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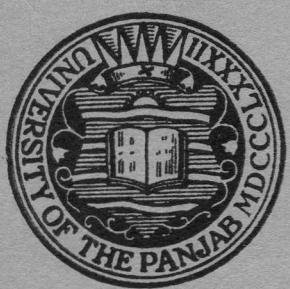

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CONTENTS

SOME PLANNING PROBLEMS IN EAST BENGAL

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PHYSIOGRAPHIC and hydrographic conditions in East Bengal are most peculiar. The nature and work of the deltaic streams, dozens of rivers, their distributories and redistributories, needs careful study. These rivers, with the exception of few, have a south-easterly course. A series of factors furnish partly complete and partly incomplete explanation. But the shifting of the rivers is a common feature of East Bengal's deltaic areas. The heavy silt load carried during the monsoon months gets deposited as bar plains and the rivers pass by them creating the appearance of braided channels. Water does not flow uniformly through these channels, which attain importance one after another, the main river is also found to shift. Thus throughout the history of East Bengal rivers have greatly affected settlements. The most recent example is the fast disappearance of large parts of Noakhli district headquarters by the waters of the Meghna.

The hydrographic conditions in East Bengal will also continue to play a most vital role in the development of transport and communications. The direction, reliability, and unnavigability of rivers constitute a decisive factor in both road and rail development. All building programmes of these land arteries would depend on comprehensive surveys of river facilities. Not only that, but industrial development, commercial routes and much of the town planning will have close dependence on the possibilities of rivers in East Bengal.

Demographic Aspects in Planning.

The study and knowledge of population is among the foremost problems of survey and planning in an area like East Bengal. No area of similar size in the world has either as many people or as high a density of popula-

tion per square mile of some of the thickly populated countries in the world are as follows :—Java and Madura (818), Belgium (712), Holland (687), Britain (545), Japan (501), Germany (414) Italy (359). China (324), Switzerland (262), Indo-Pakistan (214), France (197). Yangtse delta, the most-densely populated part of China has a density of 1350 in inner areas. By contrast the U.S.A. has, for example, no area where density exceeds 1350 except within the urban areas of largest cities. In China there are four cities with a population of over a million. In East Bengal within an area of 54,100 sq. miles are squeezed in no less than roughly 42 million people with an approximate density of 776 per square mile. Moreover densities of over 1,000 are found in such districts as Mymensingh, Dacca, Faridpur, Barisal, Noakhli, Tippera and Chittagong. Densities of over 1,500 are a common feaure of smaller areas within these districts and the staggering figure of nearly 3,228 to the square mile is reached in the Lohaganj *thana* of Dacca district. All this remarkable concentration and crowding of human beings occur in an area which grows a single food-grain, *i.e.*, rice as the sustaining crop. According to 1931 census figures the remarkably high density of population in some typical *thanas* of thickly populated districts is shown below.

Dacca (Keraniganj) 1974, Dohar 2049, Narayanganj 3010, Munshiganj 2329, Srinagar 1895, Tangibari 3044, Lohaganj 3228), Bakarganj (Bonaripara 1698), Tippera (Bancharampur 1622), Noakhli (Ramganj 1606), Faridpur (Palong 1640).

Various explanations of this immensity of numbers may be offered, most of which are of a economic character, bearing upon river economy. For example, population increases with prevalence of Aman rice and that crop itself increases in areas where inundation comes early and is widespread. Further 'Aman' is found more in the tracts of new alluvium, and population registers an increase with more jute lands and twice cropped areas. It is also found that orchards of coconut and betelnut garden also contribute to high density, as in Noakhli and Bakarganj districts. Indeed, such interesting yet complex problems would require detailed local surveys to venture more exact conclusion. There is, further, an immense rural population, there being only a single city (according

to 1941 census) namely Dacca, with over 300,000 people. There are no more than 4 towns with a population of 50,000 souls. The alterations in these figures since the partition have perhaps been noteworthy in certain cases, inflating the population of these towns, but that too does not materially change the over-all demographic picture. Population is constantly on the increase, it is unevenly distributed in certain respects, food resources do not seem to keep pace with this growth of number and the scope of emigration does not exist and inter-district redistribution, apart from being limited is conditioned by a host of physical and economic causes.

Therefore, it needs to be emphasised that in any development scheme, howsoever gigantic, the demographic consideration will be of vital significance. The regional survey will not only be concerned with the population from the ethnographic, historical, social, economic or political point of view but also more specifically with the spacial or distributional aspects as expressed in terms of several closely related features, such as numbers, density, distribution patterns and movements. From these facts arise problems of vital social, economic and political consequences. Further, it must be emphasised that the concept of numbers of people is an important one geographically, as there invariably exists a close relationship between a country or region's population and kind and intensity of land use prevailing there. For, it is obvious that facts of land utilization, and the stage of agricultural and economic development are closely related to population. The trend of population is also important *i.e.*, whether there is growth, stagnation or decline. In fact any treatment of population needs to be dynamic rather than static, for the rate of growth greatly affects its wants, institutions and cultural advance.

The Climatic Factor.

From the climatic point of view, too, a series of facts will have to be subjected to a survey, in the course of an over-all development of East Bengal. For example, the southern deltaic districts *i.e.*, Barisal, Noakhli, Khulna, Faridpur, Tippera, Chittagong and Dacca experience cyclones of varying intensity and apart from the annual incidence there have been occasions when these storms of terrific destructive power have brought much destruction

of life and property in their wake. The story of the famous 1795, 1872, 1876, 1897 and 1941 cyclones is there. Collection, classification, interpretation and illustration of such data will be of vital significance in architectural town and factory planning and transmission installation schemes.

Industrial Development.

Finally, among a host of planning problems which should be based on careful regional surveys, are those related to industrial development. In East Bengal it is not a task involving reconstruction but practically of beginning from the very beginning. There are many an important problem which deserves serious consideration. East Bengal's developed power resources are next to nil. Little oil has been struck and only a little coal is expected to be found. Therefore, her future lies with the development of hydel power. It is in this connection that the proposed Karnafuli power project looms large on the horizon. Of course, apart from the essential engineering point of view, the future of this scheme will have a close relationship with East Bengal's industrial development and its pattern. Unfortunately the source of power, the sublong or the Barkal rapids on the Karnafuli are located in a remote corner of the province ninety five miles from Chittagong, about 250 miles from Narayanganj and Dacca and are 350 miles from Mymensingh. Then power alone does not determine the location and more so the benefits occurring from industrialisation. Transmission of power over short or long distances, availability and transact relations of raw materials, labour and consuming areas and many other factors crop up. Interlinking of grids, by placing a chain of thermal stations and other alternative sources of power in other areas, would determine the desirable wide-spread and regional development of industry in East Bengal. A thorough and many-sided survey is essential.

The Problem of Jute.

Lastly, no mention of East Bengal's problems in this context will be complete without referring to jute or the popularly called 'golden fibre'. True, East Bengal produces 6 to 7 million bales annually *i.e.*, about 80 per cent. of world jute, and it is the major cash crop of the province. Thanks to the unfortunate economic back-

wardness very largely, a legacy of the past and the absence of any other rival means of earning foreign currencies and obtaining capital goods from abroad, jute talk file the nook and corner of Pakistan. But this 'jute-mindedness' sometimes reaches irrational limits. No doubt, jute industry in its many places is yet to be built up in East Bengal (it has only one modern press and no mills so far) and will assure a considerable financial prospect both for the state and the middleman and perhaps the peasant will also benefit to a lesser extent. But the future of jute is to be viewed at both from a long-range point of view and a short-term planning. It faces mainly three challenges *i.e.*,. substitutes, synthetic materials and production elsewhere. Substitutes like the Sida Retusa in Queensland, Australia and similar plants in South Africa though not yet of full stature rivals, may assume greater prominence in reasonable future The struggle against synthetic materials is already on and increase in Indian jute production has already been recorded, and latest announcements reveal that Soviet scientists have evolved new frost resisting varieties of jute which are already under production in Central Asia, Transcaucasia and the Kuban valley. Finally, conditions under which jute is cultivated bring disease, devitalisation and untimely death to the East Bengal peasant and in addition some of the most fertile food grain tracts being under the crop, a future curtailment of the raw material can well be expected with rising standards of life and growing food requirements. Will it be wise then to put all our eggs in one basket ? The whole problem is linked with the land and its people and needs thorough investigation and careful survey. The technological aspects of developing the jute industry is after all one aspect of a wider problem.

Apart from the detailed surveys, the collection of statistics under various heads is most essential to planning. During the last two years the Government Departments have not even revised certain useful publications such as the Large-scale Industrial Establishments, the Agricultural Atlas and other relevant sources of information and have not also rearranged secrecy about such publications or some meagre attempts at woefully inadequate bulletins.

In conclusion, it may well be emphasised that planning is a vital necessity, but wise planning is the very essence of it, and that in its turn, is all a matter of well organised scientific effort. I cannot do better than quoting from Burnham when he said in a similar context elsewhere, "make no little plans; they have no magic to stir men's blood and probably themselves will not be realised. Make big plans; aim high in hope and work, remembering that a noble, logical diagram once recorded will never die, but long after we are gone will be a living thing, asserting itself with ever-growing insistency. Remember that our sons and grandsons are going to do things that would stagger us. Let your watchword be "order and beacon beauty."

COEFFICIENT OF VARIABILITY OF MONSOON RAINFALL IN INDIA AND PAKISTAN

BY

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Introduction.

1. Variability of rainfall is an important climatic element. Various measures of variability have been employed by different workers. The one generally used is the mean variability calculated from the median or the arithmatic mean. Inter-quartile range is also sometimes employed. All these can give fairly good idea of the variability of rainfall for simple geographical or climatological purposes, but the results are affected considerably by slight variations in the samples on which they are based. In regions like the Indo-Pakistan subcontinent where there is a large variation in the amount of monsoon rainfall received in different parts, the simple coefficients such as those mentioned above do not give a very correct idea as the values of the coefficients depends upon the value of the variables themselves.

2. The coefficient of dispersion which is based on the whole series of data, which is not affected appreciably by slight variations in the sample and which can be used for mathematical analysis is the standard deviation. The standard deviation when expressed as a percentage of the mean to which it refers gives a relative measure of the variability independent of the amount to which it refers and is called the coefficient of variability.

Coefficient of variability of monsoon rainfall.

1. The coefficients of variability of monsoon rainfall for different divisions and subdivisions of Indo-Pakistan and Burma have been given by V. D. Iyer.* Those have been charted in figure 2 in which isopleths are drawn at

*1. *Rainfall of Siam.*—India Met. Deptt. Scientific Notes, Vol. V, No. 38, page 72.

intervals of 10 per cent. These coefficients are based on the average rainfall of a number of stations of climatologically non-homogeneous political subdivisions. This besides combining non-homogeneous populations, produces a damping effect on the dispersion. The periods of data of different stations in each subdivision are also not uniform due to which the divisional means of different years are not equally representative. These coefficients of variability of divisional mean rainfall were, therefore, not considered suitable for a thorough examination and it was decided to utilize the coefficient of variability of individual stations having long and reliable series or rainfall statistics and distributed uniformly over the Indo-Pakistan subcontinent. Such stations are not many and Shankar Narayan* had been able to select only 68 stations in the monsoon field : 6 stations in Western Pakistan which were not included in Shankar Narayan's work have been added in the present study. These stations represent the various orographic regions of the subcontinent and have a record of at least 60 years each. The mean rainfall, the standard deviation and the coefficient of variability for each of these stations are given in the table at the end.

2. The coefficients of variability have been charted in figure 1 and isoplethso drawn at intervals of 10 per cent. This diagram is essentially similar to the one prepared on the basis of coefficients of variability given by V. D. Iyer shown in figure 2, but it brings out the characteristic features of variability of the monsoon rainfall much more prominently. These are discussed below :

3. The coefficient of variability is less than 20 per cent in regions where the monsoon rainfall is heaviest, *viz.* (1) Kanara Coast, (2) East Central Provinces and the adjacent districts of Orissa, (3) In and around the Andaman Sea, (4) along the Arakan Coast and (5) along the Central Himalayas in these regions the rainfall is more or less orographic in nature. The sudden rise of the fresh monsoon air over the mountain ranges in the neighbourhood of these areas causes heaviest rainfall of the subcontinent. It may, therefore, be inferred that whatever may be the general condition of the monsoon

*2. Nature of frequency distribution of precipitation in India during the monsoon months, June to September. India Met. Deptt. Scientific Note, Vol. V, No. 55.

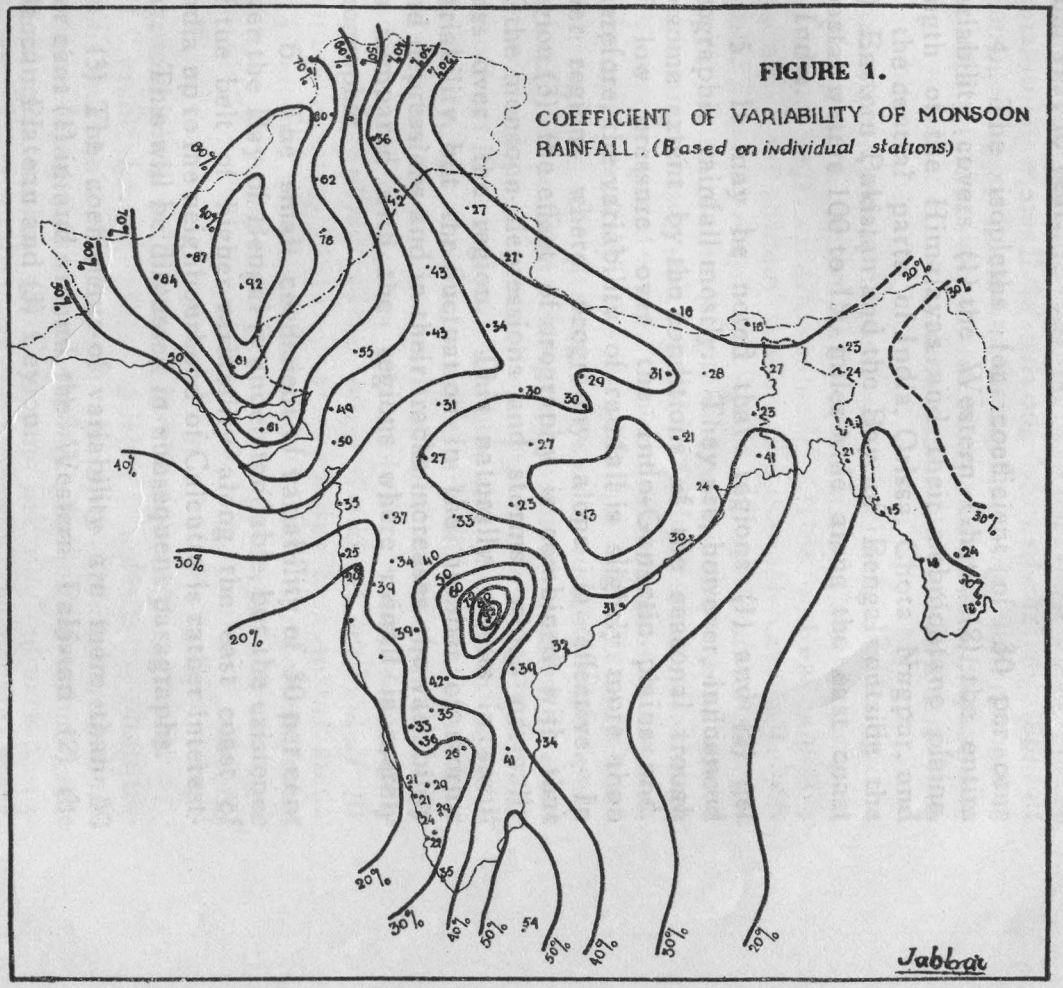
FIGURE 1.
COEFFICIENT OF VARIABILITY OF MONSOON RAINFALL. (Based on individual stations)
Jabbar

from year to year, *i.e.* whether it is strong or week over the rest of the field, the amount of precipitation under fixed conditions of orography does not very much beyond 20 per cent or in other words the moisture content of the monsoon current does not vary beyond 20 per cent from year to year.

