Letters To The Editor

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A STUDY OF CERTAIN ASPECTS OF RAINFALL OVER THE NILGIRIS

The Nilgiris, one of the smallest districts of the Madras State, lying between 11°11′N to 11°42′N and 76°18′E to 77°03′E, comprises an area of 989 square miles of mostly hilly terrain with undulating topography. The Dodabetta range running in a northeast to southwest direction divides the district into two distinct rainfall zones. The western portion receives maximum rainfall during the southwest monsoon season (75 to 80 per cent of annual rain), while the eastern zone receives the major share (40 to 50 per cent) of its annual precipitation during the post monsoon months of October to December. The high altitude stations situated on the Dodabetta range receive 30 to 45 per cent of the annual rainfall during each of the above seasons. Table 1 indicates the seasonal distribution of rainfall in different parts of the Nilgiri hills.

Rainfall and resulting soil moisture are probably the most important factors affecting crop cultivation. Each crop has its own specific water requirement and for its successful production, supply of that amount of water to the plant must be assured. For this purpose, the reliability of rainfall, *i.e.*, the lowest and the highest rainfall likely to be received in an area had to be assessed. The stations with similar range when grouped together may constitute a distinct zone so far as it relates to agricultural operations.

The limits (confidence or fiducial) within which the rainfall may be expected to lie can be set according to need. For such a purpose Manning (1956) has chosen 9 : 1 limits (90 per cent fiducial probability or $p=0\cdot1$) on the ground that a minimum expectation of this order will, in fact, approximate to a risk of failure only once in a generation. Such limits were worked out in respect of all the nine raingauge stations in the Nilgiris.

An essential prerequisite, before calculating the confidence limits of annual rainfall, is to test the normality of the distribution of rainfall. This was done and the rainfall was found to be normally distributed in all the stations except Naduvattam and Coonoor. The normal distributions of rainfall of these two stations were transformed by square root transformation to conform to normal pattern. Any failure to allow for such skewness in the distribution of rainfall will result in unreliable estimates of limit which may often be misleading. Table 2 shows the confidence limits for $p=0\cdot1$(9 :1 confidence limits) of expected annual rainfall and details of observed and expected deviations from such limits for all the raingauge stations on the Nilgiris based on 57 years' data.

It would appear from Table 2 that there are two distinct rainfall zones in the Nilgiris district (shown in bracket) in each of which the lower and the upper limits of rainfall are approximately the same. The two rainfall zones comprising (1) Ootacamund, Kilkundah and Ketti and (2) Coonoor and Kotagiri have been shown in Fig. 1. The other four stations in the district have widely varying rainfall limits.

It is seen, therefore, that this method provides the basis for a better and more comprehensive delineation of rainfall areas than what is indicated by mere rainfall isohyets based on mean values, which often ignore the variability inherent in the data and lead to erroneous demarcation of zones of rainfall. Minimum and maximum rainfall expectation may be used in the preparation of rainfall maps, either annual, seasonal

TABLE 1

Seasonal distribution of rainfall (inches) in the Nilgiris

(Mean of 57 years' data)

Station	Cold weather period (Jan—Feb)	Hot weather period (Mar—May)	Monsoon period (Jun—Sep)	Post monsoon (Oct—Dec)	Annual rainfall
Devala	0·85 (1)	10·79 (7)	127·76 (81)	18·39 (11)	157·79
Gudalur	0·68 (1)	8·17 (9)	71·64 (78)	11·13 (12)	91·62
Naduvattam	1·00 (1)	10·77 (11)	76·54 (75)	13·80 (13)	102·11
Ootacamund	1·68 (3)	10·81 (21)	24·45 (47)	15·43 (29)	52·37
Kilkundah	4·00 (8)	8·75 (17)	16·65 (32)	21·80 (43)	51·20
Ketti	3·28 (6)	10·33 (20)	20·36 (38)	19·02 (36)	52·99
Coonoor	7·91 (12)	11·14 (17)	15·06 (23)	31·67 (48)	65·78
Kotagiri	5·70 (9)	13·77 (20)	20·09 (29)	28·65 (42)	68·21
Kodanad	3·54 (6)	11·20 (19)	18·47 (31)	25·54 (44)	58·75

