It could be seen from the Table 3, there were 6 variables in Factor I and one variable in Factor II. There were 6 variables having significant loadings on Factor I. They were family status (0.76279), occupational status (0.82212), farm status (0.92651), social participation status (0.87153), farm power status (0.84107) and material status (0.90786). The first factor accounted for 52.6 per cent of the total variation. These 6 variables were considered as high loading variables having direct bearing on the extent of participation.

Communication status (0.71561) had significant factor loading on Factor II on the extent of participation. The second factor accounted for 14.2 per cent of the total variation. The first group of factors was named as "Economic factor" and the second factor as 'Communication factor".

The study leads to conclusion that we have to concentrate on educational status of beneficiaries for getting better participation in poverty alleviation programmes.

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(Received : November 1999; Revised : March 2001)

Madras Agric. J., 87(7-9): 384 - 388 July - September 2000

https://doi.org/10.29321/MAJ.10.A00478

Aberrations in monsoons in assured rainfall area of Parabhani I - Meteorologic characterization

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Abstract : Rainfall records of 52 years (1944-95) of Parbhani station located in the assured rainfall zone of Maharashtra state were critically examined for establishing the long term averages of monthly rainfall and its temporal variability by deploying appropriate statistical techniques. The deviations in normal time(s) of onset and withdrawal of monsoon, depths of monthly rainfall and their distribution were defined as aberrations. The results revealed that the average monsoon rainfall (monthly total) of 849.96 mm was distributed in the proportion of 18.13, 26.94, 25.28, 21.61 and 7.93 per cent during June to October, respectively. The variabilities in normal rainfall during crucial months of August (67.69 %) and October (119.48 %) were relatively higher than remaining monsoon months. The probabilities of normal onset (25th MW) and withdrawal (39th MW) were 44.23 and 50 per cent, respectively. The corresponding probabilities of aberrations were 55.77 and 50 per cent. The per cent probabilities of aberrations in seasonal (June to October) amount of rainfall was 56.54 per cent, with higher proportion of below normal (39.23) than its above normal (27.31) rainfall during June to October. The per cent probabilities of recupation of preceeding deficiency in succeeding months decreased with the advancement of time of occurrence of deficiency. ***(Key words** : Weather parameters, Average, Variability, Onset, Withdrawal, Spells).*

The condensation and precipitation of atmospheric water vapour are purely physical processes governed by aero-thermo-dynamic properties of surface and upper air layers. The tapestry of the interactions of these properties decides the fate of south-west monsoon over Indian sub-continent (Gowarikar *et al.*, 1989 and 1991). The qualitative (time of onset and withdrawal of monsoon, its persistence) and quantitative (magnitude, intensity and distribution) properties of south-west monsoon rainfall in Central Maharashtra Plateau Zone highly varied over time and space (Patil *et al.*, 1992). The

respective variations of 10 to 20 and higher than 20 per cent in rainfall were common in humid and semi-arid climates (Virmani *et al.*, 1978).

The vagaries induced by the variabilities associated with the extremities in weather parameters like rainfall, adversely affect all the activities of mankind including agriculture (Sarkar and Biswas, 1978), by degrading soil resources through erosion (Kumar and Kumar, 1989 and Rana and Thakur, 1995), droughts (Katyal *et al.*, 1992) and reducing water resources by silting of surface reservoirs.

Weather-data based information system offers potential opportunity in delineating the complex "Soil-plant-environment" system into homo-eco-climatic zones for transferring the plants and / or technologies (Russel, 1978).

Hence the importance of weather data based information system is greatly felt for planning the research and development activities in agriculture.

In crisp, the aberrations in weather parameters in general and rainfall in particular undermines the hopes of mankind. So the assessment of nature and degree of aberrations in rainfall would provide first hand information to combat its hazards. Therefore, efforts were made in this paper to examine the nature of aberrations in monsoon at Parbhani located in assured rainfall semi-arid climate.

Materials and Methods

Data on daily rainfall events (Rainfall > 2.5 mm day^{-1}) recorded at Crop Weather Station, Parbhani (17° 16'N, 74° 76'E and 409 m above MSL) during monsoon (June to October) seasons from 1944 to 1955 were critically examined. These data were summed over calender months and subjected to statistical analysis for establishing the monthly normals of time of onset and withdrawal of monsoons, depths of rainfall (monthly and seasonal) and distribution by deploying appropriate techniques. The accumulation of 75 mm rainfall during 2-3 consecutive days upto 24th MW, 25th MW and 26th MW, were defined as early (ES), normal (NS) and late (LS) onset of monsoon seasons. Analogously the last accumulations of 75 mm rainfall before or during 39th MW, 40th MW and 41st MW, were termed as early (EW), normal (NW) and late (LW) withdrawals of monsoon rainfall. The deviations from normals of onset and withdrawal of monsoons, depths of rainfall (monthly and seasonal) and its distributions were defined as aberrations in respective properties of monsoon. The severity of aberrations in depths of rainfall (monthly and seasonal) was adjudged by deploying the standard meteorological scheme (Acharya and Gupta, 1990) as detailed below (Table 1).

