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Short Communication

Rainfall probability in the lower Brahmaputra valley zone of Assam

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Rainfall is an important factor in crop production particularly in rainfed situation. Ramie [*Boehmeria nivea* (L.) Gaud.] is a widely cultivated rainfed fibre crop of Assam which produces the longest and strongest fine textile fibre of plant origin. Being a semiperennial crop, once it is planted in May-June with the onset of monsoon, the crop remains in the field for about 5 years giving economic production from 4 cutting in each year (Sarkar and Maitra, 2001). Ramie needs about 2000-3000 mm rainfall in a year evenly distributed at 150-200 mm a month during the active growing season i.e., April to October (Singh, 1990). So by knowing the expected rainfall in a particular month during pre-monsoon or early monsoon season the planting of ramie rhizomes could be started in this zone.

Any excess of rainfall over the normal requirement of ramie is neither particularly helpful nor harmful, provided there is proper drainage and the plant roots are never water logged. Ramie is extremely sensitive to water logging, as a field of ramie inundated for a period of 36-48 hrs will be eradicated (Sarkar and Maitra, 2001). Therefore, for planning of drainage system in ramie field, the knowledge of expected rainfall in a particular month during the active growing season is essential.

Rainfall data of recent past 37 years (1964-2000) recorded at the meteorological observatory of Ramie Research Station (26.5° N, 91°E, 90 m AMSL), Sorbhog, Barpeta, Assam were used for the analysis. The available rainfall data were analyzed for annual, seasonal and monthly values through standard deviation (SD), standard error (SEm±), co-efficient of variation (CV). Probability was calculated as described by Panse and Sukhatme (1985) as follows -

a) Calculation of normal deviate = $(X-\mu)/\sigma$, where X is the given observation, μ is the mean value and σ = standard deviation.

b) The table value of $^1/_2 (1+\alpha)$ corresponding to the values of normal deviate was computed. Intermediate values of normal deviate (which are not available in table) were obtained by interpolation.

c) Probability (%) = [1 - table value of $^1/_2 (1+\alpha)$] x 100.

Monthly and yearly events were then classified as drought, normal and abnormal (above normal) depending upon the following criteria (Sharma *et al.*, 1979).

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Table 1: Monthly, seasonal and annual rainfall statistics at Sorbhog, Assam.

Month/ Season	Mean rainfall (mm)	% of total	SD	SEm±	CV (%)	A_1 (mm)	A_2 (mm)	DM	NM	AM
March	53.9	1.8	42.5	7.0	78.8	27.0	107.8	11	22	4
April	198.4	6.7	100.8	16.6	50.8	99.2	396.9	6	29	2
May	421.8	14.2	167.8	27.6	40.6	210.9	843.7	4	32	1
Summer	674.1	22.7	240.7	39.6	35.7	-	-	-	-	-
June	628.1	21.1	216.9	35.7	34.5	314.1	1256.2	2	34	1
July	651.3	21.9	269.3	44.3	41.4	325.6	1302.5	4	32	1
August	445.5	15.0	223.7	36.8	50.2	222.7	891.0	3	32	2
September	366.0	12.3	186.1	30.6	50.9	183.0	732.0	6	30	1
Kharif	2090.9	70.3	483.4	79.5	23.1	-	-	-	-	-
October	143.0	4.8	92.3	15.2	64.6	71.5	286.0	7	27	3
November	24.9	0.8	30.5	5.0	122.5	12.4	49.8	19	11	7
December	8.8	0.3	19.1	3.2	216.9	4.4	17.6	22	9	6
January	11.1	0.4	12.8	2.1	116.0	5.5	22.1	16	14	7
February	20.0	0.7	26.7	4.4	133.3	10.0	40.0	17	15	5
Rabi	207.8	7.0	117.7	19.3	56.6	-	-	-	-	-
Annual	2972.8	100.0	611.3	100.5	20.6	2361.6	3584.1	7	22	8

If $\overline{X}$ is the mean monthly rainfall then a month receiving rainfall less than A_1 is defined as drought month, in between A_1 and A_2 is normal month and above A_2 is an abnormal month, where, $A_1 = \overline{X}/2$ and $A_2 = 2\overline{X}$. Also, if $\overline{Y}$ is the mean annual rainfall then a year is said to be drought, normal or abnormal year as it receives rainfall less than $\overline{Y}$-SD, in the interval [$\overline{Y}$-SD, $\overline{Y}$ + SD] and above $\overline{Y}$ + SD respectively, where SD is the standard deviation of annual rainfall.

