shahpur and Sheikhpura, where there occurred a fall in the total area sown at Kharif.

Commercial Season 1950-51.—The 1949-50 season saw the dollar crisis reach its peak, and in the Autumn of 1949 there took place the devaluation of currency by the majority of countries within the sterling area relative to the dollar. Pakistan feeling that the demand for its major export items would be little affected by such action, did not devalue its currency. The effect of this revaluation on the world cotton trade was that prices in devalued areas tended to rise whilst in the undervalued areas there occurred a down trend. To the exporter and the government in an undervalued country this was not a loss, as the price in foreign currency had greatly appreciated at the moment of the devaluation. But to the farmer within Brazil or Pakistan it brought no direct benefit, and was in fact to his disadvantage. None the less Pakistan cotton continued to be in demand, as was all non dollar cotton. Thus after an initial price decline in post devaluation period in Pakistan, prices started to recover as a result of the firm demand from U.K., France and other West European countries.

The rise in acreage of Upland cotton in the Punjab was 73,417 acres in the irrigated tracts, and on unirrigated land it was 6705 acres. A new

factor had now come into force with regard to the sowing of Desi and American cotton, and this was the Cotton Control Act*, which prohibited the sowing of Desi varieties in certain areas in the Canal Colonies in order to stop the mixing of cotton in the fields and in ginning. This was a practice which had been having a serious effect upon the reputation of Punjab American varieties in foreign trade. This led to a sharp fall in Desi acreage, and in its place in the Canal Colonies there was an increase of American type of cotton—the latter would have occurred in any case, due to the attractive prices. The decrease of American cotton in Lyallpur was due to the floods in Jaranwala and Toba Tek Singh tehsils, where fields were washed away.

Throughout the paper the figures illustrating changes in cotton acreage within the Province have been absolute figures. However when the cotton acreage (American variety) is considered as a percentage of the total acreage sown in Kharif, the trend, expressed as a percentage, displays a similar pattern to that of the absolute acreage fluctuations, except in 1947. This particular year being overlaid by the shadow of communal disturbances.

Conclusion.—The fluctuations in cotton acreage are primarily brought about, other than when due to the effects of communal disturbances or war, by the price of cotton in the preceding season. To say that it is the result of an interplay between the prices of cotton, and other Kharif crops is only true under a certain circumstance. This circumstance is that of low cotton price and a most attractive price for cane, or on very rare occasion some other food crop or fodder. It is of no moment if the price of cane, or the price of mutton or ghee (which would in turn affect fodder price) were high, if at the same time cotton prices are not below average. The supply of canal water, or the rainfall in the barani areas are only secondary to the cotton prices as they are but concerned with the implementation of a decision based upon price. The reliance upon canals does, however, place an upper limit upon the expansion of irrigated cotton acreage in a season, as only a proportion of each square can be sown in Kharif, due to the system of allotment of the available water. Only a new irrigation project, such as Thal or the Toonsa Project, can

*Punjab Cotton Control Act. The main provisions of this Act are as follows (1) Only specified varieties of cotton are permitted to be grown in particular areas. (2) Only certified seeds can be sown in the area under this provision. (3) Mixing of two or more varieties of cotton in the ginning stage is prohibited. (4) It prohibited the growing of Desi varieties in areas designated for the Upland or improved strains i.e. majority of the Canal Colonies.

facilitate any very heavy increase in cotton acreage in a district. All the more decisive a factor is the rainfall, or lack of it, in barani areas.

It is, however, a dangerous assumption to make, that because the price of cotton was high in the past season it will be so in the ensuing season. All too often all the world's producers will respond to good prices by enlarged acreage, unless in any specific case forbidden by national legislation *i.e.* United States, and ; unless a crop or crops fail, a big drop in price will occur. Consumption in the mills of the textile producing nations might decline with a similar effect. A wise Punjab farmer should try to foresee, by some study of the general world cotton situation, what his attitude should be towards increasing, maintaining or reducing his acreage under American type cotton. But the majority of the farmers in the Punjab are in no position to do this, as opposed to the cotton farmer in the States. A hit or miss policy is unwise for a farmer who cultivates commercial crops.

It is to be noted that the general level of cotton prices alters from time to time, the new average usually being at a higher level. These changes in the general price level are closely related to the changing purchasing power of money and the resultant variations in the cost of living.

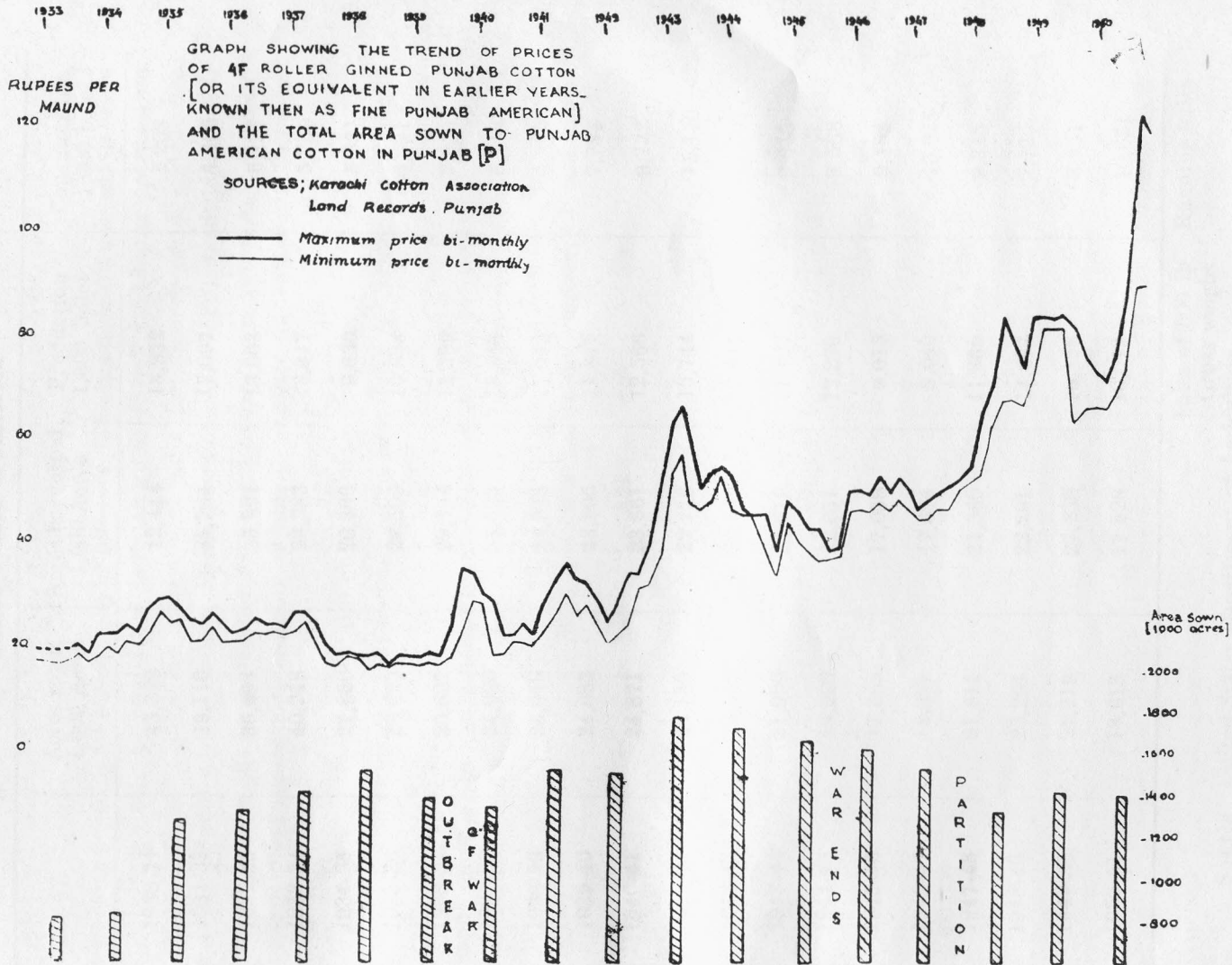


TABLE I
United States of America

	Acres sown 1,000 Acres	Acres harvested 1,000 Acres	Production 1,000 bales	Consumption 1,000 bales
1930-31	43,329	42,444	13,932	5,263
1931-32	39,110	38,704	17,097	4,366
1932-33	36,494	35,891	13,003	6,137
1933-34	40,248	29,383	13,047	5,700
1934-35	27,860	26,866	9,630	5,361
1935-36	28,063	27,509	10,638	6,351
1936-37	30,627	29,755	12,399	7,950
1937-38	34,090	33,623	18,946	5,748
1938-39	25,018	24,248	11,943	6,858
1939-40	24,683	23,805	11,817	7,784
1940-41	24,871	23,861	12,566	9,722
1941-42	23,130	22,236	10,744	11,170
1942-43	23,302	22,602	12,817	11,100
1943-44	21,900	21,610	11,427	9,943
1944-45	19,990	12,651	12,230	9,568
1945-46	17,588	17,059	9,015	9,163
1946-47	18,251	17,674	8,040	10,025
1947-48	21,611	21,380	11,860	9,345
1948-49	23,264	22,291	14,877	7,795
1949-50	27,719	27,230	16,128	8,851
1950-51	18,613	17,828	10,012	10,651

bales of 500 lb Running bales
Gross weight

Source United States Department of Agriculture.