4. The isopleths for coefficient of 30 per cent variability covers (1) the Western Ghats, (2) the entire length of the Himalayas and their submontane plains, (3) the central parts of India, Orissa, Chota Nagpur, and (4) Eastern Pakistan and the Bay of Bengal outside the coastal waters 100 to 150 miles wide along the east coast of India.

5. It may be noted that regions (1) and (2) get orographic rainfall mostly. They are, however, influenced to some extent by the conditions of the seasonal trough of low pressure over the Indo-Gangetic plains and, therefore, the variability of rainfall is slightly more than over regions where orography alone is effective. In region (3) the effect of orography is combined with that of the monsoon depressions and storms which normally pass over the region. This naturally results in small variability, but the fluctuation in the number of storms and depressions and in their tracks increases the variability as compared with the regions where rainall is merely orographic.

6. The small coefficient of variability of 30 per cent over the Bay of Bengal is understandable, but the existence of the belt of higher variability along the east coast of India up to the neighbourhood of Calcutta is rather interesting. This will be discussed in subsequent paragraphs.

(3) The coefficients of variability are more than 50 per cent (1) in and around the Western Pakistan (2) the Deccan Plateau and (3) Ceylon.

7. The monsoon rainfall in Western Pakistan, Gujerat, Rajputana and the East Punjab, is confined mainly to the occasions when Eastern depressions from the Bay of Bengal or Arabian Sea happen to reach these regions or when Western disturbances pass over Central Asia. Naturally, therefore, these regions come under the

influence of the dry North-Westernly air and/or the South-west monsoon. In some years very few Eastern depressions reach this region and the activity of Western disturbances is meagre. The monsoon current has but little chance to cause rainfall and the total rainfall of the season does not exceed even 50 per cent of the normal. In other years when the activity of Eastern depressions is more marked, the amount of monsoon rainfall is also copious and amounts as great as 150 per cent to 170 per cent or more being not uncommon.

8. The region (2) *i.e.* the Deccan plateu, has also a high coefficient of variability. This region is generally in the rain shadow of the Western Ghats, but sometimes the Eastern depressions in the months of June and September do affect this area. If a depression or a storm forms in the east central or the North-East A. S. the masoon air from the Bay of Bengal side goes to participate in these disturbances and causes quite heavy amounts of rainfall on the Eastern side of the Western Ghats, *i.e.* over the Deccan plateau. Similarly when depressions form or develop in the north-west angle of the Bay of Bengal, the line of convergence between the pure monsoon and the tropical air lies over the Konkan and the Deccan and quite heavy falls of rain are received. Again when the Eastern depressions from the Bay take a southerly course and move towards Gujerat the rainfall in the northern districts of the Deccan is quite heavy. When the conditions mentioned above are not fulfilled the amount of precipitation in the Deccan is unusually small. This explains the large coefficient of mean variability over the Deccan.

9. The third region of high variability of the monsoon rainfall is Ceylon. This is rather extraordinary, the stream turns in the upper air over Ceylon and the south. Bay of Bengal usually synchronises with those over the south-east Arabian Sea and from the scanty data for sea areas it is difficult to prove that the Bay of Bengal branch of the South-West monsoon always enters as a distinct current over the Bay and is not, in some years, obtained by the turning round of the southern portion of the A. S. branch. If, however, the Bay branch were obtained by the turning of the A. S. branch northwards on reaching the Bay of Bengal, the variability of rainfall should be

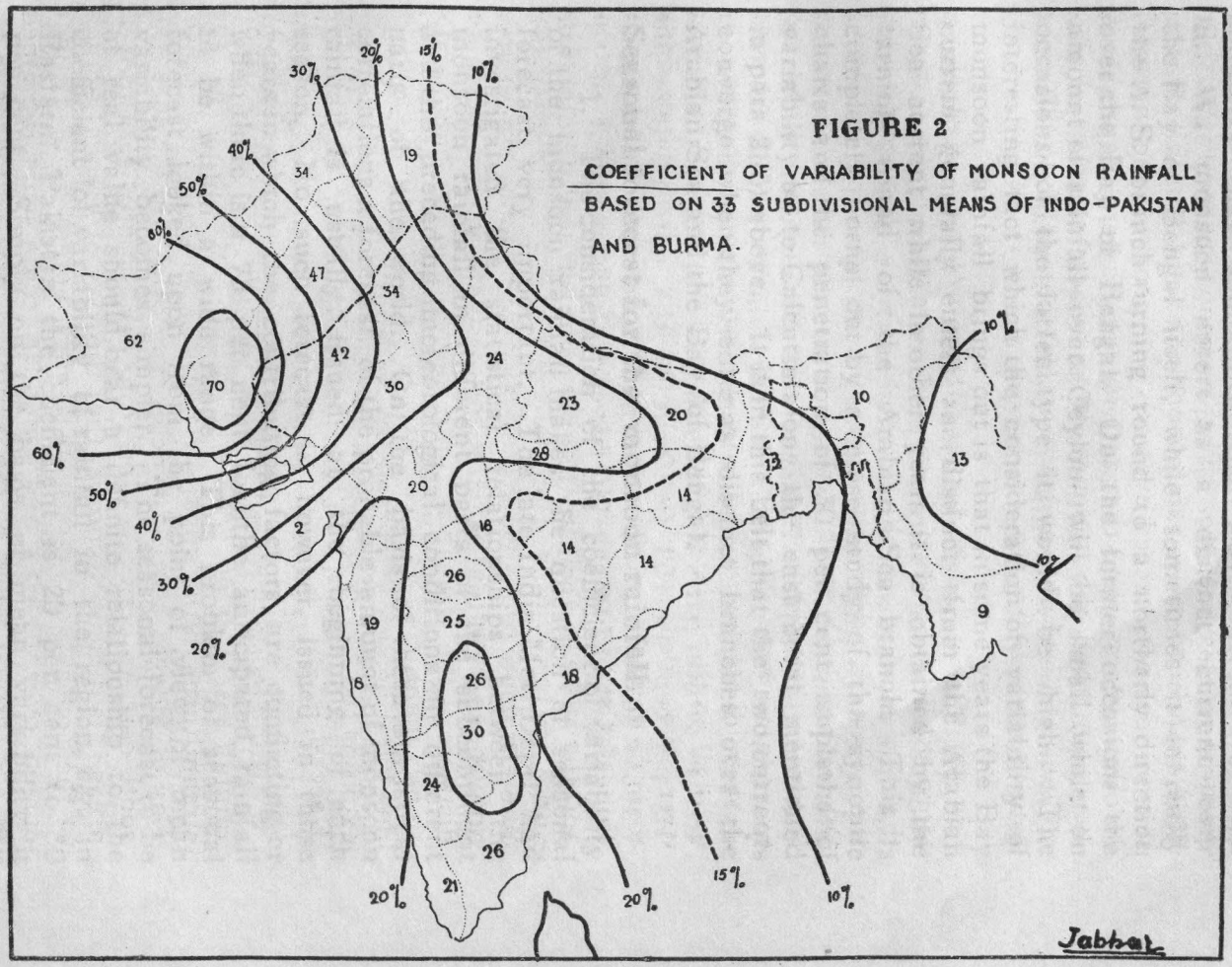
FIGURE 2
COEFFICIENT OF VARIABILITY OF MONSOON RAINFALL
BASED ON 33 SUBDIVISIONAL MEANS OF INDO-PAKISTAN
AND BURMA.
30%
20%
15%
10%
40%
50%
60%
34
19
47
34
62
42
70
30
24
23
20
28
10
13
20
14
2
18
14
14
26
19
25
9
8
26
18
30
24
26
21
20%
20%
15%
10%
Jabbar

small as on the Western Ghats and to the west of it. The large coefficient of variability over Ceylon clearly indicates that sometimes the Bay current of the S. W. monsoon enters as a distinct current over the Bay of Bengal itself, while sometimes it is really the A. S. branch turning round to a northerly direction over the Bay of Bengal. On the former occasions the amount of rainfall over Ceylon will be small while on occasions of the latter type it would be high. The interesting fact which the consideration of variability of monsoon rainfall brings out is that in some years the Bay current generally enters as distinct from the Arabian Sea current while in other years it is obtained by the turning round of the Arabian Sea branch. This is completely borne out by a close study of the synoptic charts and the penetration of 30 per cent isopleths of variability up to Calcutta along the east coast mentioned in para 2 (6) above. It is in this belt that the two currents converge when they enter as distinct branches over the Arabian Sea and the Bay of Bengal.

Seasonal forecast for the monsoon rainfall.

1. The consideration of the coefficient of variability of the monsoon rainfall makes the question of seasonal forecast very important. The late India Met. Deptt. had investigated the statistical relationships between the monsoon rainfall in different parts of the subcontinent and the preceding meteorological conditions in different parts of the world. On the basis of these statistical correlations a forecast of the probable amount of monsoon rainfall is usually issued at the beginning of each season. No such forecast is, however, issued in those years in which the contributing factors are conflicting or when there is a 75 per cent for the anticipated rainfall to be within a wide range. This problem of seasonal forecast looked upon from the point of view of mean variability becomes simpler. The seasonal forecast to be of real value should bear a definite relationship to the coefficient of variability of rainfall in the region, *e.g.* in Eastern Pakistan the coefficient is 20 per cent to 30 per cent. Simply on the basis of mean variability it can be said that there is a 50 per cent chance that rainfall in this region in any year will not be different from 80 to 120 per cent of the normal. If the seasonal forecast for monsoon rainfall in Eastern Pakistan is to be of any

value it should indicate the probable amount with greater precision. In Western Pakistan the coefficient of mean variability is 40 per cent to 70 per cent or more. A seasonal forecast to be of value in this region should, therefore, indicate—

(1) Whether the rainfall will be above normal or below it. This information will be useful to all those who have to plan their programme on the basis of this forecast such as Water Works or irrigation canals.

(2) The range of variation allowed for in the forecast should not be more than 40 per cent. If it is forecasted that the rainfall will be above normal we should be able to indicate a limit within 40 per cent by which it will be above normal. For instance, if we say that the seasonal rainfall in Western Pakistan will be anything from 100 per cent to 160 per cent of the normal, this will be no forecast at all because we know that there is 50 per cent chance that in certain parts it will not be beyond 100 per cent or 120 per cent to 160 per cent of the normal. For the forecast to be of any value we should be able to say that the rainfall will be say 140 per cent to 170 per cent of the normal or 70 per cent to 100 per cent of the normal and so on.

Floods and Droughts.

1. The problem of mean variability of rainfall has an important bearing on the question of floods and droughts and on problems of storage of water for irrigation and other purposes. In the late India Met. Department the years of floods and droughts were respectively defined as years in which the positive or negative departure of rainfall is double or more than double the mean deviation and a diagram of floods and droughts based on data from 1875 to 1940 was prepared. The diagram has been extended by the Pakistan Met. Deptt. to cover the period up to 1944. Frequency of floods and droughts in different divisions and subdivisions of India and Pakistan has been calculated from that diagram and charted in figures 3 and 4. A comparison of these figures with figure 1 shows that regions of small coefficients of variability are less liable to floods and droughts than regions of large coefficients of variability. The frequency of floods and droughts is based on data for annual rainfall, but the

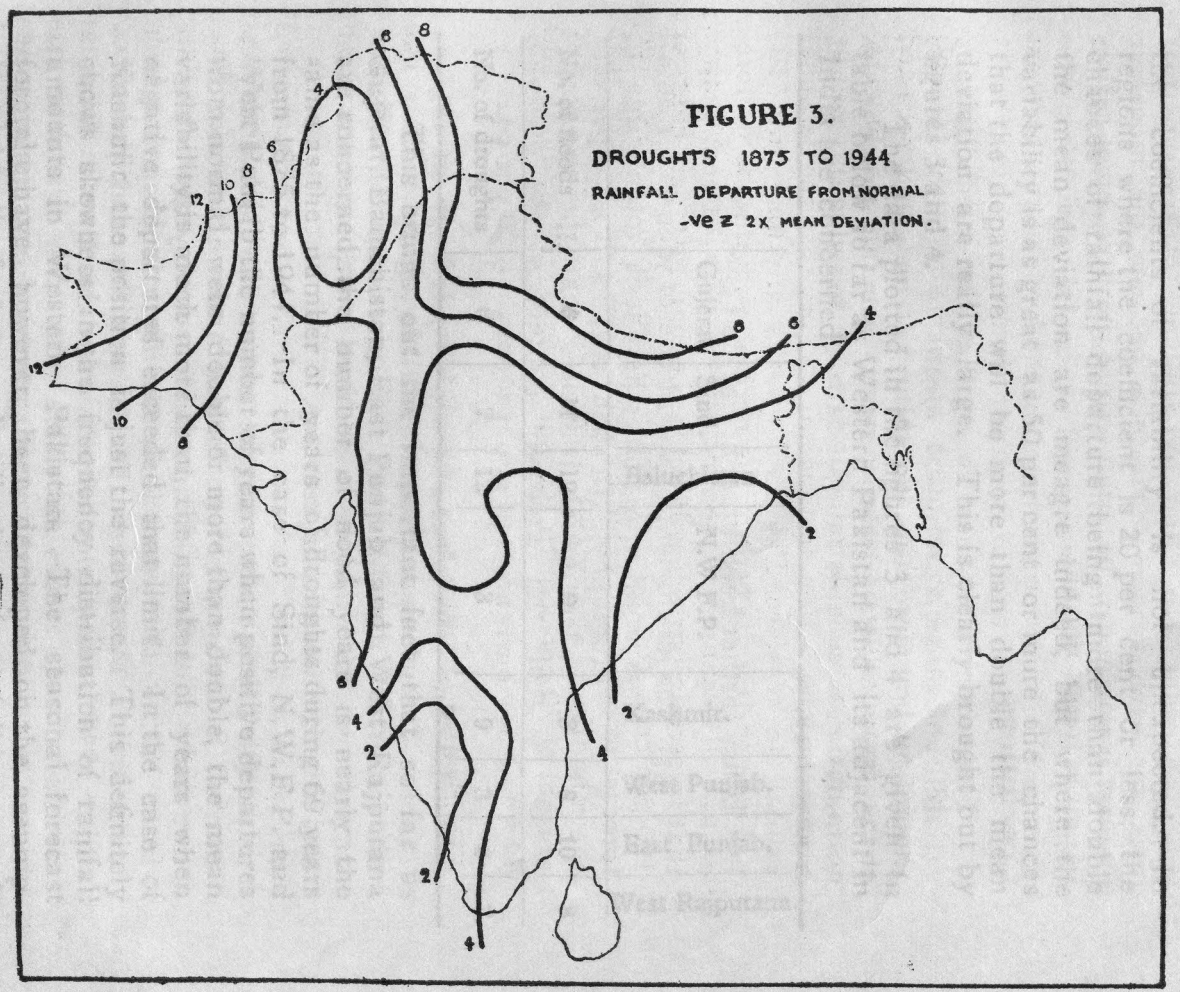
FIGURE 3.
DROUGHTS 1875 TO 1944
RAINFALL DEPARTURE FROM NORMAL
-ve Σ 2x MEAN DEVIATION.
6
8
4
6
12
10
8
12
10
8
6
4
2
2
4
2
6
4
2
2
4

coefficients of variability are only for the monsoon rainfall. As, however, the major portion of rainfall in the subcontinent is received during the monsoon period, the close correspondence between floods and droughts and the coefficients of variability is not unexpected. In regions where the coefficient is 20 per cent or less, the chances of rainfall departure being more than double the mean deviation are meagre indeed, but where the variability is as great as 50 per cent or more the chances that the departure will be more than double the mean deviation are really large. This is clearly brought out by figures 3 and 4.

The data plotted in the figures 3 and 4 are given in table below so far as Western Pakistan and its adjacent in India are concerned.