This theme was also applied for delineating the monsoon seasons into different categories.

The individual months in each monsoon season and seasons in a sample (1944-95) were schematically coded into different hydrological regimes (Table 1) and their conditional frequencies were worked out for determining the persistence of hydrological status (i.e. normal, deficit or / surplus). The simple and conditional probabilities were worked out (Munn, 1970). The probabilities of recupation or non-recupation of preceeding deficiency in rainfall in succeeding months were computed by following model:

$$P1 = \frac{(N+h+H)}{n.y.} \times 100 \qquad P2 = 100 - P1$$

Where

P1 = Probability of recupation of deficit

P2 = Probability of non-recupation of deficit

n = Number of months during which there is a chance for recupation

y = Number of years in a sample (52)

N, h and H are frequencies of each category of rainfall regime in the sample.

The returns periods of any evert were estimated by reciprocal of its probability.

Results and Discussion

The analytical results on different parameters of rainfall characteristics in semi-arid climate at Parbhani are narrated below:

Normal rainfall and its variability

Data on normal (monthly and seasonal) rainfall and its variability parameters are presented in Table 2.

The normal rainfall during monsoon season at Parbhani (Table 2) was 849.96 mm. The monthly averages increased from 154.11 mm in June to 228.98 mm in July and then it declined to 215.73 mm in August, 183.73 mm in September and 67.41 mm in October with a unimodal distribution pattern contributing 18.13, 26.94, 21.61 and 7.93 per cent during June to October, respectively. The coefficient of variability revealed three peak distribution exhibiting peaks during June, August and October

with depressions during July and September. Thus, the rainfall was more dependable in June-July and relatively less dependable in October followed by August. The variability in monthly rainfall was higher (44.23 to 119.48%) than seasonal rainfall (35.38%).

Onset and withdrawal of monsoons

As the time of onset and withdrawal of monsoon decides the length of safe growing period of crops, the frequency and probability of different types of monsoons viz., onset and withdrawals were worked out and presented in Table 3. The total probabilities of normal onset and withdrawals were 44.23 and 50 per cent, while their corresponding aberrations were 55.77 and 50 per cent, respectively.

The probabilities of aberrations in early and late onset were 32.69 and 23.07 per cent, while the corresponding probabilities of withdrawal were 26.92 and 23.08 per cent. This showed that the total probabilities of early onset of monsoons were higher than their early withdrawals and almost equal in late onset so also late withdrawals. Among early onset monsoons the probabilities of late withdrawal were higher (9.61%) than its early withdrawal (5.77%). The trend was reverse in case of late onset of monsoons. Theses data indicated a peculiar feature that the probabilities of early onset with its early withdrawal and late onset with its late withdrawal equal and lowest than rest of the monsoon types. This clearly noticed that the late started monsoon may not get withdrawal at late. This analysis further revealed that the possibility of normal onset and normal withdrawals was once in four years resulting in 15 weeks monsoon length. Similarly, the possibility of getting longest monsoon (17 weeks) by early onset and late withdrawal was once in 10 years, and the possibility of getting shortest monsoon (13 weeks) by early onset and early withdrawal was once in 12 years.

Aberrations in distribution of rainfall depth

Data on probabilities of intra vis-a-vis inter month and inter season aberrations in rainfall depths are presented in Table 4.

The inter season probability (Table 4) revealed that the chances of monsoon season receiving normal rainfall (688.46 to 1011.45 mm) were 57.69 per cent and the chances of aberrant monsoon were 42.30 per cent. The break up of aberrations revealed that the chances of monsoon being deficit or surplus were equal (i.e.21.15%). The further refined picture showed that the chances of monsoon to be severe deficit (D) were nil, while it being moderately deficit (d) were 21.15 per cent. Similarly, the chances of monsoon being highly surplus (H) were higher (15.38%) than moderately (5.77%) surplus (d).

The probability of inter monthly aberrations showed that the chances of receiving normal rainfall (Table 2) in each month were 33.46 and the chances of aberrations were 66.54 per cent. These data further revealed that the rainfall receipts being below and above normal were 39.23 and 27.31 per cent, respectively.

The probabilities of monthly rainfall being severely (D) deficit (25.38%) and excessively (H) surplus (18.08%) were higher than moderately (d) deficit (13.85%) and moderately (h) surplus (9.23%).

Auditation of inter monthly aberrations revealed that the per cent probabilities of receipts of normal (N) rainfall were higher in all the months except October, than its oscillations towards deficit or surplus depths. The chances of monsoon months beings deficit were higher than they being surplus. The chances of severe deficit during August and September were equal (28.85%) and higher than June and July but lesser than October. Similarly, the chances of excessively surplus (H) rainfall were highest in August (25.0%) and the lowest in September (13.46%). They were equal in June, July and October (17.31%).