TABLE II

Exports by Sea of Punjab American Raw Cotton.

(1,000 bales of 400 lbs. each)

	Receipts at Mills in All India of Punjab American Cotton	Europe (excluding UK)	U.K.	Japan	China	Total Exports
1930-31	...	77	86	255		418
1931-32	196	10	31	43		93
1932-33	177	51	67	142		260
1933-34	240	108	145	319	19	591
1934-35	197	146	130	219	8	503
1935-36	422	167	160	360	17	704
1936-37	393	190	232	489	18	929
1937-38	739	68	114	39	24	245
1938-39	594	81	160	123	237	599
1939-40	571	43	133	88	126	370
1940-41	686	...	151	92	174	417
1941-42	766	...	158	5	7	170
1942-43	1,084	}	NOT AVAILABLE	}		46
1943-44	380				166	
1944-45	899					
1945-46	966					

Cotton Year September 1st to August 31st.

Source Indian Central Cotton Committee.

TABLE III

General Indices of Activity in the Textile Industry and Cotton Spinning.

Average 1925-29 = 100.

			1929	1930	1931	1932	1933
France	(a)	...	98	91	76	64	79
	(b)	...	102	94	64	46	66
Italy	(a)	...	102	91	82	67	76
	(b)	...	105	89	80	84	95
Netherlands	(a)	...	107	102	93	81	82
	(b)	...	110	108	96	72	83
U.S.	(a)	...	106	84	87	76	89
	(b)	...	103	79	79	73	91
U.K.	(a)	...	98	79	82	87	94
	(b)	...	94	68	74	76	92

(a) Textile Industry (b) Cotton Spinning.

Source—World Production and Prices, Geneva 1935.

TABLE IV
Punjab—American Cotton
Acres sown in major Cotton growing Districts

Kharif Year.	Gujrat.		Jhang.		Lyallpur.	
	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1931	47308	409	76715	209	117057	104
1932	47775	424	77790	71	139508	49
1933	43653	600	77086	215	123261	74
1934	35885	1475	84314	253	118213	...
1935	52315	10629	99848	568	172700	93
1936	63204	7696	103656	620	174282	105
1937	64756	9243	108710	1024	103721	62
1938	56255	2321	99499	1063	229583	166
1939	61565	4167	96334	1025	231268	360
1940	61805	3091	107701	861	228618	486
1941	67701	2349	117488	981	234682	181
1942	55403	2882	107868	2282	278523	292
1943	58011	2272	118182	1199	327779	315
1944	59458	6038	127358	1099	327790	167
1945	59924	4015	121397	1431	336198	750
1946	70607	3607	114030	819	310366	351
1947	59423	4135	115060	514	288593	1425
1948	33532	2761	111023	1221	280228	781
1949	42638	3324	111652	341	294869	228
1950	42295	4975	112496	1019	225782	453

Source : Statement IIIA—Return of Crops in Areas for Kharif, Land Records, Punjab.

TABLE IV—(Contd.)

Kharif Year.	Montgomery.		Multan.		Shahpur.		Sheikhupura.	
	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1931	162688	11	162328	15	107313	431	44667	85
1932	176029	10	145283	14	105845	504	49511	122
1933	185799	13	188496	105	104877	1066	46522	242
1934	205626	23	195284	22	102667	1403	54960	482
1935	294402	45	303704	275	162917	9074	89938	2803
1936	307868	103	340113	481	164065	11655	82371	2274
1937	345684	31	383683	428	157250	12230	73607	2927
1938	380001	86	413522	895	157686	2914	63329	1226
1939	340673	255	391157	424	161555	4210	62796	1080
1940	300134	76	405905	348	146042	3439	64646	899
1941	308178	58	481322	469	161670	2163	77471	971
1942	314912	122	439966	379	162336	3141	70063	1105
1943	395345	36	549549	290	188457	2738	33126	1080
1944	314237	7	452410	157	180265	6589	80049	1192
1945	306575	9	470101	129	171262	5181	86455	1900
1946	299644	45	468577	118	184312	2535	84291	1970
1947	274833	10	470426	91	173175	1911	85450	1270
1948	193678	25	423544	337	162615	3363	74645	202
1949	251272	48	431253	973	139090	1531	46809	670
1950	293443	181	514620	273	154837	1950	63739	1318

TABLE V.

**Total Sown Areas of American Cotton Desi Cotton and Sugar Cane in
Pakistan, Punjab.**

	American Cotton.		Sugar Cane		Desi Cotton.	
	Irrigated.	Unirri- gated.	Irrigated.	Unirri- gated.	Irrigated.	Unirrigated.
1931-32	743055	1364	218709	6744	715829	22115
1932	768515	1611	234530	7514	575262	19506
1933	799636	2854	202703	7289	814439	31658
1934	829949	4840	191391	7027	808277	28744
1935	1252245	29250	188097	7910	712157	78895
1936	1308408	28396	216587	9720	720240	86592
1937	1391450	35678	185266	9890	809976	76999
1938	1509627	11624	151161	7722	619866	34969
1939	1392477	16026	170686	7624	574272	55086
1940	1372526	13219	222310	7343	646904	34588
1941	1524624	13245	199496	7043	577471	34886
1942	1520374	12170	184219	6953	305017	40214
1943	1774306	11541	231507	7614	321488	29775
1944	1708734	24648	240410	10457	313083	43196
1945	1637860	16589	251005	10262	266548	37316
1946	1611693	11315	251780	10956	256653	11423
1947	1537257	10610	271308	17744	257697	20810
1948	1329263	9216	289937	14148	219298	19500
1949	1417469	7905	350502	14995	105769	19661
1950	1490886	14610	312445	17976	173800	24335

Source: Statement IIIA—Return of Crops in Areas for Kharif, Land Records, Punjab.

THE GEOGRAPHICAL BASIS OF PAKISTAN'S FOREIGN POLICY

FAZLUR R. KHAN

“The foreign policies of all the powers lie in their geography.”—N. Bonaparte.

Geography of the world has undergone many changes. In the Geography of the world, Pakistan's name is only four years and a half old.

It is commonly known to most of us what led to the emergence of this largest Muslim state on the map of Asia. Briefly speaking, Pakistan is the result of a silent rebellion of millions of Muslims of Indo Pakistan subcontinent. This rebellion also ended in “the liquidation of the empire” to express in Churchill's language. And unfamiliar frontiers were drawn on the familiar subcontinent.

The declaration of June 3, 1947, closed an ugly and bitter chapter of the history of the subcontinent. The Hindus agreed to the “Vivisection of India”, while the Muslims accepted a “truncated Pakistan”. With this compromise Pakistan entered into the comity of nations as an independent sovereign country.

Situated as the Indo-Pakistan subcontinent is, to the north of the Indian Ocean, the influence of the Indian Ocean has been of vital importance. The Indian Ocean is walled off on three sides by land with the southern side of Asia fitting far off into the Ocean. The distribution of islands and archipelagos near the continental shores is another important geographic feature. The Indian Ocean washes the entire African (east) coast upto Somaliland, the south coast of Arabia, the southern shores of Iran, Baluchistan and Sind, Peninsula of India, shores of East Pakistan and Burma, Malaya Peninsula and Sumatra. The eastern and western entrances are guarded by narrow straits, the Babul Mandeb and the Straits of Malacca.

In the Indian Ocean, wind currents are of special importance and are unique in the world in their effects but the tropical storms of the Bay of Bengal ever present dangers to shipping in that area.