	Gujerat.	Sind.	Baluchistan.	N.W.F.P.	Kashmir.	West Punjab.	East Punjab.	West Rajputana.
No. of floods ...	6	11	12	9	3	8	10	8
No. of droughts	6	7	12	3	9	3	8	7

This brings out the important fact that so far as Gujerat, Baluchistan, East Punjab and West Rajputana are concerned the number of flood years is nearly the same as the number of years of droughts during 69 years from 1875 to 1944. In the case of Sind, N.W.F.P. and West Punjab the number of years when positive departures from normal were double or more than double, the mean variability is much more than the number of years when negative departures exceeded that limit. In the case of Kashmir the position is just the reverse. This definitely shows skewness in the frequency distribution of rainfall amounts in Western Pakistan. The seasonal forecast formulæ have, however, been developed on the assumption that the frequency distributions of rainfall amounts is normal, but the frequency of floods and droughts indicates that this is hardly the case. This conclusion can, however, not be taken as final because the forecast formulæ have been developed for the monsoon and the winter rains

separately and the flood and drought diagram are based on annual rainfall. Still, it is considered that the frequency distribution of rainfall in Western Pakistan should be rigorously examined by examining the moments of 1st and 2nd order, etc. and by applying other statistical tests for each season separately, because the monsoon forecast formulæ can be used only if the frequency distribution is found normal.

Conclusions.

The present study has shown that the coefficients of variability based on divisional means of rainfall do not give full insight into the variability of monsoon rainfall of the Indo-Pakistan subcontinent. For this purpose the examination of reliable rainfall data of individual stations is necessary.

It has further been brought out that :—

(1) The coefficient of variability of monsoon rainfall is small in regions where it is mainly due to orography. In such regions it is 20 per cent or less which indicates that the variability of the moisture content of the monsoon current itself is not more than 20 per cent.

(2) The coefficient of variability is large in regions where monsoon rainfall is scanty and where it depends upon the interaction of different air masses associated with eastern and western depressions.

(3) The monsoon current enters the Indo-Pakistan waters as two distinct Arabian Sea and Bay of Bengal branches in some years while in other years it is mainly one branch which blows over the Arabian Sea and just turns round northwards over the Bay of Bengal. In years in which the two branches are distinct the convergence between them occurs along the East coast of India from Ceylon to Calcutta. The coefficient of variability of monsoon rainfall is consequently larger in this belt comparatively to the areas surrounding it.

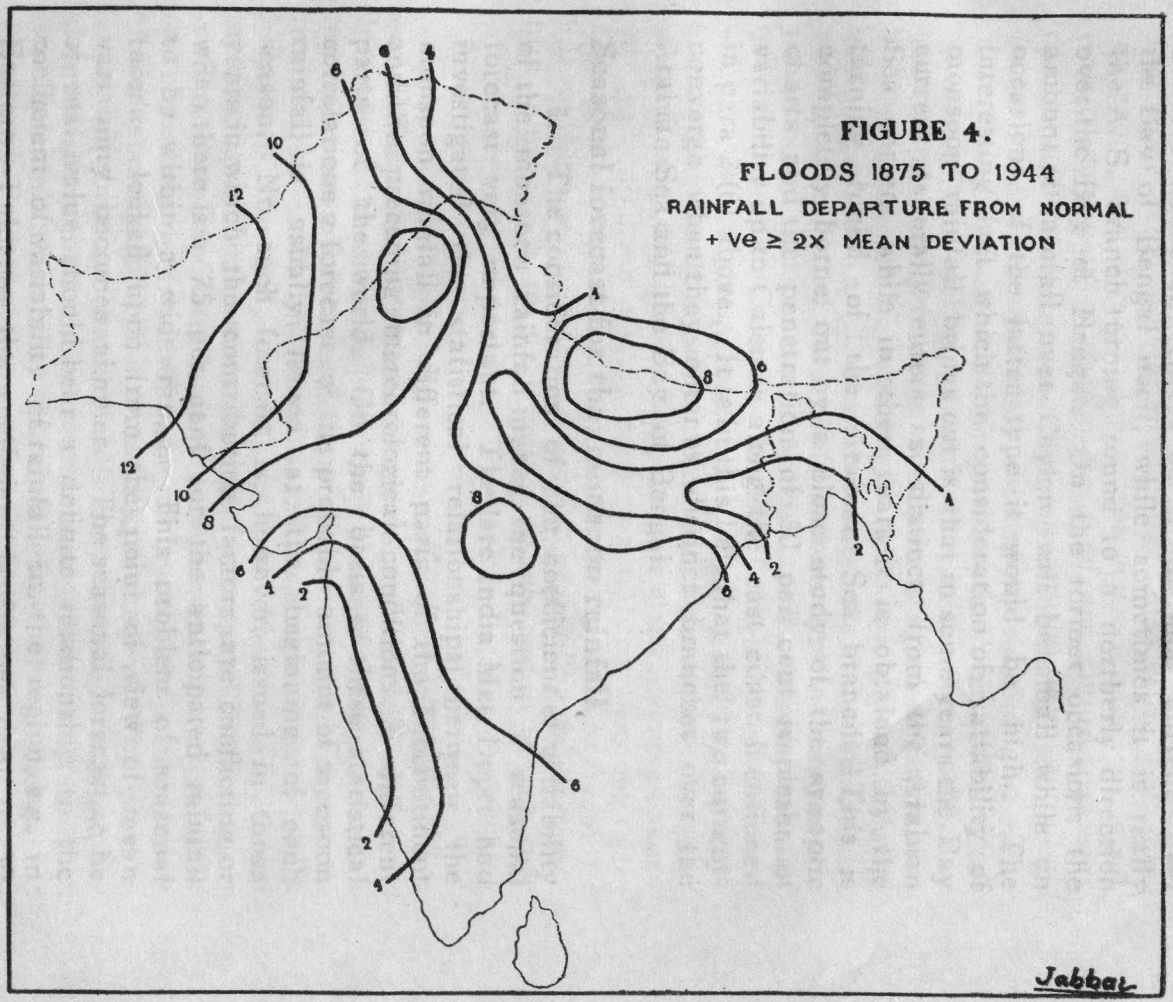
FIGURE 4.
FLOODS 1875 TO 1944
RAINFALL DEPARTURE FROM NORMAL
+ Ve ≥ 2X MEAN DEVIATION
Jabbar

(4) The limits of accuracy to be aimed at in seasonal forecasts of monsoon rainfall is to be determined by the coefficient of variability and should be well within the limits of the coefficients.

(5) There is close correspondence between the coefficients of variability of rainfall in a region and the number of floods and droughts experienced there. This information can be usefully employed in planning works like construction of dams, Irrigation Canals or Water Works, etc.

(6) There is an indication of skewness in the frequency of rainfall amounts in most of the divisions of Western Pakistan. This point requires rigorous examination before statistical methods can be satisfactorily employed for forecasting seasonal rainfall for Western Pakistan.

Normal Rainfall during the period June to September. Its standard deviation and coefficient of variation at 78 Stations in India and Pakistan.

Station	Latitude	Longitude	No. of years data used	Normal rainfall in inches	Standard Deviation	Coefficient of Variation
Surat ...	21° 12'EN	72° 52'E	63	38.66	13.26	34.53
Bombay ...	18° 56'N	72° 54'E	114	69.13	17.36	25.11
Mathiran ...	18° 59'N	73° 18'E	60	197.85	39.99	2.21
Ratnagiri ...	17° 8 'N	73° 19'E	74	94.11	20.54	21.83
Karwar ...	14° 48'N	74° 11'E	69	107.83	23.98	22.24
Mangalore ...	12° 52'N	74° 53'E	68	111.23	19.04	17.12
Tellicherry ...	11° 45'N	75° 32'E	68	105.46	22.64	21.46
Calicut ...	11° 15'N	75° 49'E	70	89.64	18.30	20.65
Ponnani ...	10° 47'N	75° 58'E	61	76.07	18.58	24.42
Palghat ...	10° 46'N	76° 42'E	68	58.10	15.80	28.91
Cochin ...	9° 58'N	76° 17'E	75	74.69	16.56	22.17
Trivandrum ...	8° 29'N	76° 59'E	79	30.01	10.38	34.58
Colombo ...	6° 56'N	79° 56'E	62	21.15	11.52	54.47
Poona ...	18° 31'E	73° 55'E	88	20.23	7.92	39.15
Belgaum ...	15° 52'N	74° 34'E	79	38.11	9.92	26.03
Shimoga ...	13° 56'N	75° 36'E	95	20.15	6.62	32.85

Station	Latitude	Longitude	No. of years data used	Normal rainfall in inches	Standard Deviation	Coefficient of Variation
Chitaldrug ...	14° 14'N	72° 26'E	62	12.32	4.35	35.31
Manantoddy ...	11° 48'N	76° 3'E	64	90.67	26.06	28.74
Malegaon ...	20° 32'N	74° 37'E	71	17.99	6.64	36.96
Ahmednagar ...	19° 5'N	75° 48'E	75	18.21	6.23	34.21
Bijapur ...	16° 50'N	75° 4'E	70	14.05	5.46	38.85
Bellary ...	15° 9'N	76° 57'E	78	10.06	4.21	41.45
Hassan ...	13° 0'N	76° 8'E	76	16.47	5.98	36.30
Bangalore ...	12° 37'N	76° 8'E	55	19.24	5.63	29.26
Akola ...	20° 42'N	7° 2'E	70	25.46	8.28	32.52
Hyderabad ...	17° 20'N	78° 30'E	67	8.51	7.00	82.26
Cumbum ...	15° 34'N	79° 9'E	62	14.32	5.63	39.32
Madras ...	13° 4'N	80° 15'E	119	15.13	5.14	33.97
Vellore ...	12° 55'N	70° 10'E	69	18.84	7.89	41.87
Balasore ...	21° 30'N	86° 58'E	72	45.06	10.98	24.37
Puri ...	19° 48'N	85° 52'E	74	38.37	11.62	30.28
Vizagapatam ...	17° 44'N	83° 23'E	65	22.05	6.88	31.20
Masulipatam ...	16° 9'N	81° 12'E	68	23.61	7.46	31.59
Dhamtri ...	20° 42'N	81° 36'E	64	46.61	6.15	13.2
Rewah ...	24° 31'N	81° 20'E	60	43.33	13.04	30.09
Nagpur ...	21° 9'N	79° 9'E	84	40.18	9.12	22. 9
Jubbulpore ...	23° 10'N	79° 50'E	84	49.84	13.60	27.28
Nowgong ...	25° 3'N	79° 30'E	64	38.90	11.64	29.89
Indore ...	22° 44'N	75° 50'E	64	30.72	8.14	26.50
Jalarpatanam	24° 36'N	76° 15'E	61	33.60	10.40	31.28
Calcutta ...	22° 32'N	88° 24'E	102	48.22	20.22	41.10
Berhampore ...	24° 6'N	88° 23'E	77	41.4	9.64	23.28
Ranchi ...	23° 23'N	85° 23'E	73	45.07	9.52	21.10
Monghyr ...	25° 23'N	86° 30'E	77	39.45	11.04	27.98
Patna ...	25° 37'N	85° 10'E	78	38.74	11.84	30.56
Allahabad ...	25° 28'N	81° 54'E	83	34.11	9.92	29.08
Agra ...	27° 10'N	78° 5'E	84	23.24	8.00	34.42
Jaipur ...	26° 55'N	75° 52'E	63	21.35	9.20	43.08
Hissar ...	29° 10'N	75° 46'E	81	12.81	5.52	43.08
Lahore ...	31° 34'N	74° 21'E	74	15.29	6.46	42.25
Gauhati ...	26° 11'N	91° 48'E	97	42.03	9.54	22.69
Cherrapunji ...	25° 16'N	91° 46'E	73	334.78	81.78	24.42
Dinajpur ...	25° 37'N	88° 40'E	73	56.82	15.32	26.98
Darjeeling ...	27° 3'N	88° 18'E	69	99.32	15.58	15.68
Katmandu ...	27° 42'N	85° 12'E	79	43.81	7.22	16.48
Almora ...	29° 35'N	79° 41'E	88	30.61	8.14	26.59
Simla ...	31° 6'N	77° 13'E	70	48.67	13.14	26.99
Karachi ...	24° 51'N	67° 4'E	76	5.76	2.90	50.35
Bhuj ...	23° 15'N	69° 49'E	69	13.00	7.90	60.77
Dacca ...	24° 14'N	72° 13'E	74	22.75	11.12	48.88
Ahmedabad ...	23° 2'N	72° 38'E	69	23.64	11.76	49.75
Port Blair ...	11° 41'N	92° 45'E	64	66.83	11.94	17.86
Mergai ...	12° 27'N	98° 35'E	67	18.36	16.84	14.23

Station	Latitude	Longitude	No. of years data used	Normal rainfall in inches	Standard Deviation	Coefficient of Variation
Rangoon ...	16° 47′N	96° 13′E	61	76.85	12.30	16.00
Prome ...	18° 48′N	95° 18′E	62	33.78	8.06	23.86
Sandoway ...	18° 28′N	94° 25′E	68	185.11	29.58	15.98
Akyab ...	20° 7′N	92° 57′E	72	170.45	25.72	15.09
Chittagong ...	22° 21′N	91° 50′E	75	77.56	16.98	21.89
Peshawar ...	34° 02′N	71° 37′E	80	4.60	3.61	78.44
Quetta ...	30° 12′N	67° 00′E	62	1.09	.95	87.16
Kalat ...	28° 58′N	66° 28′E	56	1.19	1.00	84.03
Jacobabad ...	28° 17′N	68° 29′E	77	2.53	2.33	92.09
Multan ...	30° 12′N	71° 21′E	...	4.92	3.85	78.25
D. I. Khan ...	31° 51′N	70° 56′E	78	4.99	3.11	62.32
Rawalpindi ...	33° 37′N	73° 06′E	81	22.08	7.89	35.74
Jodhpur ...	26° 17′N	73° 04′E	64	12.29	6.75	55.00
Hyderabad (Sind)	25° 23′N	68° 24′E	76	6.13	5.03	82.05

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A POLITICO-REGIONAL PLAN

BY

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AS the constitution for or new State of Pakistan is being framed, a controversy has naturally arisen about the future set-up of the Government of the two sections of Pakistan. The problem needs very careful and thorough consideration as on it rests the future welfare and progress of the people, the peace of the country and the efficiency of the administration. This question should not be left as the exclusive concern of the lawyers, parliamentarians or politicians. As it affects so vitally all the people of the State, it would be proper that it should be the result of a co-operative effort and that any contributions to it by any group or set of people should get due consideration. We here, in the University, form an academic group devoted to the search for and profession of truth and investigation of problems with a scientific approach and an unbiased mind. Let us take this problem in the same spirit and work out a solution free from racial or regional influences and party or vested interests. Geographical, economic and social conditions of today should determine our administrative planning for tomorrow, keeping in view the attainment of the best and highest of our ideals. In any constitution that we may frame there should be adequate safeguards against inefficiency and corruption, the two principal enemies of the State, and full and equal opportunity for justice and fairplay, the two chief pillars of any Government.

There are certain geographical factors which must of necessity be given proper thought, before we make any attempt to draft a constitution.

(*i*) Pakistan consists of two units commonly known as West Pakistan and East Pakistan. West Pakistan has an area of 306,977 square miles and a population of only 30,258,000 persons. East Pakistan has an area of 54,030 square miles and a population of 41,845,000 persons.

In other words, East Pakistan which is one-seventh in area has about four-sevenths of the population. The total population of West Pakistan which includes four Provinces and several States is a title over two-thirds of the population of the Province of East Bengal.

(*ii*) West Pakistan is separated from East Pakistan by over 2,500 miles by sea, a distance almost equal to that from Karachi to Suez.

(*iii*) The capital of Pakistan is located in West Pakistan, the population of which is less than that of East Pakistan but which is militarily and economically more important.

Considering these geographical factors together, we are faced with a position unique in the countries of the world—one unit (the Province of East Bengal) lying at a distance of about 8 sea-days dominates the rest of the country from the view-point of the counting of heads which should constitute a feature of vital importance in a democratic constitution.

(*iv*) Considering West Pakistan alone, it stretches over a territory more than a 1,000 miles in length from north-east to sourth-west and about 600 miles in breadth in the south. Its total population is about equal to that of the Province of undivided Punjab. It is less than three-fifths that of the United Provinces. Baluchistan which is about equal to East Bengal in area has less than one-eighteenth of its population.

(*v*) While West Pakistan is predominantly Muslim, East Pakistan has important non-Muslim minorities which represent about 30 per cent of the population. East Pakistan is linguistically and culturally (if we ignore the religious aspect) different from West Pakistan.