Probabilities of recupation of rainfall deficiency

The probabilities of recupation of preceeding deficiency in rainfall in its forthcoming period can serve as guidelines for planning the measures to be taken for mitigating the adversities of deficiency. Therefore, the probabilities of recupation of rainfall deficiency occurred up to the end of June, July, August and September during the succeeding period of monsoon were worked out and presented in Table 5. The probabilities (Table 5) of normal (N), moderately high (h) and excessively high (H) rainfall showed temporal variations.

The total probability of rainfall deficiency occurred up to the end of June, to be recouped during July to October was 58.16 per cent. The corresponding probabilities of recupation of deficiencies occurred up to the end of July, August and September during August, September and October were 55.12, 58.66 and 48.08 per cent, respectively. The probabilities of non-recupation of deficiency occurred up to the end of June, July, August and September during remaining respective periods of monsoon were 41.84, 44.88, 41.34 and 51.92 per cent.

These data further revealed that the sequential order of contribution in recouping deficit occurred during preceeding month was normal (N), followed

Table 1. Standard meteorological schemes for delineating the rainfall aberration (monthly and seasonal).

Sr. No.	Threshold criteria of scheme	Scale of severity	Symbol
1.	(-) 0.59 from normal	Severely deficit	D
2.	(-) 0.19 to (-) 0.59 from normal	Moderately deficit	d
3.	$\pm$ 0.19 from normal	Normal	N
4.	+ 0.19 to 0.59 from normal	Moderately surplus	h
5.	+> 0.59 from normal	Highly surplus	H

Table 2. Average rainfall (mm) and its variability parameters.

Particulars	Months					Monsoon season
	June	July	August	Sept.	Oct.	
Average (mm)	154.11	228.98	215.73	183.73	67.47	849.96
Std. deviation	87.79	101.13	146.03	99.59	80.54	297.68
Coefficient of variation (%)	56.95	44.23	67.69	54.21	119.48	35.38
Distribution (%)	18.13	26.94	25.38	21.61	7.93	99.99

Table 3. Frequencies and per cent probabilities of monsoon types at Parbhani.

Onset	Withdrawal							
	Frequencies				Probabilities (5)			
	Early (EW)	Nomal (NW)	Late (LW)	Total	Early (EW)	Nomal (NW)	Late (LW)	Total
Early (ES)	3	9	5	17	5.77	17.31	9.61	32.69
Normal (NS)	7	12	4	23	13.46	23.08	7.69	44.23
Late (LS)	4	5	3	12	7.69	9.61	5.77	23.07
Total	14	26	12	52	26.92	50.00	23.08	99.99

E= Early, N=Normal, L=Late, S=Onset, W=Withdrawal

Table 4. Per cent probabilities of aberrations in rainfall depths during intra and inter months and seasons.

Category of aberration	Intra month probability(%)					Inter month	Inter season
	June	July	Aug.	Sept.	Oct.		
D	19.23	5.77	28.85	26.85	44.23	25.38	00.00
d	9.61	26.92	21.15	3.85	7.69	13.85	21.15
N	50.00	38.46	23.08	32.69	23.08	33.46	57.69
h	3.85	11.54	1.92	21.15	7.69	9.23	5.77
H	17.31	17.31	25.00	13.46	17.31	18.08	15.38
Total	100.00	100.00	100.00	100.00	100.00	100.00	99.99

Table 5. Per cent probabilities or recuption of rainfall deficiency occurred during preceding period.

Deficiency occurred up to end of	Recupation parameters	Monthly recupation				Recupation		Non-recupation
		July	Aug.	Sep.	Oct.	Gross	Net	
June	N	9.61	5.77	8.17	5.77	29.32		
	h	2.88	0.48	5.29	1.92	10.57	10.57	
	H	4.33	6.25	3.36	4.33	18.27	18.27	
	Total	16.82	12.50	16.82	12.02	58.16	28.84	41.84
July	N		7.69	10.90	7.69	26.28		
	h		0.64	7.05	2.56	10.25	10.25	
	H		8.33	4.49	5.77	18.57	18.59	
	Total		16.66	22.44	16.02	55.12	28.84	44.88
August	N			16.35	11.54	27.89		
	h			0.96	10.58	11.54	11.54	
	H			12.50	6.73	19.23	19.23	
	Total			29.81	28.85	58.66	30.77	41.34
September	N				23.08	23.08		
	h				7.69	7.69	7.69	
	H				17.31	17.31	17.31	
	Total				48.08	48.08	25.00	51.92

by excessively surplus (H) and moderately surplus (h) rainfall events in succeeding months.

Acknowledgments

Author wishes to express sincere thanks to Dr. G.S. Jadhav, Professor of Agronomy for his much needed assistance with critics in finalizing the text of the manuscript.

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(Received : January 1999; Revised : March 2001)