Since the northern end of the ocean does not go much beyond the Tropic of Cancer, it is essentially tropical in character. Heavy mists, fogs and other difficulties are absent and rigours of climate are greatly modified by the geographical situation.

It was in this ocean that Britain virtually ruled the waves—and the construction of Suez Canal, which proved to be the strongest brick in the chain binding Indo Pakistan subcontinent to Britain, strengthened the hold of the British on the seas. She sailed through the Indian Ocean as absolute mistress. But the onrushing tide of the Japanese aggression entered the Indian Ocean and clearly demonstrated that the security of the Indo-Pakistan subcontinent depended on the control of the seas of the Indian Ocean.

Although Pakistan is divided into two distantly disposed geographical halves, separated by nearly about one thousand miles it forms a sort of a roof over Indian Ocean. Its position in reference to the Indian Ocean in particular and on the globe in general invests this country with great strategic importance. The solid masses of China and Russia towards the north, for all practical purposes, extend as far as the North Pole. The Indian Ocean towards south touches the circum polar waters of the Antarctic Regions.

Towards East, Pakistan borders on Burma, where the Japanese tide was stemmed and halted in the last war—the immediate neighbours in this zone are India and Burma.

Towards west, Pakistan has immediate neighbours in Afghanistan and Iran—with China and Russia touching the Kashmir borders—this situation is important in relations to communications to and from the 'oily' Middle East. This border also controls the various mountain passes through which the subcontinent has been successively invaded in the past. And if any foreign power invades the subcontinent, its invasion can be effectively halted only on Pakistan's mountainous frontier, since, besides this, there are no natural barriers which can be of avail in stopping it.

The two disjointed wings of Pakistan occupy a significant position on the land flanks of India. The northern ranges of the Himalayas are effective barriers and any threat to the security of the subcontinent can come only from NE [as we saw in World War II] and N. W. If the invader traverses East or West Pakistan it would be easy for him to spread over the entire subcontinent.

The position of the subcontinent is in one of the world's vital strategic cross roads—the control of the subcontinent by the Allies protected Africa,

stabilized S.E. Asia and guarded the lines of communications with Australia and New Zealand. Incidentally, Pakistan seals (or opens up) the doors to Russia from the south. The division sent from the subcontinent foiled the Nazi attempt to seize and control the Middle East Oil fields. And this stood guard on the approaches to Persia from south west of the Caspian. When it was joined by the Soviet troops from the north, it built a new and vital supply line to Soviet Land with the Indian locomotives and rails and this branch of Persian Railway from Bandar Shah on the Persian Gulf to the Caspian Sea was used to convey war material and equipment to Russia in her hour of need.

The results of the World War II have dramatically demonstrated what an Indo Pakistan subcontinent under hostile control could mean. The Allies would have lost the immense resources in manpower and raw materials of this area. Pakistan as a part of the subcontinent, holds a position of responsibility from the view point of politics and strategy.

PAKISTAN AND THE COMMONWEALTH

When Pakistan started her career as an independent state, she started with the advantages of close relations and associations with Britain and the Commonwealth. In other words, she was born a member of the Commonwealth, owing allegiance to the statute of Westminster.

Though Pakistan found herself in Commonwealth, the consideration of her geographical position has mainly shaped her relationship with the British Commonwealth. Apart from this, economic ties bind Pakistan to the Commonwealth. Being an agricultural country, Pakistan is anxious to have her commercial relations with the industrially advanced nations of the West, particularly when the sea link already exists between them.

AGRICULTURAL ECONOMY

Although the economy of Pakistan is one of the soundest, Pakistan has inherited through partition a predominantly agricultural economic structure. Thus, the economy of both the wings is predominantly agricultural. Notwithstanding the fact that the two food crops, wheat and rice prove stable diet of the people in West Pakistan and East Pakistan respectively, East Pakistan, where rice is cultivated extensively, is not self supporting. And on the average the rice surplus of Sind is not quite sufficient to cover the deficit of east Pakistan.

Pakistan has two cash crops which at present command good markets. These two—cotton and jute—earn the ever dearer dollars. The cultivation of best quality jute is concentrated in East Pakistan, which produces nearly about 61% of the world's jute. The important cash crop of West Pakistan is cotton, the concentration of which is in the Punjab. Nearly about 70% of the area under cultivation in the Panjab and 77% of the cropped area of Sind, are irrigated and this irrigation system is the most extensive in the world.

Although Pakistan lacks coal and oil, which are essential for the development of industry, and transportation, and though the mineral wealth lies undeveloped, Pakistan's agricultural richness in the form of gold produced from the rich soil by wheat, cotton, jute and rice, enables her to maintain a stable economy which is one of the most dependable assets known to the world in peace or in war.

Expressing the hopes that Pakistan would be a stable state, Sir Archibold Rowlands, the famous British financial expert, stated, "Pakistan starts on its career with four great advantages—first, it has an active and robust people. Secondly, it has a compact political structure, which unlike that of some other countries, is free from fissiparous tendencies. Thirdly, it has plenty of primary requirements of life *viz.* food. Lastly it has a favourable balance of trade with the outside world."

Pakistan is anxious to shed the industrial underdevelopment, which is hampering the progress of the country. It can do so when there is tranquillity in the country, stability in S.E. Asia, of which she is an integral part, and peace in the world. It is the belief of the leaders of the nation that the birth of Pakistan itself—the partition of British India into two independent states—has made a silent contribution to the stability of Asia. Any disruptive movement in Asia might endanger this stability and with these objectives Pakistan Government has established friendly relations with the Republican Government of Indonesia, Burma and the Central People's Government of China and welcomed the treaty of San Francisco with Japan.

S. E. ASIA.

As a S.E. Asian country, Pakistan rejoices when she sees that like Samson, restored to his divine strength, the peoples of the East have arisen from their slumber and are fast shedding their shackles and emerging as a new force in the world.

Burma is the immediate neighbour of Pakistan, which regards the stability of Burma's financial position to be of great importance. Pakistan has very close association with Burma. Till 1937 *i.e.* before the Government of India Act, 1935, came into force, it formed a part of the then Indian Empire and now as an independent country, it shares a common frontier with the eastern wing for some hundred miles. Like East Pakistan, in the Irrawady delta agriculture is based on the cultivation of single food crop—rice—on a large and extensive scale but unlike East Pakistan, with the object of selling the bulk of it. Because of this monoculture and because of the new paddy lands of the Delta, Burma's outflow of rice has expanded enormously at a rate faster than the population increase. The geographic proximity and the recurring food shortage in East Pakistan have brought the two countries nearer in the sphere of economic co-operation. Immediately after its attainment of freedom in 1948, the Karens rose in a revolt against Thakin Nu's Government and the whole fabric of economic stability was shattered with the result that Burma was in need of economic assistance from foreign countries so that she could put in more land under rice in "Rice Rush" area and help finance the rice export which forms the basis of the economic life. Pakistan realizing the consequences of Burma's instability agreed to give a loan of £500,000 for the economic rehabilitation.

Beyond Burma lie Malaya and Indonesia, washed by the Indian Ocean and the Pacific Ocean and occupying a strategic position. These two control the sea routes of East and South Asia more effectively than any other country.

While Malaya has a large Muslim population, Indonesia has a population of nearly 75 millions, the majority being that of the Muslims. Indonesia has twice the area of Pakistan. Though Java is the most densely populated island in the entire world with the density of about 950 persons per sq. mile, several of the big islands of Indonesia are thinly populated and are in dire need of colonisation and development. The sparsely inhabited islands of Sumatra, Borneo, Celebes and hundreds of 3100 islands could be developed by colonizers from the overcrowded East Pakistan and Java. These are fabulously rich lands and the possibilities of their rapid development are very great. Producing appreciable quantities of sugar and oil, she can exchange these for Pakistan's cotton, jute and other food grains, in which Indonesia has a recurring deficit.

With potentialities of quick development and with incomparable resources she will be of an invaluable asset as a friendly nation.

The small Viet Nam could not have been found on the map of Asia before 1946 but now it occupies nearly 125,000 sq. miles of the landmass to the south of China and goes straight south towards Indonesia. Producing exportable surpluses of rice, she has nutrition densities, as Prof. Dobby calls it, the density of population per unit rice area reaching the fantastic figures of 4750 per sq. mile in the northern regions. Before the war, among other things, she produced rubber and coal, which she exported to foreign countries at a rate of 2 million tons per annum.