(*vi*) West Pakistan and East Pakistan consist of diverse geograhical regions. Climatically, hydrographically and ethnographically they are quite different. Within these two regions

the East Pakistan has on the whole a much greater geographical unity. But in West Pakistan while there is a wider general unity marked by the contiguity of its land, bounded together by the Indus and its tributaries, extensiveness of the plain area, aridity of climate, identity of faith, there are found regionally important diversities in orographic, climatic as well as in human and economic conditions. Elongated north and south over a distance of more than a thousand miles, the functional location of its constituent parts varies and needs particular consideration. These geographical facts are to a certain extent recognised in the division of the area into four Provinces, though the divisions are not strictly geographical.

In any constitution that we may propose to frame we can neither ignore the facts of geography nor the political aspirations and administrative aspects which the division of the area into separate Provinces for the last so many years has fostered.

Suggestions have been made for the amalgamation of the Provinces of West Pakistan into one administrative unit and federating it with East Pakistan as another unit. It has been argued that this is the best way of curing the bane of provincialism and removing the social and economic inequalities prevailing in the country. This proposal has been opposed by others as anti-democratic which may lead to totalitarianism and dictatorship. It has also been asserted that the Muslim League is already committed to the autonomy and self-determination of the Provincial units.

The best constitution for us shall be one which accommodates these various considerations in their proper perspective. It is, therefore, to be examined whether our objective will be best achieved by (*i*) the creation of almost wholly autonomous provinces and federating them in a weak centre; (*ii*) the creation of a unitary Government and the abolition of the Provinces; (*iii*) the creation of Provinces partly autonomous and surrendering part of their autonomy to a strong federal centre or (*iv*) the

creation of one autonomous administrative unit for West Pakistan and the other similar unit for East Pakistan and federating the two.

Alternative (*ii*) a unitary Government and the abolition of provinces is not feasible on account of the great distance between the two main units. Therefore unitary form of Government is rightly ruled out in the Objectives Resolution already adopted by the Constituent Assembly. The fact that the capital of the country lies in the distant extreme south-west of the Indus valley, does not favour purely a unitary form of Government even for West Pakistan.

In the choice from the remaining three alternatives it is not the East but the West Pakistan that presents difficulties. We have to make up our mind whether or not the provinces are to be retained. If they are to be abolished, how to satisfy the regional needs and aspirations. Geographical considerations neither favour extreme concentration nor complete decentralisation. Geographical conditions and economic relationships among the various parts and regions as well as demographic, ethnographical and social considerations preclude the adoption of any one of the three alternatives in its entirety. The best way lies in incorporating the useful aspects of all the three alternatives and choosing the middle course. On this basis I beg to suggest a politico-regional plan with a three-storey constitution—(*i*) Federal, (*ii*) Zonal and (*iii*) Regional, with the middle storey, the Zonal constitution being the main plank of the structure.

Zonal.

(*a*) For each of the two zones of West and East Pakistan there shall be an autonomous zonal Government, with residuary powers vesting in each, exercising control in all matters except those specified as of international or inter-zonal importance and falling under the direct jurisdiction of the Federal Government. Provision shall, however, be made entitling the Federal Government to give such advice and guidance as it may deem fit and to exercise such supervision as is necessary for the sake of the efficiency of administration and the co-ordination of the activities of the two zones.

(*b*) Each zone shall be under the executive control of a separate Governor, to be appointed by the Amir-e-Pakistan (the Head of the State).

(*c*) There shall be a legislative assembly and a cabinet of ministers responsible to it. The Governor shall have the power of dismissing any minister or the cabinet and dissolving the assembly, with the approval of the Amir-e-Pakistan.

(*d*) The cabinet shall include a minister for each regional unit selected from amongst the elected members of the legislature of that unit. Such other ministers may also be appointed as may be required from time to time.

Regional.

(*a*) The Provinces of West Pakistan with their present set-up in respect of legislatures and administration should be abolished. There should instead be established regional units of administration more or less corresponding to the present Provinces with such adjustments in their boundaries as is desirable for administrative convenience, cultural affiliation and economic relationship. For example, the trans-Indus district of Dera Ghazi Khan should be transferred to Baluchistan and the trans-Indus tehsil of Isa Khel (District Mianwali) to N.W.F.P. and the Hazara district to West Punjab.

(*b*) Each regional unit shall also be an administrative unit with a separate cadre of services for various departments, the principal officers of which shall be selected from the Central services and be transferable from one regional unit to another.

(*c*) Each regional unit shall have an advisory council, consisting of all the members of the zonal legislature from the unit. The minister of state for the region in the zonal cabinet shall be *ex officio* president of the council. This council shall advise the zonal government on all matters concerning that regional unit.

(*d*) Each regional council may set up Advisory Boards for various subjects to which members of the council may be elected on the basis of proportional representation and in addition specialists may be nominated to

it by the zonal government. Regional heads of the departments shall function as *ex officio* secretaries to these boards.

Federal.

(*a*) There shall be federal Government at the centre with a republican constitution exercising direct control over certain subjects such as defence, foreign relations, communications, international trade and coinage and such powers as will enable them to co-ordinate and guide the zonal government in other subjects under conditions to be specified.

(*b*) The federal Government shall consist of Amir-e-Pakistan, a Parliament with two Houses, the lower one to be called *Jamiat* and the upper one to be called *Majlis* respectively, and a cabinet of ministers appointed by the Amir, but responsible to the Jamiat.

The Jamiat shall consist of about 72 members (one member for 10 lakhs) elected directly on adult suffrage.

The Majlis shall have a membership about two-thirds that of the Jamiat. Its members shall be elected on the basis of territorial and functional representation and shall include : (*i*) representatives of West and East Pakistan elected by their zonal legislatures, (*ii*) representatives of the States acceding to Pakistan elected by their legislatures and if no such body exists, in such other manner as may be prescribed and (*iii*) representatives elected by the special vocational constituencies established for the purpose, provided that the number of such persons shall not exceed one-fifth of the total membership, (*iv*) persons nominated by the Amir who shall not exceed one-fifth of the total membership.

Bills may be initiated in either House and if passed by the other House shall become law on receiving the assent of the Amir. The Majlis may not initiate or amend money bills. In the case of disagreement between the two Houses, if it is not resolved within a certain prescribed period, the Amir, if he deems fit, may convene a joint meeting of the two Houses for a final decision.

(*c*) The Amir-e-Pakistan shall be the Head of the State and shall be the Commander-in-Chief of the Army,

navy and air forces. All executive powers shall vest in him. He shall discharge his functions with the advice of his ministers. He shall have the power to appoint or dismiss (*i*) ministers of the cabinet, (*ii*) all civil, military, judicial, administrative and political officers of the federal services in such manner as may be prescribed by law. He shall also have the power to make short-term appointments like those of ambassadors or governors, trade commissioners on the advice of the cabinet.

The Amir shall have the power to summon, prorogue and dissolve Parliament. He shall have the power of assenting to or withholding assent from the bills passed by the Federal Parliament or zonal legislatures. He shall have the power to send drafts of bills to Parliament for consideration and to return the bills for amendment to either House. On the advice of the cabinet, he shall have the power to issue ordinances for a period of not more than six months subject to their renewal under emergent conditions.

Election of the Amir-e-Pakistan.

(*d*) Each zonal legislature of West and East Pakistan shall duly propose three representatives for election for the office of the Amir. The names of the representatives so proposed shall be presented to the legislature of the other zone for support. The name of such of the representatives as are unable to get the support of at least 30 per cent of the members of the other zonal legislature shall automatically drop for want of support. The names of such persons who are duly proposed and properly supported shall be presented to the joint sitting of the two Houses of Parliament for final election. The candidate who secures absolute majority shall be declared elected, it may be by second ballot or even third ballot.

The Amir shall hold office for five years and shall not be eligible for re-election unless he is elected unanimously by the two Houses at the next election. The office of the Amir shall not be held by a representative of a particular zone for more than two consecutive terms.

(*e*) The ministers of the Cabinet shall be appointed by the Amir on the advice of the leader of largest party in the Jamiat from amongst the members of the Jamiat.

Deputy Ministers may be appointed from amongst the members of the Majlis.

(*f*) The Amir, ministers, all officers of the Government and members of the legislatures shall be equally subject to the ordinary law of the land.

(*g*) The President of the Jamiat shall be *ex officio* Naib-Amir. He shall act for the Amir during the period when the office falls or remains vacant.

(*h*) All judicial powers shall finally vest in the Supreme Court (Adalat-e-Alia), which shall be independent of the executive. The Judges of the Supreme Court shall be appointed by the Amir from amongst a panel of names recommended by the cabinet, subject to such restrictions and qualifications as may be prescribed by the legislature. The Judges of the Supreme Court shall not be removable except in such manner as may be prescribed on the joint petition of the two Houses of Parliament. They shall retire at the age of 65 years. There shall be a High Court for each of the two zones and Chief Courts may be established for regional units.

The Judges of the High Court and Chief Courts shall be appointed by the Amir on the recommendation of the Supreme Court.

(*i*) There shall be a statutory provision for a permanent State Economic Commission, the functions of which shall be (*i*) to watch the existing economic conditions of the country and to give the necessary advice to the Government, (*ii*) to direct the execution of economic plans formulated and (*iii*) to formulate plans from time to time for the continuous economic progress of the country.

(*j*) There shall be a statutory provision for minority boards in West and East Pakistan. They shall consist of representatives of the minorities, chosen by the minority members of the legislatures. Seats should be reserved for minorities as a whole in the legislature and services. They may be given the option of joint or separate electorate.

SOME ECONOMIC ASPECTS OF FISHERIES IN EAST BENGAL

BY

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EAST Bengal possesses a great natural wealth in her vast fisheries which, if properly looked after and judiciously exploited, are capable of immense expansion. The extensive water bodies of the province—inland, estuarine and marine—provide varied habitats, suitable for the growth of a large number of species of that finny tribe which is highly esteemed as an important ingredient of daily meals all over the province, since it forms a valuable addition to a diet, the staple of which is rice. The principal grain diet consisting of boiled rice is particularly deficient in nitrogen, phosphorus and animal fat, all of which are essential in the dietary of the people. In the general unfamiliarity of the mass with meat, milk, butter, etc., which are considered more or less as delicacies in this part of Pakistan, fish not only provides a comparatively cheaper and readily available source of protein and vitamin but also adds relish and nutrition to the otherwise poor and insipid meal.

Negligence of fisheries in the past.

Notwithstanding the vital part which the fisheries of East Bengal have been playing from time immemorial in her economic and dietatic life as an important source of her food requirements, the people always looked towards the problem of their conservation and development with an apathetic attitude. This, instead of contributing to her prosperity as they do in most other countries supplying an important food to the people and furnishing employment and occupation to many, has resulted in the gradual depletion and deterioration of the fisheries of this province, especially the fresh-water ones. Not only has Nature's great gift in her fishery resources not been given such attention as would seem just and essential in comparison to that bestowed upon agriculture, the fishing industry has almost been left to its fate, so that it remains primitive and wholly unsatisfactory from catch to sale

even at the present day and can hardly supply the bare requirements of the people.

Geographical Aspect of Fisheries.

Fisheries of East Bengal offer innumerable problems of diverse nature. The influence of environment, organic or inorganic, is so great on fisheries, like some of the allied industries, that an analytical and synthetic study of fisheries with the application of geographical propositions will result in the revelation of many curious facts, hitherto unknown or unexplained. Geographical factors, such as location, topography, hydrology, climate, vegetation, etc., will be found to be affecting almost all the aspects of the fishing industry, *viz.*, distribution, breeding and growth of fish fauna, the production and transport, marketing and consumption of fish and its utilization for valuable by-products. Even the socio-economic aspects of fisheries are, though not directly, at least imperceptibly influenced by them. The geographical conditions affecting the production and trade as well as the human side of the fishery problems most needs be studied in the past as well as the present so that their changing nature may be appreciated and future possibilities foreseen.

Physical Environment.

Except a narrow hilly tract towards the east, physically the whole of East Bengal belongs to the deltaic region of the three mighty rivers of the Indo-Pakistan sub-continent, the Ganges, the Brahmaputra and the Meghna, which together with their tributaries and innumerable distributories form a veritable network all over the province. Besides the large number of perennial streams, the South-West Monsoons bring copious rains and cover the major part of the province with a vast sheet of water for the greater part of the year, thus providing an ample space where large number of fish of various species can thrive. The shallow nature of the Bay of Bengal, with the tongue of the deepest sea, "Swatch of no ground", extended towards the Sundarbans coast and a large number of distributories of the hydra-mouthed Ganges carrying nutrient salts and discharging immense volume of water into it, thereby lowering its salinity on the whole is a favourite haunt of a large variety of marine fish.

Extent and Types of Fisheries.

The total area of the fisheries of East Bengal may be estimated including the marine fisheries of the Bay of Bengal and excluding the tanks and jheels, fisheries for which there are no statistics available, although they constitute a very important source of food fish in the province, to be approximately in the dry season as follows :—

Bay of Bengal	...	26,000 square miles
Estuaries	...	3,565 square miles
Rivers, streams, etc.	...	1,500 square miles
Total	...	31,065 square miles

Unique among the provinces of the Indo-Pakistan subcontinent, more than a third of the extent of this province, at any rate in the lower Bengal, is comprised of water areas, and during the rains, the whole country is flooded by a vast sheet of water, turning it into a large fishery, thus multiplying the virtual fishery area many times.

Although certain species of fish—the cattle of water-bodies—are known to adapt themselves in two or more habitats and fished in all of them in considerable quantities, it has been found in majority cases that only some fish species can flourish in particular waterbodies. The environment or habitat, as we understand in the geographical sense, is the prime factor, governing the life and activities of all living beings. The characteristics and bionomics are determined in case of fish fauna by a number of factors, chief amongst them being the nature of water, in which the fish grow and flourish, whether confined and stagnant or flowing and open, the chemical properties of water whether fresh or brackish or saline, the situation of the waterbodies, whether they are situated inland, or constitute parts or whole of the open sea, or are located in the plains or in upland or in the estuarine region. Marine biologists are aware how the influences of various habitats are reflected on the life, bionomics and other well marked characteristics of different genus and species of fish.

East Bengal waters provide wide environmental contrasts with varied physical features. The hill streams

with torrential falls, the long broad and placid rivers with extensive deltaic and estuarine systems, salt lakes, backwaters and tanks, marshy, sandy or rocky coast, combed by the extension of a large number of tidal rivers, canals and creeks and lastly the funnel-shaped Bay of Bengal provide suitable environments for the growth of a large number of fish species. The fisheries of East Bengal may conveniently be classified into fresh-water, estuarine and marine fisheries, according to the types of environment where particular species of fish thrive most.

Fresh-water Fisheries.

The extensive fresh-water fisheries distributed all over East Bengal is the most important source of fish supply in the province. The innumerable rivers, canals and streams, 'jheels' and tanks, etc., constitute the freshwater fisheries of the province, where not only the fresh-water species of fishes breed and thrive, but some of the migratory fishes in search of food or breeding ground ascend in large numbers during the rains, when much of the salinity of foreshore areas are neutralised with the inflow of fresh water. A true fresh-water fish lives entirely in fresh water both in the young and adult stages, and never goes to the sea. But the anadromous fishes, like the Hilsa (the Indian shad) which are essentially marine, but ascend up the rivers during the monsoons, and the catadromous fishes, such as the eel, which are essentially fresh-water forms, but descend into the sea, cannot be regarded as true fresh-water species, in spite of the fact that both are fished in large quantities in the inland water-bodies. Of the various species of fresh-water fish, special mention may be made of the Carps (Cyprinidae)—Rohu (Labeo rohita), Katla Catla (buchanani), Mrigal (Cyrrhina mrigala), the Cat fishes—Boal (Wallagu attu), Ar (Microne Aor), Singhi (Succobranchus fossilis) the snake-headed fishes—Sol (Ophiocephaius striatus), the fresh-water mullets, the migratory marine or estuarine fishes, such as Hilsa (Clupea) and Topsi or Mango fish (Polynamous paradiseus) and various species of molluscs, turtles and sharks.

Estuarine Fisheries.