NOTE—The figures in bracket indicate seasonal rainfall expressed as percentage of annual

TABLE 2

Confidence limits (9:1) of expected annual rainfall in the rain recording stations on the Nilgiris

(57 years' data)

Station	Mean (inches)	Standard deviation	Coefficient of variation	Confidence limits of rainfall in inches $p=0·1$		Deviations from limits		Total deviations from limits	
				Lower	Upper	Below	Above	Obser-ved	Ex-pected
Devala	157·76	23·36	14·81	118·68	196·84	3	3	6	5·7
Gudalur	91·63	18·80	20·51	60·18	123·08	2	3	5	5·7
Naduvattam	102·10	18·24	17·86	73·79*	133·40*	2	2	4	5·7
Ootacamund	52·37	9·98	19·06	35·67	69·07	2	4	6	5·7
Kilkundah	51·20	8·96	17·50	36·21	66·19	4	3	7	5·7
Ketti	53·00	11·51	21·72	33·74	72·26	3	4	7	5·7
Coonoor	65·78	14·84	22·55	42·90*	91·58*	2	4	6	5·7
Kotagiri	68·21	13·73	20·13	45·24	91·18	0	2	2	5·7
Kodanad	58·76	10·29	17·51	41·54	75·98	2	3	5	5·7

*Transformed data reconverted into original units

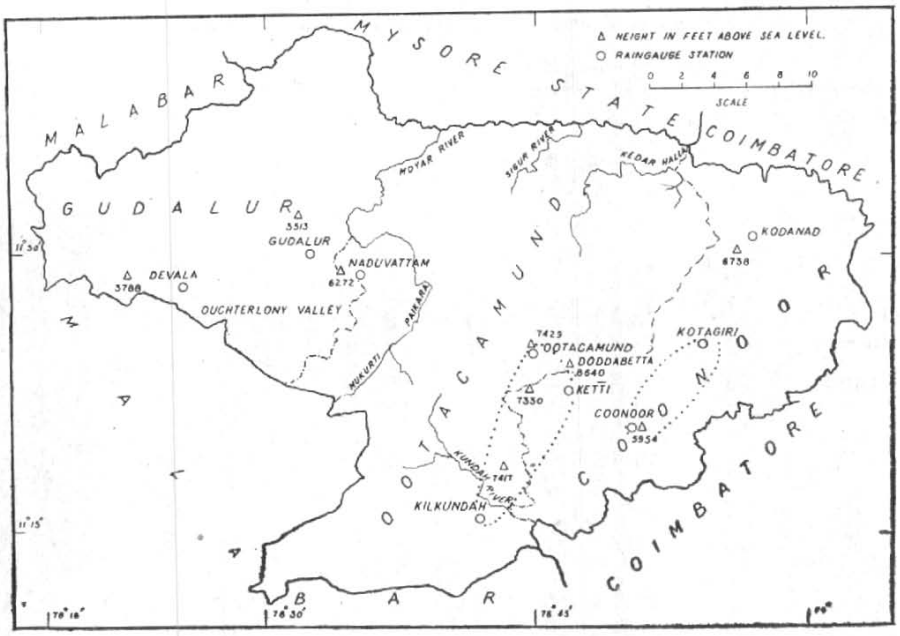

Fig. 1. Nilgiris district showing the raingauge station with two territorial rainfall zones
.....Line of equal rainfall probability with approximately similar lower and upper limits of rainfall expectation

or even for shorter periods. As pointed out by Manning (1956), given estimates of water required for optimum crop growth, it is a simple matter to calculate the chances of obtaining such amounts of rainfall. Attempts for evaluating such rainfall probabilities during important phases of crop growth will be made.

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REFERENCE

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