The policy of Pakistan towards Viet Nam has been vacillating despite the fact that the Government realizes that the 'war torn' economy of Viet Nam denies the needy Asians the exportable surpluses of rice. Moreover exportable surplus of coal can be an important source of power for the industrial development of Pakistan.

Accepting as an established fact, the Government of Pakistan has recognized the central People's Government of China, where the revolution has once for all eradicated the corrupt Kuomintang. The unsettled conditions hampered the economic progress of the country but after the restoration of peace, there were signs of revival of stable economy, which after the diplomatic relations between the two countries reflected in the easy flow of trade between them.

JAPAN.

Pakistan contributed much in the struggle for victory against the Japanese as the soldiers of Pakistan set up distinguished records in the same. The Peace treaty, signed in San Francisco where the different nations not long ago signed the UNO Charter, was mild, generous and magnanimous and it has opened a new Chapter in Japan's history. Change have been made in the economic and social structure of the country—cartelization has been completely discarded and the purge of the financial families has taken place.

The industrial power and experience of Japan and its economic revival are of great benefit and significance to Pakistan in her industrial policy. Being the most highly developed industrial country in Asia, the economic relations between the two are of importance.

Pakistan with its agricultural economy has to devote attention to the agricultural improvements for the full developments of which the industrial development cannot also be neglected. As a manufacturer of fertilizers and

modern agricultural equipments Japan can be of help to the underdeveloped economy of Pakistan. With the increasing population and industrial nature of economy, Japan needs rice, wheat, textile fibres, hides and skins. With a surplus of agricultural products, Pakistan is concerned with the improvement of the standard of living of the agricultural population. For the development of industries covering also the field of fabrication her raw materials are essential. As a manufacturer of industrial machines, Japan is capable of meeting Pakistan's demand for capital goods to build up her industries. Lacking coal and iron, Pakistan is developing the hydel power in the field of which, Japan's achievement has been outstanding. For Pakistan, with the signing of treaty, an abundant supply of machineries is ensured in the future. The economic revival of Japan will, instead of strangling the Pakistan's economy, help its development.

Another small country which has a role not inconspicuous in the foreign affairs of Pakistan is Ceylon, which is providing port facilities along the line of sea communications between Western and Eastern Pakistan. The relations between the two have been harmonious.

It was in the capital of this small country that the Colombo Plan was officially inaugurated on July 1, 1951. It is a six year scheme for the co-operative economic development in SE Asia. The Plan is founded on planning fitted to the special needs of SE Asia. The development in these countries will be achieved by big multipurpose projects—having a close resemblance to the TVA. The six year Plan of Pakistan, under this Colombo Plan is a well thought out plan of consumption, production investment, trade and economic distribution in accordance with the needs of the country as a part of South East Asia. Realising that in the economic rehabilitation of the people Pakistan cannot go a long distance without international co-operation, the Government joined this Plan.

MIDDLE EAST.

For thousands of years the peoples of Pakistan and the Middle East have been united by the most intimate ties. Culturally Pakistan feels a natural affiliation with other Muslim countries. Apart from this fact, the grave external dangers, the attainment of political freedom, the common economic and strategic problems, the easy means of communication, the geographical contiguity, the pride in past heroes and achievements, cement them securely.

With Turkey Pakistan is connected by a series of ties even before the partition of the subcontinent took place—The fraternal alliance was best

manifest when the Indian Muslims felt grieved at the dismemberment of Turkey after World War I. The selection of Karachi, an air centre and a good port and "a window on the outer world" is of significance to Pakistan with interests in close contact with the Middle East.

Pakistan and the Middle East are both faced with the same economic problems. Different stages of agricultural development are to be found in these lands—varying from nomadic pastoralism to modern advanced irrigation farming. The population density also varies from very intense to thin. The general trend in these countries is towards industrialisation but the common problem is the shortage of technical personnel and lack of capital.

The strategic and geographical positions of Pakistan and the Middle East place them on the globe prominently. The tricontinental position of the Middle East has made it the nerve centre of all the mercantile activities of the world.

As far as political and defence arrangements are concerned, most of the observers are unanimously of the opinion that closer cooperation between Pakistan and the Middle East is essential. Britain's inability to use troops from Indo-Pak subcontinent in the Middle East has figured prominently in the debates and discussions on the Middle East in the House of Commons. In the July 30, 51 debate W. Churchill named the loss of "the well placed and formidable resources of the Imperial Armies" on the subcontinent as the chief reason for the decline of British influence in the Middle East. Although this evoked the tart remark of Labour M.P., R.H.S. Crossman, "One does not make a policy by having a nostalgia for the Indian Army", it clearly shows that in their world of today, when the bulk of power is centered in Washington or Moscow, the co-operation of Pakistan, at the outset is essential for the defence of the Middle East.

The Britain's keenness to retain supremacy over these parts was emphasised by Anthony Eden on July 19, 1937—"It has always been and it is today a major British interest that no Great Power should establish on the eastern shore of the Red Sea".

If Russia were to overrun Iran, Pakistan's strategic importance would increase manifold and the co-operation of Karachi would be indispensable for the success of Anglo American assaults.

Because of the past association, cultural affinities, physical contiguity and strategic considerations, Pakistan is interested in the Middle East and she

made every effort to protect and advance the interests of the Muslim countries of the Middle East and took lead in the fight in the UNO against the formation of the state of Israel.

THE WEST

The people of Pakistan have taken over from their former rulers the aspirations and ambition of the West but Pakistan has a standard of living which can be accepted by illiterate and politically inarticulate people. To make Pakistan politically and economically stable, the aim of the Government is to raise the living standards of the poverty stricken masses.

The capital, plants and technical skill, needed for large scale development, which ushers in an era of prosperity, Pakistan can, for a good many years to come, at any rate, obtain only from the Western countries. The existing economic interests of Pakistan also link it essentially with Anglo American sphere. The direction of the foreign trade and the sources of imports are overwhelmingly in this sphere for reasons partly historical but mainly geographico-economic.

Pakistan has always admired the great and rapid progress which the Soviet peoples have made in their country and she is desirous of studying the socialist methods with a view to applying them to the solution of her own agricultural and economic problems. Pakistan did not see anything sinister in the invitation of Russia to late Mr. Liaquat Ali Khan and on the contrary there was a great enthusiasm in this country for that "sine die" postponed visit to Russia.

Late Liaquat Ali Khan had to abandon the visit and was compelled to make pilgrimage to the land of Truman and dollars, only because he gave top priority to the agricultural and industrial development of the country.

INDIA, AFGHANISTAN AND KASHMIR

It is particularly unfortunate that Pakistan's relations are not good with Afghanistan. Despite the farcical and fantastic cry of Pakhtoonistan, Pakistan's policy about Afghanistan has been one of restraint as against provocative behaviour of the latter Country. This hostility is striking in the sense that among Muslim states only Afghanistan had been critical of the creation of the largest Muslim state in the world. Continuously deteriorating economic conditions of its citizens as contrasted with the improving economic conditions of the people across the Durand Line compelled the Afghan Government to divert the attention

of the poverty stricken masses from the real conditions of life. The basic point in the Afghan claims against Pakistan is the status of the Durand Line between Afghanistan and Pakistan. If the Durand Line is an accepted International border, the country on the other side of it, cannot interfere in the domestic affairs of the other.

The frontier agreed between the Indian and the Afghan Governments in 1893 was called the Durand Line after the Secretary of the Government of India, Sir Montimer Durand. According to this agreement, this line with a number of geographical provisions forms the border between Afghanistan and British India (now formed into Pakistan and Bharat) and both were to agree to the inviolability of the line. They were not to make any claims on the areas across the line and they were not to interfere in the affairs of the other.

Since then the status of the Durand Line has been maintained as an international border. In fact, in 1928, the British Government made it clear to the Afghan Government that there existed no "no man's land" between India and the Durand Line.

Then on August 14, 1947, Lord Mountbatten as the G. G. of British India issued the Indian Independence Order, 1947. This was an International Agreement. According to this agreement, Pakistan was responsible for the administration of all the territories on Pakistan's side of the Durand Line. Again, the Secretary of State for Commonwealth Relations stated in 1949—"It is His Majesty's Government's view that Pakistan is in international law the inheritor of the rights and duties of the old Government of India and of His Majesty's Government's in the U. K. in the tribal territories and that the Durand Line is an international frontier."