Next to fresh water areas, the estuaries furnish the best fisheries both in extent and prolificness. The numerous deltaic rivers fall into the Bay of Bengal forming the

great estuarine fisheries along the sea shore, extending from the Raimangal river in Khulna district to the Gulf of Tekka touching Cox's Bazar in the southern extremity of Chittagong district. The comparatively low salinity of the waters of the Bay of Bengal, being constantly dilated by the great fresh-water effluents from three sides, and the gradual changes from the markedly low saline waters of the Bay to the fresh waters of the rivers beyond tidal limits facilitates along this highway the immigration of marine forms into fresh-water areas by gradual adaptation to the transitional conditions of existence in the estuaries. Hence both marine and fresh water varieties can be found here and due to rich planktonic food in this region, a very dense piscine population is the outcome.

The most important estuarine fishery of this province is in the Gangetic delta, comprising the Sundarbans, in the Khulna and Bakarganj districts. A vast tract of swamps, thick jungles and innumerable water channels and creeks, the whole region is subject to tidal action and occupies an area of about 3,565 square miles. The Sundarbans, locally known as the " Bada " have been very aptly described as a tangled region of estuaries, of rivers and watercourses enclosing a vast number of islands of various sizes and shapes. The whole region is teemed with a large number of valuable fishes and crustacea and the major portion of the " Bada " area still remains unexplored for want of enterprise and proper transport facilities. The most important variety of fishes and crustocea usually caught in the estuarine region are Bhetki, Hilsa, Lotya, Mango fish, various species of prawns, lobsters and crabs, hangars, sharks and rays.

Marine Fisheries.

The coast line of East Benal is intersected by numerous rivers and estuaries, the mouths of which, with a few exceptions, are obstructed with sandbanks, making the passage of vessels of even of small draught difficult. It is an uninhabited belt of lowlying swamps and dangerous jungles infested with tigers, crocodiles and venomous snakes, and often with a fringe of dunes, varying in height from 10 feet to 20 feet. The most serious defect that overwhelms the whole coast is the absence of even tolerable harbours, where fishing boats can find refuge in rough weather. But the remarkable fact about the coast is that

a series of elongated and shallow sand banks or 'char' formations at the mouths of the innumerable estuaries do nowhere exceed three fathoms in depth and that they all converge on either side towards the "Swatch of no ground". At its head is situated an extensive but almost uniformly shallow region, about 600 square miles in area, known as the "Argo Flat", formed in the main by the Passur and the Haringhata rivers. The main foreshore fisheries of the Province are carried on in this flat by the numerous big fishermen settlements along the Sundarbans coast, especially at Dubla islands, Rangabali, off the Passur and at Baisdia. Off the coast of Chittagong, near Maheshkali, Sonadia, Kutbdia and Cox's Bazar, there prevail similar topographical conditions, although less extant in area.

The deep sea fisheries of East Bengal are unfortunately up till now almost entirely neglected and remain practically unexploited and virgin. The Bay of Bengal is regarded as one of the best fishing grounds of the world, having great potentialities and capable of much expansion. The exploratory researches carried by Sir K. G. Gupta, Dr. Travis Jenkins and Colonel Alcock in the early decade of this century and the Japanese enterprise in the Bay just before the outbreak of the last War justifies the right presumptions of the vast piscine resources that the Bay hold. The sea perches, sillage and pomfrets of different species, mango fish, ribbon fish, yellow tails, soles and founders, crabs, prawns, lobsters and economically important sharks, skates and rays are the more important varieties that are fished in the marine fisheries at the present day.

Production of Fish.

In Eastern Pakistan, no production figures or estimates of catch could yet be made available. It has, however, been estimated by the Agricultural Marketing Department of East Bengal that the annual consumption in this province would be about 26,534,000 maunds, and the total exports of fresh fish are 482,000 maunds. In addition, approximately 10,000,000 maunds of dry fish are produced in this province, which would be equivalent to about thirty lakh maunds of fresh fish. Thus the total catch or production may be estimated at over three crore maunds annually. Calculating at an average price of Rs. 60 per maund, the

approximate value of fish caught annually in East Bengal will be well over Rs. 1800,000,000. The fresh water fisheries, as the circumstances are at present, account for more than 85 per cent of the total annual production.

A critical study of the production figures as well as personal investigation in the principal fishing centres of the province revealed the fact that there are three distinct fishing seasons in East Bengal, (*a*) the hot season (March to June-July) when the estuarine and foreshore fishing are at a suspense owing to unpropitious weather and the fresh water fish supply, as a result of overfishing, gradually decreases till the ' burst of the monsoons ', (*b*) the monsoon season (June-July to September-October) when the major part of the province remains under water and all fish, big or small, get free range and fishing is almost at a suspense except that of the anadromous Hilsa which ascends up the principal rivers of the province in great numbers almost simultaneously with the monsoon outburst, and (*c*) the winter season (September-October to February) which is the principal fishing season in East Bengal accounting for 60 per cent. of the total annual catch, and when the most optimum conditions for fishing prevail as a result of fine weather and gradual subsidence of flood.

Fisheries and Fishermen.

The fisheries of East Bengal are scattered wide all over the province and as a result, not only the professional fishermen but also the ordinary villagers catch fish the latter for their own consumption only. The actual fishermen—those pitiable amphibious creatures—are the most superstitious and conservative beings who are poor, illiterate and economically and socially very much depressed. As in agriculture, so in fishing also, they adhere faithfully to the same old methods prevalent among them from times immemorial development either in methodology or in technique in the various aspects of the industry has taken place. The result is that they do not get adequate returns from their indefatigable labour. Agriculture and other professions with more alluring prospects are attracting a larger and larger number engaged in this profession, as is evidenced by the decreasing number of fishermen, confirmed in a comparative study of the last few census report.

Some Causes of Impoverishment of Fisheries.

Both natural and human agencies are responsible for the gradual impoverishment of the rich fisheries of the province especially the fresh water ones. Among the natural agencies, the gradual decrease of the area under water due to the silting up of the river beds and depressions as well as the epeirogenic movements raising the deltaic region as a whole are most important. The various canals and irrigation schemes in upper India greatly decreasing the volume of water flowing down the Ganges and its tributaries, premature reclamation of land in the Ganges delta, putting up of 'bunds' and other artificial obstructions in the courses of streams, embankments of roads and railways, have all been responsible for the drying up of extensive fresh water areas. Besides, the effects of pollution of water due to erection of factories along the river banks, the retting of jute in streams, ponds, etc., and above all, the disposal of sewage and filth in the main or smaller rivers are considerable in the deterioration of fisheries. Overfishing, absence of any close season of legislative measures for protecting young or brood fish, short-term leases of fisheries are some of the examples of direct human interference which brings about premature decay of fisheries.

Subsidiary Industries.

At present, the demand for fresh fish is so great that there is no appreciable surplus to start industries either for the preservation of fish or for producing the valuable by-products. Due to lack of proper transport, fish curing at present is carried on to some extent only in the foreshore fishing centres, in the simple, primitive and crude methods. Manufacture of fish oil, guano, meal, isinglass and glue are not only inadequate in quantity, but also most unsatisfactory as regards the modes of preparation. Button making and chank bangle industries have been deteriorating as a result of decrease in the supply of necessary raw materials.

Present State of Fish Trade in East Bengal.

Marketing and trade of fish, too, is wholly unsatisfactory at the present time, due to lack of adequate facilities for good and rapid transport as well as proper arrangement for preservation and cold storage in the impor-

tant fishing centres. Fish differ from other foodstuffs in respect of its very high perishability which necessitates quick disposal of the catch. Demand, supply and prices of fish vary according to the season of the year and also year after year.

Fish is in great demand all over the province and the present production can hardly meet the demand of the ever-increasing population. The geographical momentum is still orientating the fish trade of the Lower Ganges Delta towards Calcutta, and even now the greater portion of fish entering into trade finds its way to that city, to the vexation of the under-nourished population of East Bengal. With a great source of production in the extensive fresh water areas, and potentially rich, but still almost virgin estuarine and marine fisheries, better transport and cold storage facilities, a constantly high demand throughout the year together with the possibilities of immense expansion of those industries requiring fish as the chief raw material, it is expected that production will be able to expand enormously.

Important Fish Ports.

The fish follows the current and the fishermen follows the fish. Hence it is really not possible to find out any fixed locality where fish may be found and caught annually in almost the same amount. Of course, there are certain localities where owing to peculiar topographical and other favourable circumstances, the fish fauna flourish in large number every year and important fish ports have developed near these areas consequently.

Absence of statistics regarding trade in fish renders it difficult to ascertain the relative importance of the different fishing centres of East Bengal. Only the outward figures of export from the various riverine ports of the province will however give a rough idea of the extent of trade carried on in this commodity. Goalundo situated at the junction of the Padma and the Jamuna (the Brahmaputra) is the most important fish booking centre in the whole of the Lower Ganges region. Other important centres of export are Kheppupara (Bakarganj), Chittagong, Chandpur, Akhaura and Asuganj (Tipperah), Sylhet, Bhairab Bazar and Mohanganj and Narayanganj (Dacca), and Madaripur (Faridpur). It should be noted that more than three-

fourths of the fish for the Calcutta market in the past and still at present comes from these centres.

Pisciculture in East Bengal.

The conspicuous role of pisciculture or fish farming in the economic life of East Bengal can hardly be overstressed. Any programme of rural uplift, Grow-More-Food Campaign or of conservation of fishery resources of the province must take into account the great possibilities of scientific pisciculture in East Bengal possessing numerous tanks and vast inland waterbodies. East Bengal has got the most optimum conditions in the whole of the Indo-Pakistan subcontinent for the development and extension of pisciculture which will not only result in increased nutritious food, but also ameliorate the economic condition of the teaming rural population.

Conclusion.

For the proper development of this important industry, fishery development work may conveniently be divided into two parts and both of them should proceed side by side. Work with reference to fisheries, sensu stricto, consists of conservation of fisheries by improving the inland waterbodies, establishment of hatcheries and gradual dissemination of scientific knowledge regarding pisciculture as in Japan and Egypt, legislative measures against destruction of fish fry and fingerlings and brood fishes, improvement of fishing methods and provision of better modes of transport and cold storage facilities, establishment of various industries connected with the preparation of preserved and cured fish and utilization of fishery by-products for which there is great demand within the province as well as abroad. The other branch of work will aim at the improvement of the socio-economic aspects of fisheries, such as the amelioration of the condition of the fishermen and thorough reorganization of fish trade in East Bengal. It may be pointed out, in conclusion, that only a properly equipped and adequately staffed Fishery Department with plenty of fund and much scope for long-term original research as well as a real and constructive vision about the present state with an eye towards the future possibilities will be needed to co-ordinate successfully these two branches of fishery development work.

COTTON-GROWING IN WEST PAKISTAN

BY

FAKHAR B. MAHMUD, DEPTT. OF GEOGRAPHY.

COTTON is the chief cash crop of the peasantry of Western Pakistan and is almost the mainstay economy of the country which is mainly agricultural. From the commerical point of view the importance of the plant can hardly be minimised.

The cotton plant is actually a perennial plant. The annual plant habit has been developed by the human agency during the last two centuries in order to provide a constant flow of the raw cotton for the ever-expanding textile industry of the world. Although about 9/10th of the raw cotton of commerce is now obtained from the annual plant, the balance is still got from the perennial plants, which are usually found in the tropical lands.

The cotton plant is grown generally between 35° and 28°5′ north latitude. The northern limit of cultivation has been extended recently to about 42° north in the Russian Turkistan. In the Northern Hemisphere cotton has been grown as far north as to 48° in Hungary. In the south, it has exceeded 28° latitude by means of small area in the southern Argentina.

The essential conditions for cotton-growing are :—

(*1*) *Climate.*

This is the most important factor determining the areas under cotton in the world. Although in Western Pakistan this is not such a potent factor since any visible short-comings can be made good by irrigation. The climate of our country is conditioned by the physical features which lie beyond its frontiers. For a proper appreciation of the metereological conditions in this country, the change in seasons in the whole of the South-East Asia has to be taken into consideration. In the winter season the wind directions are from land to sea and during this season Western Pakistan is under the influence of North-East trade winds. The thermometer quite often registers frost in December and January. The winter rains are in fact just an extension

of the winter rains of the Mediterranean regions. In summer, the conditions are quite different. The intense heat records the temperature of about 110°F. The Monsoons break usually during July and continue to September. The rainfall in the greater portion of the cotton belt in West Pakistan varies from 10 to 20 inches. The early growing season is characterised by severe heat. A few stations out of the cotton-growing belt of Western Pakistan can be given as an illustration.

Mean Max. (Temp. in F° of 3 Stations of W. Pakistan Cotton Belt).

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jly.	Aug.	Sep.	Oct.	Nov.	Dec.
Hyderabad (S. Sind).	80·5	91·3	102.7	110·2	115·4	113·5	107·7	102·4	104·5	104·1	96·8	86·8
Lyallpur (W.P.)	67·3	71·1	82·3	93·4	102·3	106·1	101·8	97·9	97·4	92·7	81·3	69·9
Multan (W.P.)	68·2	72·6	83·8	95·2	104·6	106·0	102·8	98·7	98·3	94·2	82·8	71·5

2. Relation between cost of production and market price.

The economic value of the commodity depends upon the labour and other initial charges incurred on its production. In our country picking is generally done by women and children who usually go to the fields early in the morning and are given very moderate charges, sometimes in the shape of produce. The defective methods of picking deteriorates the value, while mechanical picking is out of question at present here in this country as it is still in experimental stage even in the advanced countries like U.S.A. Usually there are three pickings encouraged by trade The second picking brings out very clean stuff hence higher in value while the other two produce comparatively inferior lint. It is a glaring fact that indifferent picking reduces the commercial value of cotton, but unfortunately no tangible heed is paid to the maintenance of quality here though the varieties grown are of high grade.

(3) Means of Communications and Transport.

Cotton is a bulky produce and easy means of transport are necessary to render the crop more economical. Efficient communication has a great effect on time, which is an essential element in the price factor. Roads have been called the "ARTERIES OF COMMERCE." The success of the agricultural country like Pakistan

depends directly on the good means of transportation. Thus in Pakistan this is a vital problem and needs serious attention of the State as well as the producers and distributors. Broadly speaking, transportation is an integral part of marketing. At present, the stuff finds its way from the villages to markets on carts, camelback, donkeys and ponies. With the advent of mobile vehicles, this problem is solved to a great extent, but the efficiency of road is still a handicap. After the partition, the development of the Railway facilities has accelerated the transport system in the Western Pakistan, and still better achievements are in store with the construction of new roads in the country.

Area.

The area sown under cotton in the Western Pakistan during the last few years is given below :—

TABLE I.

Area in Thousand Acres.

Year	West Punjab	Bahawalpur	N.W.F.P.	Sind
1937-38	3119	460	22	1049
1938-39	2176	395	22	902
1939-40	2037	311	17	903
1940-41	2012	302	13	894
1941-42	1965	229	6	629
1942-43	1868	296	6	629
1943-44	1837	276	6	651
1944-45	1890	208	6	696
1945-46	1951	405	16	826
1946-47	1900	184	15	830

It will thus be seen that the area in the West Punjab is considerably high, which claims more than half the area in Sind next in order. It will also be seen that during recent years, there has been a tendency towards decrease in area, which is due to the fact that during World War II, more areas had to be cultivated for other food crops to meet the shortage there.

The following table will clarify.