The mean annual total rainfall of Sorbhog was found to be 2972.8 mm with coefficient of variation (CV) of 21% (Table 1). The highest annual rainfall of the concerned period was 4055.5 mm in 1984 which was 36% above normal (Fig.1). The lowest rainfall of 1925.9 mm was recorded in 1994, which was 35% below the normal limit. Just more than the lowest rainfall was recorded in 1997 measuring only 1945.9 mm (34.5% below normal). Considering the mean annual rainfall as normal, during the reported period of 37 years, in 16 years the rainfall was above normal, in 19 years it was below normal and in 2 years (1980 and 1982) it was just normal (Fig.1). As per the criteria described by Sharma *et al.*, (1979), among the reported 37 years, 7 and 8 years were dry and abnormal (above normal) years respectively and the remaining 22 years were normal (Table 1).

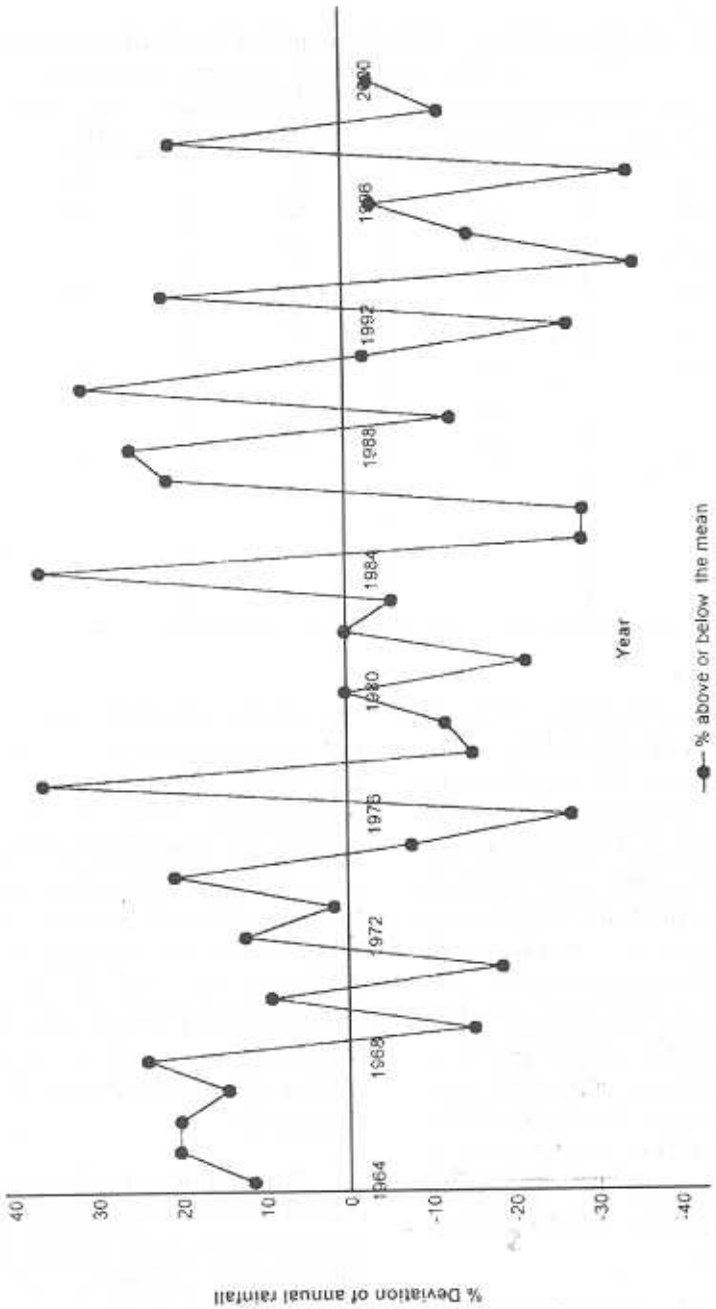

Fig. 1 : Deviation (%) of annual rainfall over 37 years from the mean (2972.8 mm)