Afghanistan's claims for the establishment of "Pakhtoonistan" on the grounds of language and race do not stand the test, as only 30% of the Afghan population has Pashtu as their language, while in N.W.F.P. and the tribal areas Pashtu is the only one language which is spoken. One may say that, on the other hand, on this score the Pathans of the N. W. F. P. have a good case for absorbing the Pashtu speaking Afghans. Thus the whole propaganda becomes imaginative.

Feeling neighbourly sentiments with an expression of good will, Pakistan's policy about Afghanistan has been of restraint. Pakistan Govern-

ment did not take any step against Afghanistan, despite the fact that Afghanistan persisted in inflaming the tribal people by making propaganda of the so called expansionist policy of Pakistan, which was, according to the master minds of Afghanistan's Goebbels, about to annex the tribal territory. Conveniently they forgot to explain how Pakistan can "annex" its own territory, which by all canons of International Law, forms an integral part of Pakistan.

Since Pakistan does not want any instability in its neighbourly countries, she did not stop Afghanistan's trade passing through Pakistan. This, incidentally, is the entire trade of Afghanistan, which thus gets all her vitally needed supplies through Pakistan.

Pakistan's relations with India are far from happy, despite the fact that their very situation, economy and considerations of defence and security demand that they ought to stand in friendly co-operation with each other. But as the things are, there are disputes between India and Pakistan and the principal dispute is about Kashmir.

Strategically, economically and geographically, Kashmir is so interlinked with Pakistan that any separation is unimaginable. In addition to the river links, the road and trade links of the state with the Punjab further emphasize the geographical contiguity and integral unity of Pakistan and Kashmir.

"There can be no doubt in any reasonable mind," says General Sir Frank Measervy, the first C-in-C of Pakistan Army, "that the natural and developed communications, all leading from Pakistan are a strong factor in favour of Pakistan's claims".

The state is deficient in foodstuffs and depends on imports from the Punjab. A vital factor for Pakistan is that the fertile plains of West Pakistan are largely dependent on the irrigation waters of the Jhelum, Chenab and Ravi. The headworks of the upper Jhelum and the Upper Chenab Canals are in Kashmir. The irrigation problem has been accentuated by the boundary between India and Pakistan cutting across the hitherto unified Punjab irrigation networks, giving rise to many difficulties and "Canal Water disputes" is among the differences obtaining between the two neighbourly countries.

It has been estimated by F. J. Fowler* of the Leeds University that the natural flow of "five rivers was already fully utilized before partition." There is thus little hope for Pakistan to find any alternative supply in the country

*"Water distribution in East and West Punjab" Geog Review Vol. 40.

itself for irrigating the Sutlej Valley areas, if the flow of the Sutlej is tempered with. The solution suggested is the construction of reservoirs in the upper Valley of the Jhelum and Chenab to "store summer flow for use in autumn and winter." For this Pakistan is again vitally concerned with the outcome of the Kashmir question.

The accession of Kashmir to Pakistan will ensure Pakistan's safety from excessive exploitation of soil erosion and rapid run off in summer which in its turn reduces the seepage back to the rivers in autumn.

The strategic importance of Kashmir can very well be summed up in the words of General Sir Frank Messervy, C-in-C. of Pakistan's Army from August 15, 1947 to Feb. 15, 1948.

"The Poonch districts have always been a recruiting ground for the Punjab Regiments, now a part of the Pakistan Army. There are some 50,000 Poonchis in the Pakistan Army today with a potential reserve of another 40,000. As regards the defence of Kashmir, the State's boundaries march with three foreign countries — Afghanistan, Chinese Turkistan and Tibet while Soviet Russia is close just across the Wakhan, the narrow strip of Afghanistan, which separates Kashmir from the U.S.S.R. The defence is mainly provided by nature, as vast mountains and high plateaux traversed only by mule tracks, form a natural barrier. There must, however, be some troops to prevent unopposed invasion and these can be supported quickly enough from the Peshawar—Pindi bases..... Pakistan is only interested in Kashmir defensively. Kashmir can, for her, be no offensive spring board, but she cannot possibly allow any hostile or potentially hostile country to hold Kashmir. An enemy force in Kashmir would threaten at close range the main vital rail and road communications from Lahore to Peshawar."

The size of the world is shrinking year by year and Pakistan is trying to keep pace with the speed not by shrinking her mind and heart but by enlarging them—thereby—to know the people outside the nation's frontiers. Living in the Copernican world, Pakistan has no Ptolemaic conception of the world. It has no territorial and imperial ambition and no aggressive designs. Realising its place on the globe, Pakistan obtained the membership of UNO to which it is making her fullest contribution.

CLIMATIC REGIONS OF EAST PAKISTAN

Dr. KAZI S. AHMAD

A Paper Contributed to the Pakistan Science Conference, Section Geography, Geology and Anthropology, 1952 (Peshawar).

General Climatic conditions :—East Pakistan is situated between 21° and $26^{\circ}58'$ north. The Chittagong area and the greater part of the delta lies south of the Tropic of Cancer. Though the major northern half is outside the Tropics, it enjoys almost tropical climate. The monsoons blowing from the Bay on the south carry the Equatorial humid influences over the flat lowlands far into the interior. The moderating influence of the sea is supplemented by the flooding of large areas and by the presence of numerous streams and Bhils. Humidity is high practically all the year round, throughout East Pakistan. No month has a humidity less than 70, while during the rainy season it is generally over 80.

Temperature :—The mean annual temperature varies from 75°F in the north to a little over 79°F in the south-west. In January, the coldest month, the isotherms are sun-lines running east and west and the mean temperature varies from about 70°F in the extreme south of Chittagong to about 62°F in the north. Most of the area (excluding the Chittagong hills) has temperature between 62° and 67°F . The mean minimum temperature in the plain is between 49.2° and 56.2°F the mean maximum between $75^{\circ}.4$ and 79.6°F .

April is the hottest month, the isotherms under the continental influence from the west run north and south with a concave bulge towards the east. The mean temperature for this month increases from about 81°F in the east to about 86°F in the west centre. The mean maximum temperature for April is generally higher than that of any other month and varies between 97°F (Satkhira) and 88.7 (Cox Bazar). The mean minimum for this month is between 73.2° (Chittagong) and 69.3° (Srimangal).

The mean annual range of temperature is generally under 20°F . It is lowest at the mouth of the Meghna.

Winds and rainfall :—The direction of the prevailing winds is from south or south-west from April to September, from the north or north-west from

November to February. In the months of October and March they are variable. The summer monsoon sets in the eastern part about the end of May and in the western part in the first week of June.

The pre-monsoon thunderstorm rains in April and May merge into the monsoon rains of June. Due to thunderstorms and Norwesters or some storms from the Bay, East Pakistan is the rainiest region in the subcontinent of Indo-Pakistan in the months of April and May. In no part the rainfall is less than 2" in April and it rises to more than 9" in the north-east. In May the rainfall varies between 10" and 20" in the eastern and 5" to 10" in the western parts. Even in March the rainfall varies from 1½" to 3". So, unlike West Pakistan, the early summer months in East Pakistan are quite rainy and this period is known in many parts as *Chhota Barsat* (small rainy season).