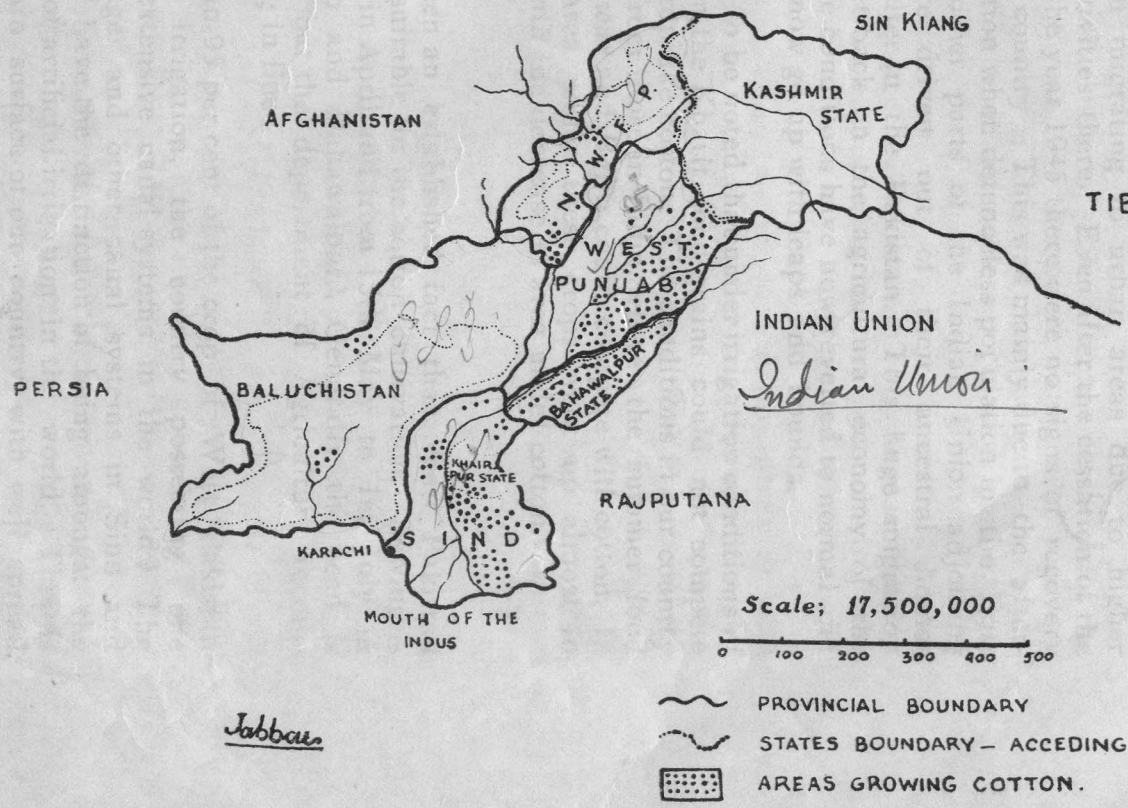
TABLE II.

Area in Thousand Acres under Food Crop in West Pakistan :[1]

Year	West Punjab	N.W.F.P.	Sind
1939-40	22000	2265	4520
1942-43	27375	2638	5146

[1] Figures very approximate and available for these years only :

MAP OF WEST PAKISTAN
SHOWING COTTON GROWING AREAS.



Jabbar

It is apparent from the above that the area under food crops has registered an increase with corresponding decrease in the areas under cotton. The possible explanation of this shortage may be found in the fact that the labour force in agriculture decreased in the World War II, as majority of the young agriculturists enlisted themselves in the army. Thus the agricultural operations suffered. As also in the same period there was a general tendency of the population migrating to urban areas due to higher industrial activities there. Even after the cessation of the hostilities in the year 1945 there were no signs of recovery visible in our country This was mainly due to the aftermath of partition when defenceless population in the East Punjab and other parts of the Indian Union adjoining Pakistan were driven out of their ancestral homes for taking shelter in the Pakistan. This huge migration was a stiff set-back on the agricultural economy of the country. The conditions have now reverted to normal and the crop will now go up with leaps and bounds.

It is also to be noted that under irrigation conditions of West Pakistan the Kharif food-grains could not compete with a cash crop like cotton. The conditions in our country are different from those in India, where the summer food grains like *Jawar* and *Bajra* could compete with cotton. In India, the area under these crops went up almost in consonance with the decrease in area under cotton.

Production.

It has been an established fact that West Pakistan is eminently suitable for the cotton cultivation. Sowing is done in Sind in April and from 15th May to 1st July in West Punjab and Bahawalpur. Generally the seed is disseminated but the department of Agriculture recommends sowing in lines.

More than 95 per cent of the crop of West Pakistan depends on irrigation, the country possessing one of the most extensive canal systems in the world. The Lloyd Barrage and other canal systems in Sind and West Punjab have the distinction of being amongst the biggest units of artificial irrigation in the world. This is due to the plain surface of our country with well spread out rivers. The gentle contour of about one foot per mile towards the south-west is ideally suited for canal

system. As compared with Indian Union where only 4.3 per cent of cotton is grown under irrigation, our percentage of irrigated cotton stands very high.

Manure in appreciable quantities is not usually applied to the crop in our country. This is rather unfortunate and if yields are to be increased, more liberal policy of manuring this crop will have to be adopted.

Some reference of picking of cotton has already been made while discussing the essential conditions of crop-growing in the country, but to be more regional in character we may now say that the crop is picked with the fall of temperature beginning from September onwards. The *Desi* crop is ready for picking earlier than the American crop. In Sind crop matures earlier than in West Punjab where picking is finished by the middle of January, while it is done by the middle of December in Sind.

A special feature of cotton production is the high degree of concentration of its area in particular countries and tracts. The main concentation of area in our country under cotton is in the tracts, where canal irrigation is available. It is interesting to note, in this connection, that the U.S.A., India, Pakistan, Egypt and Brazil contribute 84 per cent of the total world exports of cotton. In these countries, the importance of cotton in the internal economy is great.

As has been said earlier, cotton is an irrigated crop in this country. The yield is, therefore, high. Official estimate of the yield of the previous years in Pakistan along with that of the Indian Union are given below :—

TABLE III.

Official Estimate of the Yield Per Acre in lbs.

Province	1937-38	1938-39	1939-40	1940-41	1941-42	1942-43	1943-44	1944-45
Indian Union.								
Bombay	76	71	77	75	77	76	83	69
Madras	79	77	82	88	91	81	90	95
C. P.	69	59	88	92	90	72	80	67
C. India	43	56	46	68	69	68	80	58

	West Pakistan.							
W. P.	145	152	154	171	180	172	103	141
Sind	146	170	145	195	149	171	216	206
Average in Indo-Pak Sub-continent	89	86	92	101	103	98	100	94

It will be seen that the yield per acre in Pakistan is practically double the average yield in the Indo-Pakistan sub-continent. The main reason for this high yield is irrigation facilities available in this country.

The production in West Pakistan is higher due to the higher yield per acre. The figures of the past few years are given below :—

TABLE IV.

Production in 000 Bales of 400 lbs. each.

Year.	*West Punjab*	*Bahawalpur*	*N.W.F.P.*	*Sind.*	*Total.*
1937-38 ...	878	145	7	487	1517
1938-39 ...	904	132	12	425	1473
1939-40 ...	832	146	3	399	1318
1940-41 ...	969	192	3	467	1631
1941-42 ...	1068	197	3	446	1714
1942-43 ...	998	189	3	456	1646
1943-44 ...	807	172	3	548	1530
1944-45 ...	795	156	3	445	1399
1945-46 ...	809	166	3	176	1353

The above table clearly indicates that the production of cotton has come down from 1.5 million bales to 1.3 million bales. The decrease in production is due to decrease in area, the reasons for which have already been enumerated above.

Although the area under cotton in West Pakistan is roughly one-sixth of the area in Indian Union, yet the yield of cotton crop of West Pakistan is comparatively higher. India is also very deficient in high grade cotton while Pakistan abounds in it.

The production of cotton is likely to expand more quickly than all the other commercial crops of the country and there will be ample quantity available for export in the near future.

The yield per acre in the undivided India was notoriously low. In fact it was the lowest yield in the world. Figures of some countries are given below :—

TABLE V.

Country.	*Yield in pounds.*	*Percentage of total world area.*	*Percentage of total world crop production.*
India ...	160	24.5	9.5
Pakistan ...	340	6.1	6.0
Egypt ...	900	2.3	6.2
U.S.A. ...	640	34.7	42.5
Brazil ...	360	6.4	6.0

It will be seen from the above that while the yield of cotton in India is lowest on record in the world, Pakistan has a yield equal to the world average.

Pakistan in fact produces short staple Desi and Medium long staple American. Mixing of different kinds of cotton had a very adverse effect on the quality of the cotton, because if a superior cotton is mixed with an inferior type, there is an appreciable fall in its spinning properties. To stop this ugly habit, the Government had to resort to an Ordinance called " New Cotton (Control) Act of 1949" which will help a long way in providing pure cotton to the factories for ginning purposes.

Commercial Varieties.

Cotton has been grown in Pakistan since time immemorial. There are two different types of cotton grown in our country. (1) The old variety of the old world cotton or Desi cotton aud (2) American cotton (Upland American cotton). The Desi variety has been grown in this country since antiquities, but the American cotton has recently been emigrated in Indo-Pakistan sub-continent. The latter have greater area under cultivation than the former on account of availability of the irrigation facilities. The recent researches carried on by the West Punjab Agricul-

tural Department experimental farms have resulted in a new variety of cotton known as " Lasani " being evolved. This has the potentiality of revolutionising the cotton industry of the Province.

The characteristics of the main variety are briefly described below :—

Desi Variety.

1. *West Punjab Desi.*—This is mostly 39 Mollisoni developed by the cotton section of the Department of Agriculture. It is a short-stapled cotton with rough lint. It was grown in scattered area over the whole of the Province, but during 1949-50, its cultivation has been banned to certain areas specially in submontanous tracts. During 1946-47, the total production was 120,000 bales of 400 lbs.

2. *Sind Desi.*—This is similar to the West Punjab Desi, but the fibre is exceedingly rough and short. It is grown mainly in the North Sind and is liked in the U.S.A. market for being mixed with the woollen products manufactured in that country. It is suitable for being woven into some mixed fibre. This cotton, therefore, fetches a higher price than the West Punjab Desi variety. The market quotation for the 24th July, 1949, was Rs. 56 per maund for West Punjab Desi and Rs. 62 per maund for Sind Desi cotton.

3. *N.W.F.P. Desi.*—The quantity is very small on account of the hilly nature of the country. It is white, rough and short. No other variety of cotton is grown in this Province.

4. *Baluchistan Desi.*—Local West Punjab and Sind Desi cotton are grown here.

American Variety.

There is a high range of varieties being grown in this country. The most important are given below :—

West Punjab.

4-*F.*—This is the first variety of the American cotton produced in this country. It began its career in 1914 with

about 1000 acres cultivated in Lyallpur district. It has a good fibre length. Now its cultivation has been restricted under the Cotton Control Act of 1949, to the districts of Jhang and a part of Montgomery. The total production during 1946-47 was about 2,150,000 bales of 400 pounds each.

289-*F.*—Although original 289-F has entirely changed, the trade still recognises the variety and the following types are traced under the name 289-F/243, 124-F and 199-F. The last is the modern variety, and is now competing with 124-F. These varieties are being extensively grown in Montgomery, Multan, Dera Ghazi Khan and Muzaffargarh districts. The total production during 1946-47, will be about 1,50,000 bales of 400 pounds each.

L.S.S.—This is supposed to be a selection from 4-F, but has a higher yield and better staple. It is a late maturing variety. The reselections are giving very encouraging results. Under the Cotton Control Act 1949, West Punjab, its growing is confined to Sheikhupura, Lyallpur aud Sargodha districts. Its production in 1946-47 was about 2,85,000 bales of 400 pounds each.

Bahawalpore.

The cotton-growing areas of Bahawalpore are contiguous to the cotton belt of the West Punjab. The climate and soil are also similar. The state has no well-established. Research Department of its own and, therefore, the varieties grown in the West Punjab are also popular here. The area under American cotton (4-F and 124-C) is very high in comparison with the area under *Desi Mollisoni.*

Sind.

The cotton belt of Sind expands from the cotton belt of the West Punjab and Bahawalpore by the stretch of desert area. The following varieties are noticeable :

1. *Sind NT.*—It really defies any description. It is quite similar to 289-F/43 of the West Punjab. It is, however, a long-staple variety. Production was 50,000 bales o 400 pounds each in 1946-47.

2. *Sind M4.*—It is most popular variety in Sind. It is now being sown in this province at the cost of NT. It is a latest variety of American cotton. The production during 1946-47 was 200,000 bales of 400 pounds each.

3. *4F.* It is of medium staple and is of the same variety as grown in the West Punjab. The production in 1946-47, was about 75,000 bales of 400 pounds each.

It will be seen from the above that the American cotton made a modest beginning with about a thousand acres in 1914. Ever since then the area under it has increased at the expense of Desi varieties so much so that now more than 80 per cent of the area under cotton in West Pakistan is under the American varieties. The main reason for this change-over in the acreage is due to the high cash returns obtained from the American varieties.

POTWAR PLATEAU *(Contd.)*

CLIMATE

BY

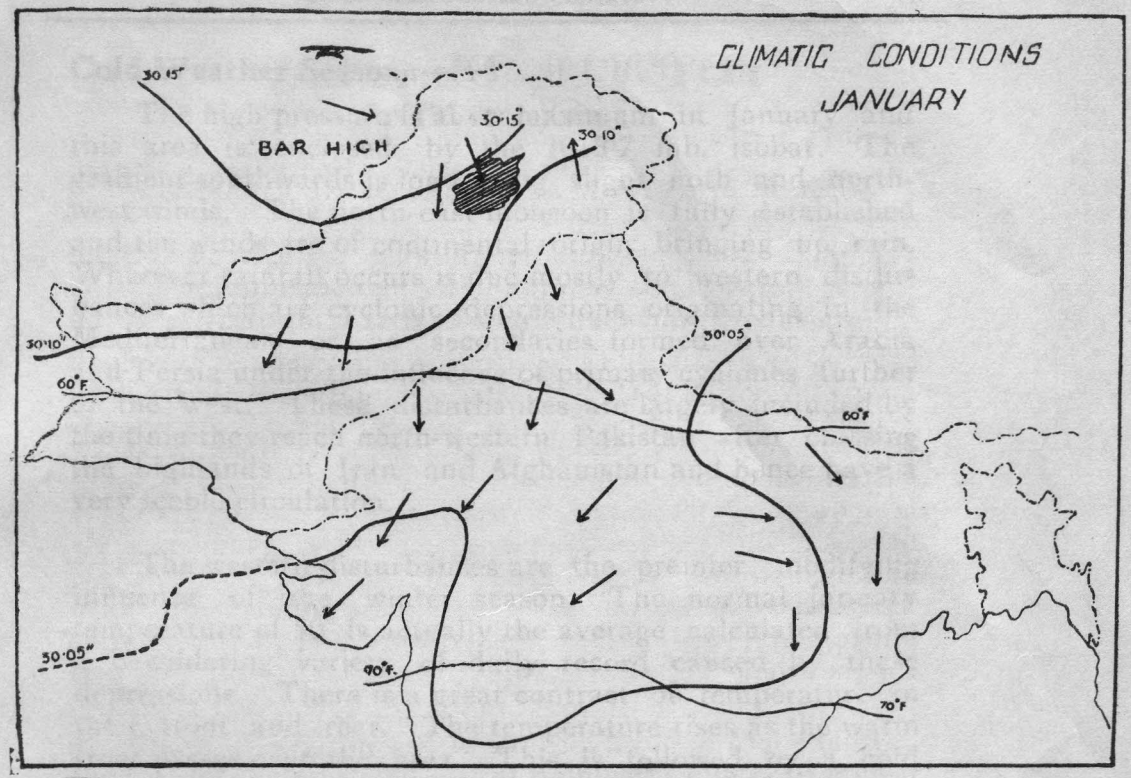
M. A. BHATTY, M.A., DEPTT. OF GEOGRAPHY.

