

Review

Regionale Typen im Jahresgang der Niederschläge in Vorderindien und ihre Beziehung zu Landschaftsgrundlagen by von Hildegard Ludwig, pp. 144, 2 plates. (Hamburg: Cram, de Gruyter and Company 1953)

India is an agricultural country and hence a precise knowledge of the distribution of rainfall and its seasonal and monthly variation is of fundamental importance to the agriculturist. A mere statement of the amount of rainfall for the whole year at any place is not sufficient for him. A country, so vast in size and diverse in topography as India, must need have a great diversity in its rainfall, and in point of fact, no country in the world furnishes such differences as India. Any attempt to summarise the rainfall characteristics or to present a simple spatial pattern of its distribution, therefore, is always very welcome not only to the agriculturist but also to the meteorologist.

2. von Hildegard Ludwig's paper on "Regionale Typen im Jahresgang der Niederschläge in Vorderindien und ihre Beziehung zu Landschaftsgrundlagen", which forms one of the series of very important publications under the auspices of the University of Hamburg, contains a discussion of the volume of rainfall data available with a wealth of detail, all the features of which it is not possible for anyone to bring out in a small review. Besides the three maps, one of which gives the location of the stations whose data have been used for investigation, the other the division of India into various precipitation zones, and the third representing zones over which maximum precipitation occurs in the same month, about half the paper is made up of tables containing the mass of data used, while there are no fewer than 20 diagrams illustrating the march of mean monthly rainfall at various stations.

3. Realising that in low latitudes the seasonal distribution of rainfall, and particularly the length of dry seasons, is of great importance to agriculturists, the author has made

use of the characteristics shown by mean monthly rainfall curves for various stations in India for his classification. This classification is certainly very ideal as it possesses the two-fold advantage of (i) convenience and (ii) of grouping together regions with a similarity of elements resulting from a similarity of causes.

4. After summarising the annual and seasonal characteristics of pressure, temperature and wind distribution over the country, the author shows that the variability for the various monthly averages is small, if one uses the average of 30 years or more and thus justifies the use of 30 years or 55 years averages already available with him from Indian records for his investigation. On the basis of the similarity in the seasonal distribution of rainfall and the seasonal position of the absolute maximum he finds that the characteristics of Indian rainfall as shown by the mean monthly curves can be classified into 5 types and that India can be divided broadly into 5 main regions, in each of which not only the nature of the mean monthly rainfall curve is represented by one of these types, but where various factors which combine to give that rainfall distribution are also similar even though the rainfall varies greatly from station to station.

5. From the characteristics of the mean monthly curves discussed by the author, it is clear that in the seasonal distribution of rainfall over India excepting the northwest highlands, we have a combination mainly of monsoon and equatorial regimes. While the former tends to give a typical absolute maximum and most rain in the summer months with a long dry winter (type I) over the plains of northern India as far east as Burma (Major Region I), the latter is responsible for the double maximum recognisable in the mean monthly curves for stations over the peninsula. This double maximum, although not so clearly recognisable over the central parts of the country and the Malabar coast (Major Region II) due to the interference of the former, can be clearly identified

in Major Region III consisting of the Deccan Plateau, the southern parts of the Peninsula and west Ceylon and in Major Region IV consisting of south Coromandel coast and east Ceylon. These two regions, however, differ in their characteristics in so far as, while the former shows a preponderating maximum in early autumn and a secondary maximum in spring or early summer with a pronounced dry period in winter (type III), the latter exhibits an absolute maximum rainfall, mostly due to the movement of cyclones and the effect of the northwest monsoon, in late autumn with a complete absence of intense rain in summer (type IV). The stations in Major Region V consisting of the Suleiman and Kartar Ranges on the Northwest Frontier, on the other hand, are not affected by either of the two monsoons and as the rainfall in this region is mostly influenced by the passage of the western disturbances during winter the mean monthly rainfall curves at each station show an absolute maximum of rainfall in winter or spring and a secondary maximum in summer (type V).

6. These five major regions, however, get divided into 27 smaller regions as soon as the author attempts a finer classification by grouping together stations which have similar topographical features and whose rainfall curves exhibit not only similar seasonal characteristics of rainfall distribution but also show position of absolute maximum in the same month. Although this picture of rainfall distribution gets quite complicated when a further subdivision is attempted by grouping together curves of stations not having only the same topographic features and the position of absolute maximum in the

same month, but also, in addition, the same period of rainfall activity, it brings out the large contrast which the rainfall distribution shows over northern India. Thus, for example, although rainfall curves show in general similar features in Assam and north-west India, the stations in Assam record rainfall for 9 months as against 3 months in the Thar desert. This analysis also very clearly demonstrates how various combinations of rain producing factors acting on an almost infinite variety of topography produce a bewildering number of rainfall distribution curves and that any system of classification adopted can recognise only the broadest type unless it is to become unwieldy.

7. The author for his investigation has used the monthly averages for drawing the curves but as the monthly values are of different lengths, the mean monthly curves are faulty in so far as the quantities are not directly comparable. It would have been better if the author had reduced all the values to a uniform length of 30 days for his discussion. The reviewer also feels that the value of the map indicating the various precipitation zones would have increased considerably if in addition, graphs of the monthly values were also included on the site of at least a few of the important stations. In any case, the University authorities of Hamburg and the author, von Hildegard Ludwig deserve congratulations for their valuable contribution. Any one who is interested in a serious study of the Indian rainfall distribution is strongly advised to go through the paper.

S. M.

ERRATA FOR VOL. 5 NO. 3

Page 213, column 1, last para, line 2, for 'buorgh't read 'brought'

Page 214, column 2, equation (37),

$$\text{for } R_{\xi} = \left(\frac{v}{v+w^2\xi} \right) \quad \text{read } R_{\xi} = \left(\frac{v}{v+w^2\xi} \right)^n$$

Page 278, column 1, line 33, for '8 December 1943' read '8 December 1953'