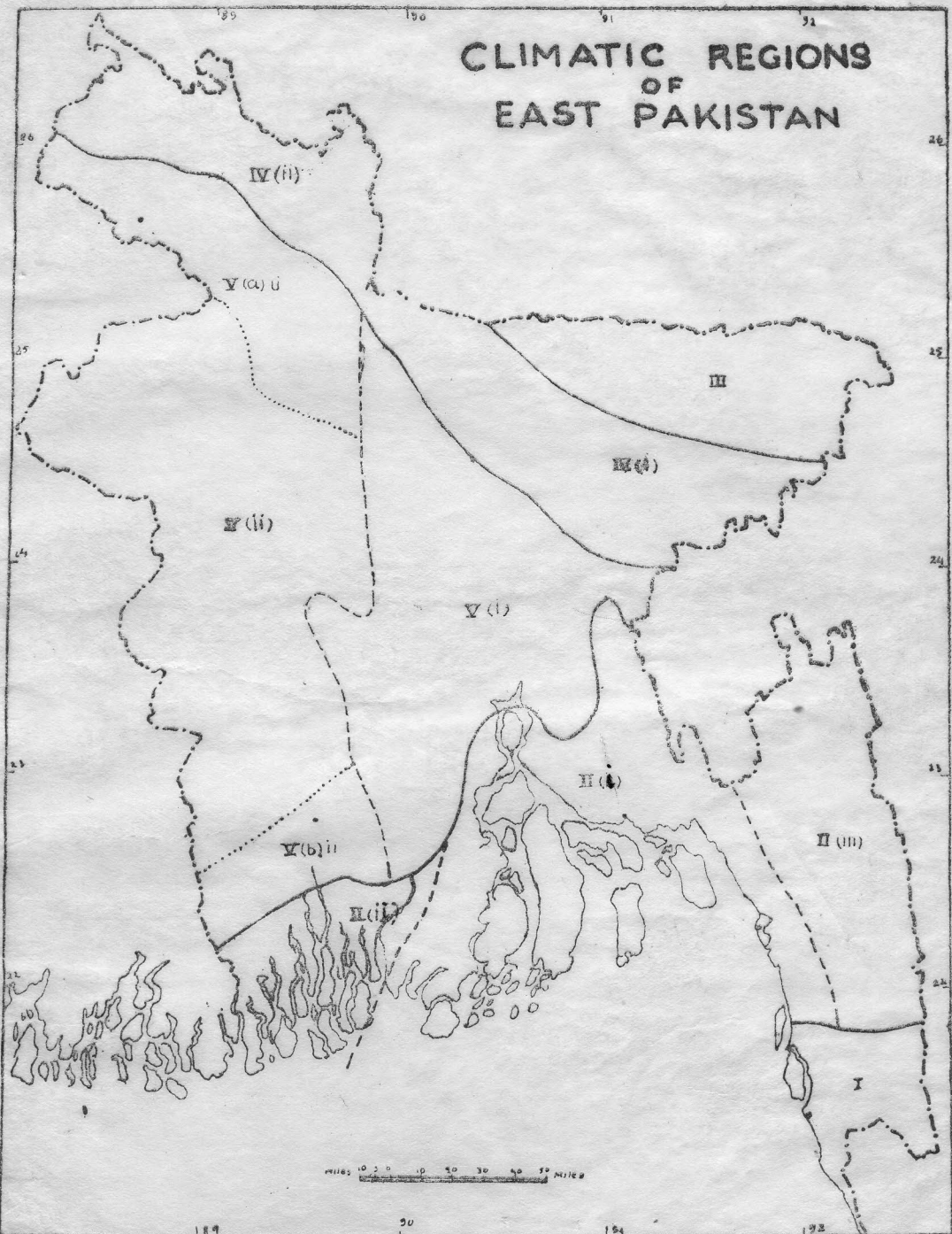
The annual rainfall varies from about 50" in the West to more than 100" in the south-east and in the sub-montane region of the Assam Hills and the Himalayas. More than two-thirds of this rainfall takes place in the months from June to September during the prevalence of wet monsoon. It withdraws in the 1st week of October. At Cox Bazar the percentage of rainfall during this season is about 78. The rainiest month varies in different parts—June, July or August. The rainfall in each of these months ranges from 7 to over 25 inches. These three months have also the largest number of rainy days—15 to 25 in each month. The monsoon rains are followed by a good amount of rainfall in October from the Cyclones which form in the Bay and invade East Pakistan during this month. November is free from rains, but December and January are generally the driest months. No part of East Pakistan during these months gets more than half an inch. Each of these months has less than two rainy days. December is even drier than January.

The length of the period with more than one inch of monthly rainfall decreases from 10 months in the south and east to 7 months at Dinajpur. The variability of rainfall is generally the least in Indo-Pakistan. According to Williamson¹ it is less than 15% except in the west where it is between 15 and 20 %.

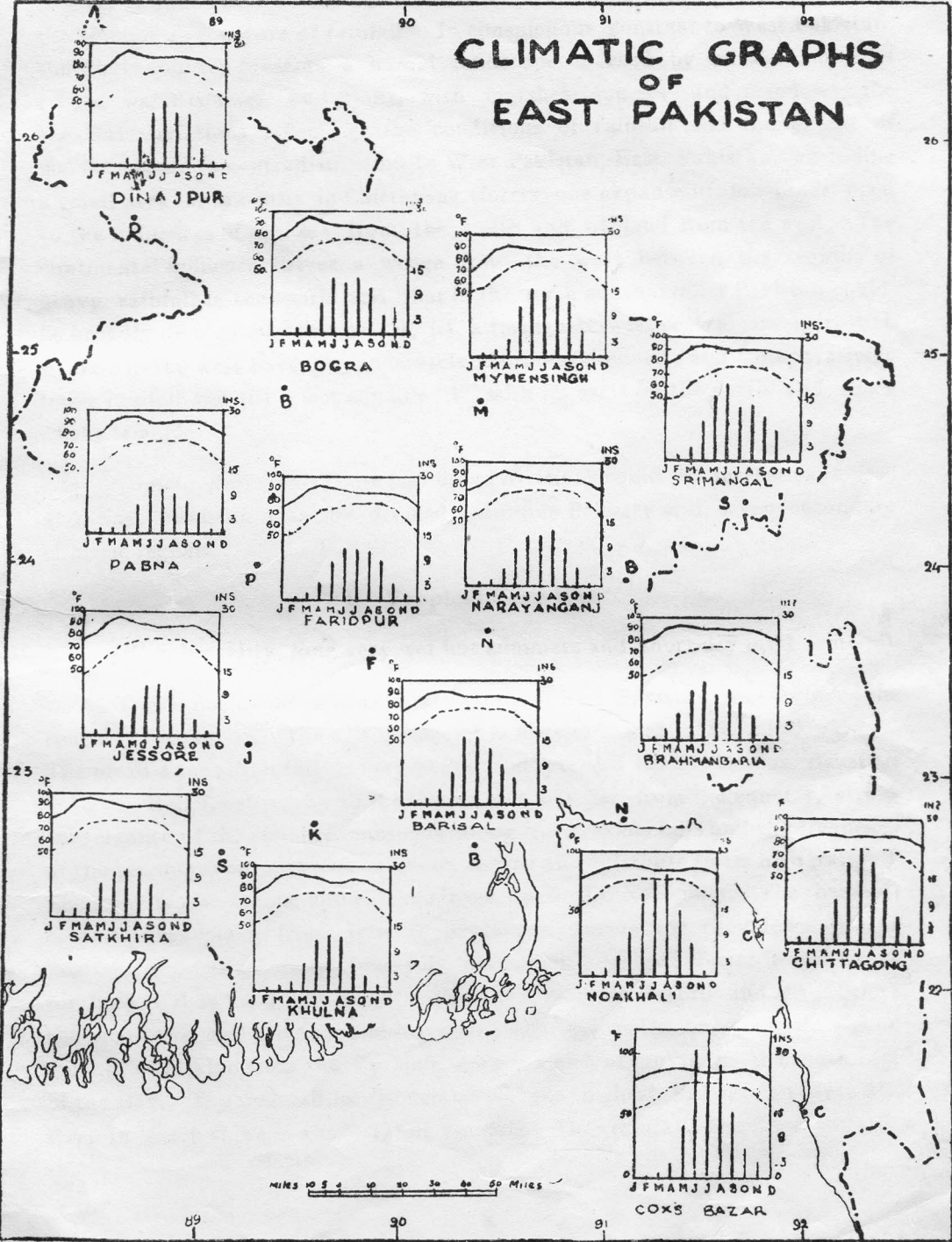
Fogs are experienced practically all over East Pakistan in winter. The number of foggy days generally varies from 2 to 12 in each of the months, December to February.

1. Williamson and Clark, The Variability of Annual Rainfall in India, Q.J.M.S., Vol. 57, 1931.

CLIMATIC REGIONS OF EAST PAKISTAN



CLIMATIC GRAPHS OF EAST PAKISTAN



In short humidity, heavy rainfall and equable oceanic influences penetrating far into the interior are the dominant climatic controls. While the whole country is humid and warm, the climatic regions differ mainly on the basis of the amount and nature of rainfall. In conspicuous contrast to West Pakistan, the whole country presents a humid landscape marked by an abundance of rivers, water-courses, and Bhils, with marshes, jungles and meadows, the regional variations reflecting the conditions of rainfall and the extent of floods. Again in contradistinction to West Pakistan, East Pakistan, excluding a small area of low hills in Chittagong, forms one expanse of low-lands open to the influences of the sea from the south and of land from the west. The continental influence drives a wedge from the west between the regions of heavy rainfall in the south and that in the north so that East Pakistan could be broadly divided into two halves, (i) a triangular west-central interior with its base in the west having a moderately continental climate and comparatively lower rainfall and (ii) a wet equable "V" with its arms on the north and south of the triangle.