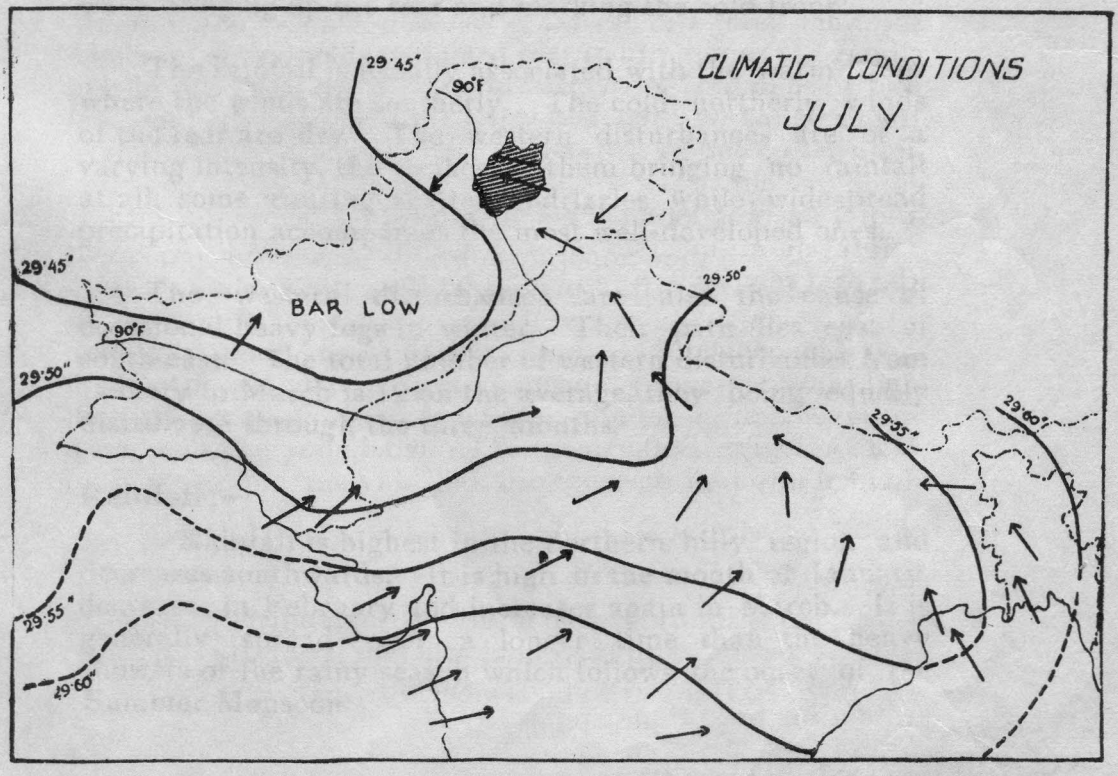
THE basic factor determining the climate of the Potwar is its position in the remote interior of the sub-continent of Indo-Pakistan far away from the oceanic influence, situated at a rather high elevation of 1500 to 2000 feet, the area has an extreme climate with hot summers and cold winters. For three months, July to September, normal climate conditions are dominated by easterly monsoon depressions while the rest of the year is marked by their retreat and sway of western disturbances. These are supplemented by local thunderstorms and dust-storms which make the weather all the more variable. The Potwar has the highest number of storm phenomena—hailstorms, dust-storms and thunderstorms for the whole Indo-Pakistan.

The location and altitude of Potwar give it a climate peculiar to itself. Rainfall is well distributed throughout the year and with double maxima, a primary one to mark climax of the activity of the eastern monsoon depressions and a secondary one which coincides with the peak of the frequency of western cyclonic disturbances. In fact the Patwar epitomises the two major influences which determine the climate of India, the summer monsoon and the winter depressions. This also provides the region with a rainful more sufficient for its agricultural needs than that in the arid regions surrounding it on the east, west and south.

The conventional division of the year into cold, hot and rainy seasons of four months each may be discarded in favour of a more scientific scheme adopted by the Meteorological Department of United India. The year is divided into four seasons :—

1. Cold Weather Season—January to March.
2. Hot Weather Season—April to June.
3. Rainy Season—July to September.
4. Transition from Summer to Winter Monsoon—October to December.


CLIMATIC CONDITIONS
JANUARY
30·15"
BAR HIGH
30·15"
30·10"
30·10"
60°F
30·05"
60°F
30·05"
90°F
70°F


CLIMATIC CONDITIONS
JULY.
29·45"
90°F
29·45"
BAR LOW
29·50"
90°F
29·50"
29·55"
29·60"
29·55"
29·60"

Cold Weather Season :—

The high pressure is at its maximum in January and this area is enclosed by the 1018·7 mb. isobar. The gradient southwards is low giving slight noth and north-west winds. The north-east monsoon is fully established and the winds are of continental origin bringing no rain. Whatever rainfall occurs is due mostly to western disturbances which are cyclonic depressions originating in the Mediterranean or as secondaries formed over Arabia and Persia under the influence of primary cyclones further to the west. These disturbances are largely included by the time they reach north-western Pakistan after crossing the highlands of Iran and Afghanistan and hence have a very feeble circulation.

The western disturbances are the premier modifying influence of the winter season. The normal January temperature of 50° is actually the average calculated from a bewildering variety of daily record caused by these depressions. There is a great contrast of temperature in their front and rear. The temperature rises as the warm front passes over the area. This is followed by a cold wave bringing up the rear and marking the cold front.

The rainfall is usually associated with the warm front where the winds are southerly. The cold northerly winds of the rear are dry. The western disturbances are of a varying intensity, the weakest of them bringing no rainfall at all, some causing scattered drizzles while widespread precipitation accompanies the most well-developed ones.

The western disturbances are also the cause of occasional heavy fogs in winter. Their path lies east of south-east. The total number of western disturbances from January to March is 19 on the average, they being equally distributed through the three months.

Rainfall :—

Rainfall is highest in the northern hilly region and decreases southwards. It is high in the month of January, decreases in February and increases again in March. It is generally spread over a longer time than the heavy showers of the rainy season which follows the onset of the Summer Monsoon.

DISTRIBUTION OF RAINFALL

January to March

	January	February	March
Rawalpindi ...	2·49"	2·48"	2·67"
Jhelum ...	1·96"	1·41"	1.56"

Temperature and General Weather Conditions :—

As the prevailing weather is anti-cyclonic, the sky is generally clear. Free insulation and radiation under cloudless sky result in a great diurnal range of temperature.

Rawalpindi :—

	Jan.	Feb.	March
Maximum Temp. ...	62·3°	65·2°	75·1°
Minimum Temp. ...	37·9°	41·7°	50·4°

This gives a diurnal range of 25° which increases further south to 30° F. Sharp frosts are characteristic of nights from mid December to mid February. The absolute minimum over the Potwar is less than 30° F. The number of days of thunder increases from less than one in January to 4 in March. The number of days of fog decreases during the same period from 2 to less 1 for the whole region and from 7 to 5 for Rawalpindi.

(2) The Hot Weather Season :—

In March the temperature begins to rise accompanied by a continuous fall of pressure. The anti-cyclonic conditions of winter are replaced by low pressure. By April, a low pressure develops south of the River Soan, the high pressure retreating north-westwards. In May the high pressure disappears altogether and by June the isobar of 997 mb. encloses the area. The wind, however, continues to be north-west during April and May veering to north in June.

Rainfall :—

The rainfall is due mostly to western disturbances which continue with their cold whether intensity till May, after which they decrease suddenly. Another factor in rainfall is local thunderstorms.

Rainfall from April to June

	April	May	June
Rawalpindi ...	1·92″	1·25″	2·31″
Jhelum ...	1·11″	0·99″	2·12″

The rainfall again is highest in the Northern Hills and decreases south and westwards.

Temperature and General Weather Condition :—

The temperature goes on increasing as the season advances. But it is lower than that in the neighbouring areas, being kept down by the western disturbances. The season is one of intense heat, and fine, dry, almost rainless weather except for local storm phenomena and the passing of an occasional depression.

TEMPERATURE FROM APRIL TO JUNE

Rawalpindi

	April	May	June
Maximum ...	86·2°	97·7°	103·5°
Minimum ...	59·3°	68·7°	75·9°

The diurnal range is higher than in the winter season.

Thunderstorms and Duststorms are frequent phenomenon of the hot season.

Thunderstorms :—

The essential condition for their formation is the production of rising currents of moist air on a sufficient scale to make the air unstable. In the Potwar, this happens in two ways :—

(1) Strong surface-heating by contact with the heated ground. Rapid convection takes place in the hot sultry afternoons in summer giving rise to thunderstorms which are local in character but occur simultaneously over a large area. They may be called "heat thunderstorms."

(2) "Depression thunderstorms" caused by the mechanical uplift of moist air by the undercutting of cold heavy air. This usually takes place during a western disturbance. They are common from October to June but are less frequent in their total number.

FREQUENCY OF THUNDERSTORMS

Rawalpindi.

January	...	0·3	July	...	6·2
February	...	0·9	August	...	6·0
March	...	1·9	September	...	6·3
April	...	3·7	October	...	2·6
May	...	2·7	November	...	0·3
June	...	3·8	December	...	0·1

The thunderstorms have a double maxima in the Potwar, one occurring in April and the other in June-July. The former is associated with "depression thunderstorms" and the latter with "heat thunderstorms."

Hailstorms:—

Their origin is similar to that of thunderstorms. When the vertical air currents associated with a thundercloud have sufficient velocity and extent to bring about a freezing of moisture and its precipitation as hail or ice, a hailstorm is the result. It is usually connected with heavy thunderstorms. The hailstorms vary in sizes and are seldom bigger than a golf ball. Hailstorms are most frequent from January to June and Rawalpindi has a particularly high frequency due to its proximity to the Northern Hills which experience the most violent thunderstorms.

Dust-storms.

They also resemble the thunderstorms in their mode of origin. After the intense heating of mid-day, steeply ascending currents in a dry dusty tract raise large quantities of dust which are carried along over long distances. A dust-storm is usually heralded by a fall in the barometer followed by a spasmodic rises and much irregular oscilla-

tion as the storm approaches. They almost always occur towards the end of a close warm day.

The following table gives a rough idea of the frequency of dust-storms in the Potwar :—

Frequency of Dust-storms in the Potwar.

January	0	May	2-4	September	1-2
February	0-1	June	2-4	October	0-1
March	1-2	July	2-4	November	0
April	2-4	August	2-4	December	0

The frequency is on the whole greater in the western parts than in the east. The table shows a high frequency from the beginning of the Summer Season to the middle of the Rainy Season. The dust-storms vary in intensity from light storms to the black dust-storms which obscure visibility and are accompanied by rain and thunder. Their general trend is from west to east. Besides these there are local small whirlwinds known as "dust-devils."

Rainy Season.

The prevailing conditions of heat and drought are fully intensified towards the end of June and the Potwar lies in an area of maximum temperature and minimum pressure for the whole of Indo-Pakistan. A steep barometric gradient exists due to the high pressure over the Indian Ocean. As a consequence the south-east trades are drawn across the equator into the North-West Indo-Pakistan Low. Undergoing rotational deflection to the north-east, they blow as the south-west monsoon. On land, their actual direction is determined by relief so that the Bay of Bengal branch comes as the south-east monsoon and the Arabian Sea branch enters from the south-west. The monsoon currents travel over large expanses of the mainland before reaching the Potwar and are considerably exhausted of their moisture content. The monsoon currents come in the shape of monsoonal depressions. As a smaller number of these reaches the Potwar, there is a consequent scantiness of rainfall as compared to the other regions more favourably situated.

Rainfall in the Rainy Season.

	July	August	September
Rawalpindi Rainfall ...	7.66"	9.14"	1.31"
Jhelum ...	6.49"	6.63"	2.57"

The heaviest rain falls in the months of July and August. The monsoon breaks near about the beginning of July, the normal date of onset being 1st July for the eastern part and 15th July for the western section of the Potwar. As compared to the Winter Monsoon rain this rainfall is confined to a few days which shows its pulsatory character. The usual date for the withdrawal of the monsoon is the 1st of September. But both the dates of onset and withdrawal are subject to considerable variation and the rainfall itself is very variable and uncertain.

As the height of the rainy season is in August, the pressure increases from 997 mb. in July to 998.7 mb. The time of the beginning of the monsoon has an important influence upon crops. Periodically the monsoon rainfall tends to be in great defect or excess as will be shown by the figures for the three district headquarters in the area :—

	JHELUM.				RAWALPINDI.				ATTOCK.			
	July	Aug.	Sept.	Total	July	August	Sept.	Total	July	August	Sept.	Total
1926 ...	5.25	9.97	3.19	18.41	9.56	17.99	12.67	40.22	5.75	4.05	0.56	10.36
1927 ...	3.36	7.55	0.82	11.73	6.58	8.61	1.15	15.34	2.56	18.26	5.93	26.75
1928 ...	1.81	3.42	3.78	9.01	5.88	2.05	6.22	14.15	4.09	4.22	0.51	8 82
1929 ...	11.45	10.5	0.37	22.32	9.40	18 43	0.22	28.05	1.07	1.89	2.84	5.80
1930 ...	10.28	5.14	4.23	19.65	16.43	8.43	2.00	24·90	6.38	11.01	0.00	17.39

The monsoonal rainfall is almost entirely associated with eastern depressions which originate mostly in the Bay of Bengal and travel north-westwards. The presence of a depression in the Potwar is always marked by strong monsoonal inflow with a heavy rainfall.

Temperature.

The outburst of the monsoon is accompanied by a marked lowering of the temperature and of the diurnal range and a general increase in the humidity of the area.

Rawalpindi.

	July	August	September
Maximum ...	97.8	93.7	93.4
Minimum ...	77.1	75.5	69.3

The mean July temperature is 90°-96° for the Potwar with a mean diurnal range of 20°-28°.

Season of Retreating Monsoon.

The retreat of the monsoon, following the southward march of the sun results in a rise of temperature in spite of the lateness of the season. This accounts for the secondary maximum in October when the clear skies again permit free insolation. October and November are the best months in the Potwar with highest sunny skies, clear air and moderate temperature. The storm phenomena do not introduce any violent changes. Mean daily relative humidity is less than 50 per cent. Even in this season dry for the rest of northern parts, the Potwar gets some rain.

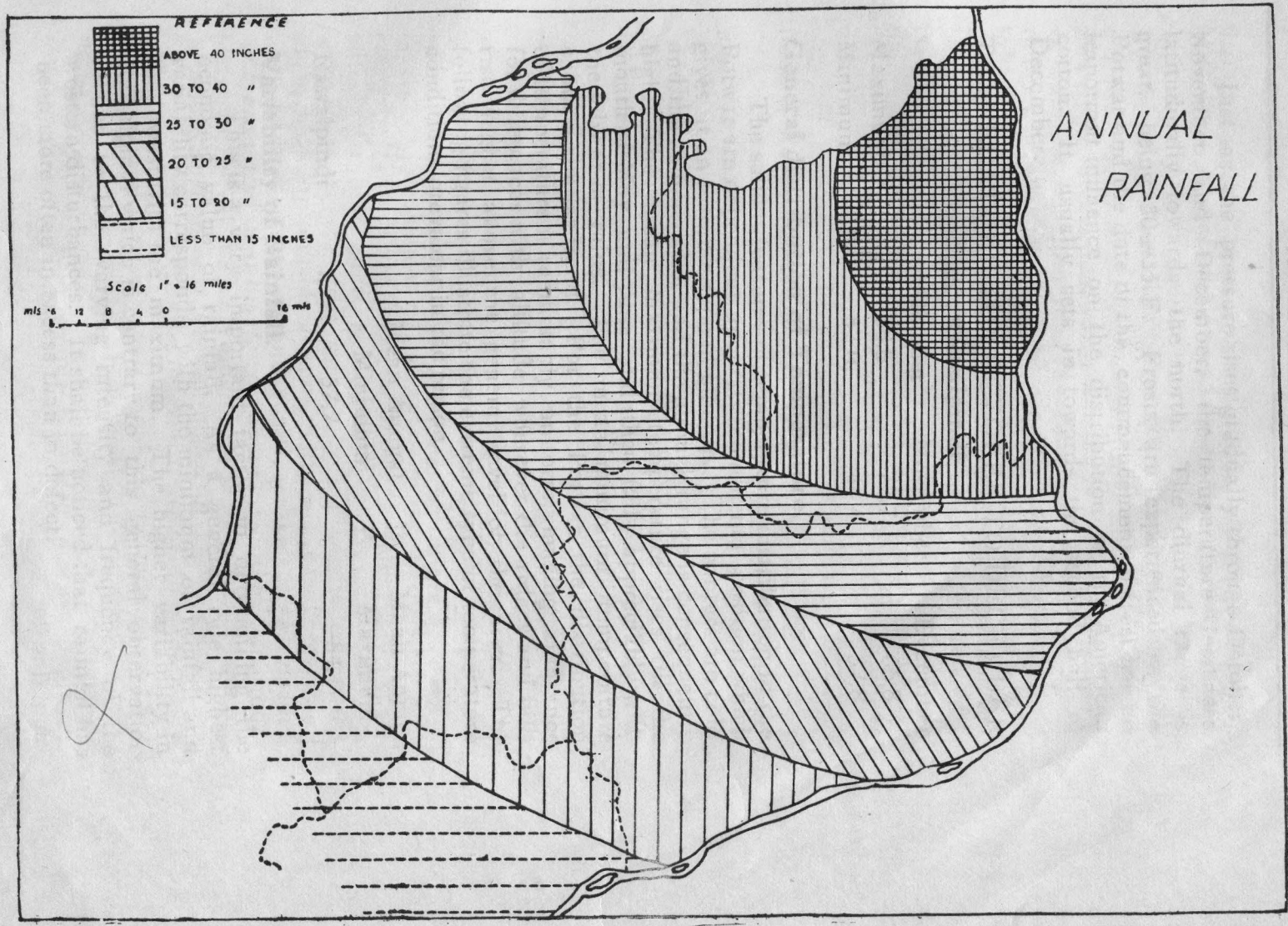
Rainfall from October to December.