Table 2: Monthly rainfall probability (%) at different expected levels of rainfall at Sorbhog, Assam

Months	Rainfall amounts				
	250 mm	200 mm	150 mm	100 mm	50 mm
March	-	-	1	14	54
April	31	49	68	94	93
May	85	91	95	97	99
June	96	98	99	99	100
July	93	95	97	98	99
August	81	86	91	94	96
September	73	81	88	92	96
October	12	27	47	68	84
November	-	-	-	1	21
December	-	-	-	-	2
January	-	-	-	-	-
February	-	-	-	-	13

Three distinct seasons had been identified for Assam (Deka and Nath, 2000). These are summer (March to May), *kharif* (June to September) and *rabi* (October to February). The seasonal rainfall distribution at Sorbhog was of same pattern as observed in other zones of Assam (Sarma *et al.*, 1996; Deka and Nath 2000). *Kharif* season contributed highest amount of rainfall (2090.9 mm) followed by summer (674.1 mm) and *rabi* (207.8 mm) season (Table 1). The percent contribution to total rainfall was 70.3, 22.7 and 7 for *kharif*, summer and *rabi* season respectively with the lowest CV in *kharif* (23%) followed by summer (CV=35.7%) and *rabi* (CV = 56.6%). Highest CV value in *rabi* season signified sporadic and highly variable rainfall during the winter months.

Monthly rainfall data (Table 1) revealed that July was the wettest month (651.3 mm) followed by June (628.1 mm). It is quite main share of *kharif* rainfall as the southwest monsoon in Assam brings rain from 1st week of June (Deka and Nath, 2000). December was the least contributing month (8.8 mm) followed by January (11.1mm). At Sorbhog June provided consistent rainfall with minimum CV (35%) and in contrast December had highest CV value (217 %), so the winter rainfall was sporadic and uncertain. Out of the 444 months under consideration in 37 years, drought (DM), normal (NM) and abnormal (above normal) months (AM) had been found to be 26%, 65% and 9% respectively.

Probabilities of getting 50, 100, 150, 200 and 250 mm of monthly rainfall in a month are given in Table 2. The probability of getting 50 mm rainfall in a month is more than 80% from April to October. An amount of 150 mm of monthly rainfall during the active growing season of ramie (April - October) is considered

essential for sustaining higher fibre yield (Singh, 1990). It was observed that at Sorbhog probabilities of getting 150 mm of monthly rainfall during April is 68% and in May it is 95%. So, ramie rhizome can safely be planted at any time in May and in some cases even in April as it satisfies the rainfall requirement of ramie.

Probabilities of getting 250 mm rainfall during June and July are 96 and 93% respectively. During this period proper drainage facilities are to be provided to ramie field as Sarkar and Maitra (2001) reported that such a huge rainfall may inundate the field and if water logging persists for 36-48 hours, the crop will be eradicated.

There is 68% probability of getting 100 mm rainfall during October, which may be utilized for land preparation for wheat. It is quite interesting to note that the probability of getting 200 mm of rainfall during September is 81% which may be considered as assured rainfall (Gupta *et al.*, 1975). This 200 mm rainfall during the pre-*rabi* month will recharge the sub-soil moisture and which will be ultimately utilized by wheat crop through its dense root system (Parihar and Sandhu, 1994). During October probability of getting 50 mm rainfall is 84% which may be utilized for *rabi* legumes such as lentil, lathyrus etc. Being deep-rooted, lentil makes fairly good use of moisture stored at the lower depth (60-90 cm) of soil (Chatterjee and Bhattacharyya, 1986).

The information generated from this study can be useful for timely planting of ramie rhizome and for providing drainage facility in ramie-fields of the lower Brahmaputra velley zone of Assam. The series of information can also be utilized for management and sowing of *rabi* cereal such as wheat, which is gaining importance steadily among the marginal and small farmers of this region and for timely sowing of *rabi* legumes namely lentil and lathyrus.

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