Climatic Regions:—These two broad divisions could be further analysed and East Pakistan may be divided into five Primary and seven secondary climatic regions.

I. Tropical Very Wet

(High humidity, long very wet hot summers and short dry mild winters).

This is one of the two rainiest regions of East Pakistan and includes the southern parts of the Chittagong district and the hill tracts. The mean annual rainfall is very heavy and exceeds 120". At Cox Bazar it is 140". Relief, contiguity to the warm sea not far from the equator, strong convergence of the summer monsoons along the Arakans hills and the frequency of the pre-monsoon and post-monsoon storms all contribute to its high rainfall. The rainy season is long and extends from April till November. The heaviest rainfall takes place from June to September during the prevalence of the monsoon and has an early June-July maximum. At Cox Bazar the average for June is 31.14" and July 35.52". Even the months of April and May before the monsoons, and October and November after the monsoon, get quite a good amount of rainfall from the Cyclonic storms which originate in the south-east of the Bay. The rainfall for November is the highest in Pakistan (over 3"). Even in March there is about $1\frac{1}{2}$ " of rainfall. The rainfall decreases towards

the north. The three winter months are almost dry January being the driest.

Humidity is high throughout the year. It remains 80 and over from May to December rising to about 90 in July and August. Even in the remaining months it does not fall below 75.

Under the influence of the sea, heavy rainfall and on-shore winds the temperatures are equable. At Cox Bazar the mean annual range of temperature is 14.4°F. January is the coldest and May the hottest month. The mean temperature for January and July is 67.9°F. and 82.3°F respectively. The mean minimum temperature for January is 56.2°F. the highest in East Pakistan.

The mean maximum temperatures for April and May, the hottest months, are 88.7° and 88.8°F respectively, while the mean maximum temperature for January is 79.6°F. Thus there is a difference of only 9°F between the mean maximum temperature for the coldest and the hottest months. The mean minimum temperatures, however, vary by about 19.7°F between the hottest and the coldest months. This shows that the equable influence is more important during the day when the sea-breezes blow.

While the mean minimum temperature is quite steady throughout the early and late summer, there is a slight rise of mean maximum temperature in September and October when the rainfall diminishes in comparison to that of the previous three months. This gives a very slight secondary maximum in early autumn.

II. Tropical Wet

(High humidity, long wet summers, short dry mild winters.)

This region includes the southern and south-eastern coastlands adjacent to the Bay. Here the rainfall is heavy but less than in region I between 80"-120". The rainy season is slightly shorter than in region I and extends from April to October. In each of these months the rainfall is comparatively less than in region I. Winter and early summer rains are slightly heavier. It is comparatively more affected by spring and autumn thunderstorms.

The range of temperature is generally lower as compared to Region I, the mean maximum temperatures are slightly higher in summer. The mean minimum and absolute minimum temperatures are the highest in East

Pakistan. There is a secondary maximum in early autumn but comparatively less marked than in region I. It may be divided into three secondary regions. (i) south-eastern lowlands, (ii) southern lowlands and (iii) north-central Chittagong highlands.

(i) *South-East Lowlands* :—It includes the coastal areas of the district of Chittagong north of the region I, of Noakhli and eastern part of Backurganj, parts of Tippera and the islands at the mouth of the Meghna. The oceanic influence advances farther into the interior of the Meghna and Padma. The position of the region in the north-east corner of the Bay into which the south-west monsoon winds converge and blow transverse to the coast gives this region generally a much heavier rainfall than in the other two secondary regions. It exceeds 100" in the Coastal strips. Sea breezes are very important in summer and prevent the day temperature from rising very high. At the mouth of the Meghna under the oceanic influence the mean monthly range of temperature is the lowest in East Pakistan. Noakhali may be taken as the typical station. Here the mean annual rainfall is 115" of which about 95% takes place between April and October. Humidity is high, no month has less than 78. From May to June it is over 81 rising to 89 in July and August, the rainiest months.

May is the hottest month when the mean temperature is 83.3°F, the mean maximum 89.1°F and the mean minimum 77.6°F. Between March and October the mean maximum temperature does not vary more than 3°. The mean minimum temperature for January, the coolest month is as high as 57.5°F only about 20°F lower than the mean minimum for the hottest month.

(ii) *South West Lowlands* :—The region includes the southern coast lands of Khulna and western part of Backurganj district. The rainfall is generally less than that of region, (i) between 80 and 100 inches, but the moistness of the landscape is intensified by the presence of large swamps, Bhils and forests. The mean maximum temperatures and mean monthly range of temperature are higher than in (i) and in both of these values there is an increase towards the west. Humidity is almost as high as in (i).

The mean maximum temperature is highest in April but on the whole May is warmer than April. The moist ground retains the summer warmth and the mean minimum temperatures are highest from May to September about 77° or 78°F. Winters are almost as cool as in (i) and equally dry. As in (i) the rainy season lasts till October, the mean minimum temperature for January

is 55.4°F while the mean maximum for this month is 77.8°F and for April 92°F. This is the foggiest part in East Pakistan. In January the number of foggy days reaches 12 to 20.

(iii) *North-Central Chittagong Highlands* :—This region consists of a tangled mass of low forested hills traversed by many rivers. Though humid, the climate is to a certain extent modified by relief. The hills are cool and pleasant while the valleys are unhealthy during the rainy season. The humidity remains just as high throughout the year as in the other two parts. The rainfall is over 85" and exceeds 100" in the central part. The mean annual rainfall for Rangamati is about 94" which may be taken as representative of this region. Owing to differences of elevation and exposure and increasing height of hills towards the east the rainfall varies greatly from place to place. December and January are the only dry months. There is about 18" of rainfall in each of the months from June to August. Maximum and minimum temperatures vary between 90° and 50°F.

The prevailing winds during the rains and the hot season are from the south west and in the cold season from the north. At both the ends of the rainy season violent storms of thunder and lightening occur.

III. Sub-Tropical Very Wet

(High humidity, very heavy rainfall with a late summer maximum and good spring rains, equable temperature. Summers are not hot while winters are quite cool).

This region includes the north-eastern sub-mountain tract in the district of Sylhet and eastern part of Mymensingh. Owing to the ascending movement of the monsoon current caused by the steep scarp of the Assam hills, the rainfall is heaviest in East Pakistan and in some parts averages between 200 and 250 inches. The Mean annual rainfall of Sylhet is 157" and of Sunamganj about 210". The rainy season starts and ends a month earlier than in region I, *i.e.* in March and October respectively. It is not affected by the Bay Cyclones in November but on the other hand experiences a good rainfall in March from thunderstorms. The maximum rainfall takes place towards the end of summer, August being the rainiest month with about 47". Floods, on account of very heavy rainfall in the hills to the north, accentuate very much the effect of rainfall. November to January is the dry season, the monthly rainfall varying from half an inch to one inch.

In spite of being situated in the interior, humidity remains high practically throughout the year and the temperatures are equable. Quite a good rainfall in the month of March, April and May prevents the development of high temperatures in early summer. Very heavy rainfall from May to September keeps the temperature down and it remains quite steady during these months. Winters are quite cool.

IV. Sub-Tropical Wet

This region includes two narrow strips of lowland in the north and north-east running in N.W. and S.E. direction, a little farther away from the Himalayas and the Assam hills, with a rainfall of 80-120". Though humidity remains high as in the tropical wet type, on account of their position farthest from the Sea, the mean maximum temperatures in summer as well as annual mean maximum temperatures are slightly higher, while the mean minimum temperatures are slightly lower throughout the year. The annual range of temperature is also greater.

(i) *South Sylhet-Mymensingh*:—This region lies in the southwest of region III in the re-entrant of the Surma Valley and consists of a narrow strip of lowland running from the Garo hills in the north-west to the south-east including the southern part of the Sylhet and the larger western and central part of the Mymensingh district. Farther removed from the Khasi and Jaintia hills the strip has a rainfall comparatively lower than in region III. The rainy season extends from April to October but the rainfall is unevenly distributed between the months in different years according to the influence of thunderstorms, monsoons and the cyclones from the Bay. Though June, July and August, when the monsoon is at its height, are the rainiest months and together account for about 55 P.C. of the total rainfall, the heaviest rainfall may take place either in early summer on account of thunderstorms or in late summer from the Bay depressions which break up on reaching the Assam hills. For this reason rivers come into floods in various months. Four months, November to February, are almost dry, while March records less than two inches. A good spring and early summer rainfall contributes to the agricultural prosperity of this region, as it helps in the cultivation of rice.