	October	November	December
Rawalpindi ...	0.60"	0.28"	1.24"
Jhelum ...	0.36"	0.28"	0.64"

November is the driest month. The rainfall is almost entirely due to passing western disturbances for, by the month of November, anti-cyclonic conditions again prevail, the area being enclosed by the isobar of 1015.9 mb. and the general wind direction closely resembles that in the winter season being north-west for the most part.

Average number of depressions during October to December.

October	November	December
3	6	11


REFERENCE
ABOVE 40 INCHES
30 TO 40 "
25 TO 30 "
20 TO 25 "
15 TO 20 "
LESS THAN 15 INCHES
Scale 1" = 16 miles
mls 16 12 8 4 0 16 mls
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Just as the pressure rises gradually through October, November and December, the temperature decreases latitudinally towards the north. The diurnal range is great, being 30—35°F. Frosts are experienced in the Potwar and the date of the commencement of frost has an important influence on the distribution of the American cotton. It usually sets in towards the second half of December.

TEMPERATURE FOR OCTOBER TO DECEMBER

Rawalpindi

	October	November	December
Maximum ...	88.6	77.7	66.8
Minimum ...	57.0	44.4	37.8

General distribution of Temperature.

The salient features of temperature distribution in the Potwar are dependent upon its continental position which gives it an extreme type of climate. The winters are cold and the summers hot and the annual range is consequently high. The mean maximum temperature rises till the month of May and June and then falls appreciably with the advent of rains. The mean minimum temperature shows a similar trend. For the Potwar the distribution of temperature is remarkably uniform, making allowance for differences with altitude wherever the ridges and bills rise higher above the general level of the area. The following figures illustrate the extreme type of temperature conditions prevalent in the region.

	Mean Annual Minimum	Mean Annual Maximum
Rawalpindi ...	57.7	84.1

Variability of Rainfall.

This is a very important factor in determining the economic value of rainfall. As a general rule highest variability corresponds with the minimum of rainfall and the lowest with the maximum. The higher variability in Rawalpindi which is contrary to this general observation is due to the varying intensity and frequency of the western disturbances. It shall be noticed that rainfall has been more often in excess than in defect.

GEOGRAPHICAL NOTES & NEWS

JUTE : The Golden Fibre of Pakistan.

The "Brown paper of the wholesale market" and the "Golden Fibre" of Pakistan is the mainstay of Pakistan's economic life. Decisions as bold and far-reaching as that of "No-devaluation" are feasible primarily on account of the unparalleled richness of the country in this useful community. Jute is to Pakistan what Coffee is to Brazil. Pakistan is the "Lord of Jute world." About 80 per cent of the world Jute is produced in this country. The natural conditions favourable for the production of Jute are all found ideally in Eastern Pakistan. They are :

(1) An annual rainfall of about 80".

(2) High temperature with various small annual range.

(3) Annual inundation of the area resulting in a renewed coating of rich silt.

(4) Ten inches of rain in May.

(5) Availability of clean water for "Steeping" or retting purposes.

The first two conditions are fulfilled in more or less uniform way in the two Bengals, but Pak-Bengal enjoys a much privileged position with respect to the remaining conditions. The regime and the distribution of the distributaries in the Ganges Delta observe favouritism towards Pak-Bengal in so far as the tendency of the rivers is to dilate upon the south-eastern than the western parts of the delta. The discharge of water and silt in the eastern districts is also greater than the western ones. Jute-growing areas of Eastern Pakistan are, thus, more favoured than their smaller counterparts in West Bengal. The fulfilment of condition 4 ensures better quality. As the desired amount of rainfall in May is experienced only east of 90°-E. longitude the jute-growing areas of Pak-Bengal alone are privileged with it.

The sacred Ganges with its "Burden of filth" being disqualified for "Steeping", East Pakistan is once again favoured with a perennial supply of clean water as it contains the Magna and the Karnafulli rivers.

Under these conditions, then East, Pakistan produces every year from 6 to 7 million bales of jute whose value at the present level of prices varies from 100 to 125 crores of rupees. Only 3 per cent of the jute produced is meant for domestic consumption. The remaining jute (97 per cent. of the total produce) goes to foreign markets. The potentialities of growing more jute in Eastern Pakistan are still greater. At present only about 10 per cent of the cultivated land is under jute. When Pakistan is able to utilise, in full, her natural resources, it will be possible to supply the world market with *Low-priced and best quality jute* and to draw from it whatever is required for the industrialisation of the State.

The United Kingdom is Pakistan's oldest and up till now biggest single customer next to India. After the last War, Germany, Italy and Japan lost their old positions, but Czechosolovakia, Brazil, USSR and Australia are rapidly going ahead. More than 40 countries including dollar areas like USA and Canada are in need of Raw Jute. This year the Pakistan Government have granted licences to export the Raw Jute via Chittagong to 20 countries for which quotas have been fixed.

As Jute provides Pakistan with adequate purchasing power the long range policy of industrialising the country and raising the standard of living of the common man is quite practicable. The urgency of establishing the Jute mills in Eastern Pakistan in the first instance, has become all the more pressing in view of the No-devaluation decision and the consequent unforeseen attitude of Indian Jute Mill Owners. Their uncompromising, rather aggressive policy of stopping jute purchases at the declared rates of exchange of Indian and Pakistani Currency will do more good than harm to jute industry. The Indian Jute Mill Industry which is a parasite on Pakistan Jute is on the other hand in real danger.

For the stability and security of Jute-growing Industry in Pakistan, the Government is going to organise 'Jute Purchasing Corporation' as a temporary measure. They may also resort to valorisation. As a part of their long-range policy they are going to place orders for the purchase of three jute mills immediately.

CHITTAGONG : Gateway of Eastern Pakistan.

The port of Chittagong being a few miles above the Karnafuli is naturally well disposed as it is safe from the ravages of the storms. This suitability for the site of a port in Eastern parts of the sub-continent of India was fully realised by the Portuguese in sixteenth century.

With the tilting of the balance of power in favour of Britain, anyhow, the petty village of Kalighat was destined to be the hub of all the economic activity of the Province of Bengal. The justification of raising this village to the standard of a city like Calcutta was based on geographic-cum-political considerations. It ensured a good anchorage to the narrowest point of the Hooghly where it could be crossed for trade but at the same time could afford a barrier to Marhatta raiders. These considerations obviously operated adversely against the good natural harbour of Chittagong which had been badly neglected for a long time.

The construction of Bengal and Assam Railway, however, affected rather favourably. Then the birth of Pakistan with its "scattered" or more correctly "disjuncted" shape at once brought to light the potentialities of Chittagong to rise to the eminence of a gateway of East Pakistan.

The "extremely vital" importance of the port and the "absolute" necessity of its development were realised now more than ever before. In order to handle the cargoes of diversified description—a position so singularly enjoyed by Chittagong in East Pakistan —adequate steps are being taken to bring about an all-round development of the port. An existing berth and a transit shed have been extended, a shed for the storage reconstructed, a Railway marshalling yard established and new jetties have been established. The effect of it all is that while the port could formerly provide accommodation to only four ships at a time it can now offer anchorage facilities to ten at one time.

The port awaits further developments, some of which are as follows :

(*a*) Construction of new jetties with one passenger-cum-heavy lift jetty.

(*b*) Construction of transit sheds, railway sidings and marshalling yards.

(*c*) Provision of heavy-lift cranes, shunting locomotives etc.

(*d*) Raising of a housing estate for port and custom authorities.

(*e*) The introduction of night pilotage of ships.

By the establishment of a flotilla it will be directly connected with the internal riverain points. The materialisation of the multipurpose Karnafuli Project will all the more augment the utility of Chittagong. The proposed construction of a double Railway line from Bhera Bazar to Chittagong and the completion of a uniform railway system converging on Chittagong, the city is destined to go a long way to play its important role. It is estimated that the present capacity of the port to handle 5 lakh tons of cargo yearly will increase to 7,50,000 tons in 1950, and ultimately to three million tons after the materialisation of the long-term plans.

Karnafuli Hydro-Electric Project.

Karenfuli river has since long been one of the important arteries of commerce in the eastern parts of East Pakistan. A considerable porportion of the import and export trade of Surma Valley already used to be diverted to Chittagong, and not to Calcutta, even before the formation of Pakistan. The importance of river-navigation in these parts of East Bengal has always been great. Karanfuli being navigable up to about 100 miles, and, having at its mouth the port of Chittagong—Gateway of Eastern Pakistan—it needs the attention of the Government. It is, therefore, in the fitness of things that schemes of improving the navigational facilities, and controlling of floods in the Karnafuli are already afoot. The Karanfuli Hydro-Electric Project aims at bringing about the aforesaid improvements. It also proposes to provide the Chittagong area with about 40,000 k.w. of electrical energy for purposes of industrial development. The installation of a Steam Station near Chittagong to work as an accessory to the hydel project is also under the active consideration of the Government. These improvements are proposed to be followed by an extension

in the existing Chittagong-Nazirhat section of the East Bengal Railway in order to meet the necessities of the growing industrial and commercial needs of the area.

Stepping up Pakistan's Cotton Productions.

Cotton is one of the most important cash crops of Pakistan being second in value to Jute, and it gives Pakistan a foreign exchange of about Rs. 40 to 50 crores.

Our long-range policy is to increase the outturn and improve the quality of our cotton. Although we get 60 to 75 per cent of the better varieties of cotton grown in the Indo-Pakistan sub-continent, there is very considerable scope, indeed, for further improvement both in quality and in outturn. It is our aim to improve quality and to double our outturn which would increase our foreign exchange resources from Rs. 40 crores to 80 crores a year.

Development of Cotton Varieties.

The Pakistan Central Cotton Committee has decided to set up a Cotton Technological Laboratory at Karachi. The Laboratory will carry out technological tests on varieties of cotton already grown in Pakistan and new varieties introduced from time to time. It will help assessing the spinning properties of the various cotton varieties and will advise the cotton breeders about the development of cotton varieties.

New variety of cotton for West Punjab.

Researches carried on the West Punjab Agriculture Department's experimental farms have resulted in a new variety of cotton know as "Lasani" being evolved.

This, it is claimed, has the potentiality of revolutionising the cotton industry of the Province. It spins 70 counts as against 60 counts of Egyptian cotton.

The area under cotton in West Punjab is normally in the neighbourhood of 2,000,000 acres and on the completion of the Thal Project, it is expected to increase by 20 to 25 per cent. The present yield of cotton is 700,000 to 800,000 bales of 400 lbs each, per year.

Lower Sind Barrage.

The spade work having been completed on the site of the proposed Lower Sind Barrage near Kotri on the river Indus, the main work is expected to be in full swing from November this year. The project which is expected to be complete in 1954, will increase the food production of Sind. It will bring under cultivation about 23 lakh acres of land. At present only 6 lakh of land is under cultivation. Out of 23 lakh acres of land, about 2,50,000 acres will be reserved for forests. An equally large area will be used for collective farming with modern tractors and other agricultural means. It is believed that the Sind Province which is to a considerable extent feeding the deficit areas, will be able to produce 1,00,000 tons more foodgrains by 1960. Besides bringing under cultivation very large area of estate land, the project will have a hydro-electric power station.

Measures to Increase Electric Supply in West Punjab.

Four new oil fired steam turbines are being installed, two each in Lahore and Lyallpur. These installations are expected to be completed by the end of this year.

They will yield 13,000 k.w. of electricity. The capacity of the Lyallpur plants will be 8,000 kilowatts, whereas that of Lahore plants will 5,000 kilowatts. The energy thus produced will be one and a half times of what East Punjab has under the new contract agreed to supply to West Punjab from Jogindernagar during the present year.

The N.W.R. Power House, which was lying idle even before the partition, is now working at full capacity and meeting the entire needs of the Railway Department.

Mianwali Project.

The Development Board of the Pakistan Government accorded "a very high priority" to the Multipurpose Mianwali Project of the West Punjab. The project is expected to yield about 51,500 k.w. of hydro-electricity which will be harnessed to operate several thousand tube-wells to irrigate buge tracts of land in north-western parts of the province.

Power from the Mianwali Project will also be used for meeting the growing industrial needs of the area and, when completed, the project will be linked with the network of similar hydel projects *viz.*, the Warsak, Rasul and Dargai hydro-electric generating stations.

Malakand Extension.

The new extension of the Malakand power supply will bring further benefits to districts in which most of the provinces' trade and industry are concentrated, which may indeed be regarded both as the cultural and commercial hub of the entire Pathan world on both sides of the Durand Line. Further, by supplying the West Punjab's grid it makes that province less dependent on sources of power outside the Dominion. What has been achieved is, however, only the forerunner of further development in contemplation. The enlarged Malakand system, when finished, will be supplemented by the huge new hydro-electric installation on the Kabul River, to be erected at Warsak, near the point where that stream emerges from the N.W.F. tribal belt into the vale of Peshawar. When all this power and water for irrigation are available the N.W.F.P's prospects will be transformed with far-reaching effects on a fine but hitherto poverty-stricken people's life. Further the Province, as the Power House of north-western Pakistan, will be drawn even closer to the West Punjab and the prosperity of this huge and populous area should make great strides, thereby contributing, in a region of enormous strategic importance to the political stability of the whole Indo-Pakistan sub-continent.

Dargai Hydel Plant.

The Pakistan Government have approved N.W.F.P. Government's scheme for the construction of Dargai Hydel Plant on which Rs. 60,00,000 are proposed to be spent during the current year. The Pakistan Government has also agreed to give a loan to N.W.F.P. Government for carrying out the scheme.

The construction of the station has been taken into hand and a sum of rupees 1,50,000 has already been spent on the project.

While the Malakand Extension which was linked with the grid system in the West Punjab in May last would

supply power to towns in the West Punjab and some districts of N. W. F. P. and Tribal Territory the Dargai Hydel Station would mainly supply electricity to the Frontier Province and would prove a great asset in the completion of various industrial schemes launched by the Government.

Five-year Plan to make East Bengal Self-sufficient in Food.

An expenditure of about Rs. 5,00,00,000 spread over a period of five years will be incurred on East Pakistan's proposed food development drive according to preliminary estimates. The five-year plan aims at making East Pakistan self-sufficient in food. It might even yield small surplus. After the execution of the plan there would be no more food shortage in the province.

The five-year plan deal with supply of fertilisers to agriculturists, excavation of silted up irrigation channels, establishment of agricultural stores and reclamation of waste lands by mechanical methods. The total area to be benefited under the plan would be about 70 lakh acres. About five lakh acres of land would be reclaimed and added to the total available cultivable acreage of about 26 lakhs in East Pakistan. The area of the Province is about 34 million acres of which forests cover about three million acres, and waste land almost four million acres.

Trading Estate.

The N.W.F.P. Government are considering the establishment of trading estate near Nowshera. It will roughly cover an area of 400 acres and will be on the same model as that of Karachi and Hyderabad Sind.

Cheap electric power and water facilities, as well as means of building factories and labourers' quarters under expert guidance, will be provided by the Government to parties who would like to start any industry in that area. With the exception of flour mills, which will be located in Peshawar, all big industrial and manufacturing concerns will be situated in this trading estate.

Pakistan's Wool Industry.

Wool is one of the most important exportable commodities of Pakistan yielding to the nation a foreign exchange of the order of Rs. 3,50,00,000 a year. Our annual local production is estimated at 24 million pounds, another 11 million pounds are brought into the country, most of it by nomadic tribes living across the border, and we export 27 million pounds to foreign countries, mainly the United States of America and the United Kingdom.

In spite of the fact that this export is large and steady, the reputation of our wool in the foreign markets has remained rather low since export first began during the first quarter of this country. The problem of undoing the damage of the past and of placing our wool on a proper level in the foreign market has been engaging the very earnest attention of Government since the partition.