The mean maximum temperatures are higher and the mean minimum temperatures are lower than those in region II, the corresponding Tropical Region in the south. Humidity though high is 1 or 2 p.c. less than in region II. At Mymensingh which represents this region, the mean maximum tempe-

ature is highest in April while the mean minimum is highest in July and August. The mean temperature remain steady with very little variation between March and October. January is the coolest month with a mean of 57.6°F. The mean monthly temperature rises to its peak in July and then falls continuously to its lowest in January. The secondary maximum is not clearly noticeable.

(ii) *North Rangpur—Dinajpur* :—This region comprises the northern parts of Rangpur and Dinajpur, the two northerly districts of East Pakistan. Though the rainfall of this region is almost the same it is comparatively less humid than region IV (i), except during the season of the wet monsoon when the humidity is as high. In January when the weather is cloudy and the north-east winds blow from the Himalayas the humidity is almost as high as in September, and is for this month the highest in East Pakistan.

Although it is affected by the thunderstorms and cyclones of the pre-monsoon period, the rainfall from these sources in the pre-monsoon period is comparatively lower than in IV (i). It is outside the track of the autumn cyclones from the Bay and therefore October is much less rainy. It is cooler in winter and hotter in summer. Under the influence of northerly or north-easterly winds from the Himalayan region the mean minimum temperature falls to about 49°F in January. It is the coolest region in East Pakistan in winter.

Rangpur, representative of this region, has a mean maximum of 74.5°F in January and 91.4° in April, the hottest month, with a variation of less than 17°F. The variation in average minimum temperature is however much greater, rising from 49.3°F in January to 78.2°F in July—about 29°F. The moderating influence of cool winds from the mountains and the Bay keep the changes of day temperatures within narrower limits. Hot dry winds, for spells of a few days, blow from the west and one or two dust-storms are experienced in April.

The landscape is not very different from that characteristic of West Bengal, with a network of streams, numerous Bhils, ponds and marshes. They are, however, not so big as in the delta.

V. Sub-Tropical Moderately Wet

Although the humidity is high as in the rest of Pakistan, the rainfall is moderately heavy, under 80" falling to about 50" in the west. This region is broadest in the west along the boundaries of Bihar and West Bengal and

tapers towards the east. It includes practically the whole of the central part of East Pakistan. Dominated from the west this region has a climate most nearly approximating to continental in East Pakistan. On account of the differences in the amount of rainfall and the ranges of temperature this region may be divided into two secondary regions (i) East-Central and (ii) West-Central:—

(i) *East-Central*:—This region lies approximately to the East of Jamuna-Padma-Madhumati line (about long 90°E) in between the Tropical and sub-tropical wet regions, comprising the district of Dacca south-western part of Mymensingh, most of the eastern part of Faridpur and the northern part of Tippara and Backerganj districts. The rainfall is heavier than that of the western portion and average between $65''$ and $80''$. Spring and early summer rainfall is comparatively greater than in the west. The rainfall in April and May exceeds $5''$ and $10''$ respectively. The cyclones which originate in the Bay in Spring and autumn generally recurve to the east and cause a greater rainfall in this section. Thus not only the amount of rainfall is heavier but also the period of effective rainfall is longer than in the west.

Further away from the Continental influence of the West and more directly affected by the Sea, the temperatures are more equable in this region than in the west.

Naryanganj (Dacca) which may be taken as a representative of this region has a mean annual rainfall of $73.79''$ of which $68.69''$ falls between April and October and $3.63''$ in February and March. The rainfall is the highest towards the end of the monsoon season in August.

The mean maximum temperature quickly rises from 77.9°F in January to 92.4° in April and then falls gradually to 88.2°F in October, after which it goes down more steeply till January. Mean minimum temperatures are slightly higher than in the west. These are a little over 78°F from June to September, the highest being 78.9°F in July. There is a slight secondary maximum (in August or September) noticeable in mean maximum temperatures but the mean monthly temperatures are almost uniform being about 83.5°F from April to September. Mean monthly range increase towards the north-east.

(ii) *West Central*:—This region lies to the west of the region V (i) and is more extensive. It is elongated north and south and much dominated by the conditions in contiguous areas of West Bengal and Bihar in winter when

the winds are generally northerly or north-westerly from November till February. From May till September they are generally southerly and south-westerly. From March to May norwesters may traverse this area from the north or the west. During the period of the summer monsoon, from June to September, there is greater frequency of thunder than in the east, the number of days with thunder generally exceeds 4 in each month. Dust-storms are experienced in August and May. Compared with the eastern part the annual range of temperature is greater while the rainfall over most of the area is less. The mean annual and monthly range of temperature increases towards the west.

The main Central part of this western region includes the districts of Rajshahi, Pabna, Kushtia, Jessore and western part of Faridpur. Excluding narrow strips of land in the north and south the rainfall is generally between 50" and 65", least in East Pakistan. Like most other parts of East Pakistan the rainy season extends from April to October but the rainfall in each of these months is lower than that of any other part in East Pakistan. The variability of rainfall is greater than in other parts. There is almost complete absence of thunder and rainfall from November to January, excepting one or two little showers. The total rainfall for these months is less than three inches. Severe norwesters are experienced in May which generally come in the evening and last about an hour during which the rainfall is very heavy and thunder and lightning practically incessant. They sometimes cause a great damage.

As regards temperature, this region is more continental in character than any other part of East Pakistan. Both the annual and diurnal ranges of temperature are generally greater than in any other region. But the seasonal variations are quite limited and cannot be called extreme. At the utmost it could be termed moderately continental.

Jessore has a mean rainfall of 64.93" and Pabna 60.96". The mean maximum temperature for April is as high as 96.6°F at Jessore and 95.9°F at Pabna while the mean minimum for January for these stations is 49.2°F and 52.8°F respectively. It will be seen that the more southerly of these two stations is hotter in summer and cooler in winter.

Humidity remains high throughout the year, the lowest being 75 in March at both of these stations.

The narrow northern and southern strips where the rainfall is between 55 and 80" may be classified as sub-regions.

- (a) The northern strip comprising the southern part of Dinajpur and Rangpur and the north-western part of Bogra forms a sub-region in the north and transitional in character between the region IV and the main part of the west central region. Dinajpur and Bogra represent this sub-region. The mean maximum temperatures are high. At Bogra the mean maximum temperature for April is 95.6°F and the mean minimum for January 52.1°F. At Bogra the mean monthly range is a little over 10°F in July and a little less than 24°F in January.
- (b) Similarly the strip in the south, consisting of the northern part of the Khulna district, with a rainfall between 65" and 80", forms a transitional sub-region in the south. This sub-region is represented by Khulna. The mean minimum temperature for January is 55.2°F and the highest minimum is 78.9°F for June. The Mean monthly range for January is 23.3°F and for July 11.7°F. The mean minimum temperatures are higher than in the main region practically throughout the year while the mean maximum temperatures are slightly lower. This is obviously due to the nearness of the sea.

REFERENCES

1. Elliot. Climatological Atlas of India, 1906.
2. Climatological Atlas for Airmen, Poona, 1943.
3. Climatic Charts of India and Neighbourhood for Meteorologists and Airmen, Indian Meteorological Department.
4. Chatterjee. Bengal in Maps. Orient Longmen, Calcutta, 1949.
5. Williamson and Clark, The Variability of the Annual Rainfall in India. Q.J.M.S. Vol. 57, 1931.
6. Williamson and Clark. The Rainfall Regions of India. Geography, Vol. 16, 1931.
7. Frequency of Thunderstorms in India, Scientific Notes, Vol. I No. V Indian Meteorological Department, 1928.
8. Imperial Gazetteer of India. Provincial and general volumes.
9. District Gazetteers.
10. Statistical Data supplied by the Pakistan Meteorological Regional Directorate, Lahore and Chittagong.
11. Blanford. Climate and Weather of India, Burma and Ceylon.
12. Norwesters of Bengal, Technical Note No. 10, Indian Meteorological Department 1944.