

## RAINFALL PATTERN AND CROP PLANNING FOR RAINFED FARMING IN INDORE REGION

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Quantification of variability of climatic factors has always been a matter of concern for local crop planning (Cochemean and Franquin, 1967 and Hargreaves, 1971). Study of the rainfall behaviour in such areas would help in farming the crop planning. The present paper suggests cropping pattern for the black-cotton soil rainfed region of Indore [22°43' N, 75°48' E, 567 m above MSL], where major portion of rain is received from the south-west monsoon.

The daily weather data recorded at the meteorological observatory of JNKVV farm at Indore campus, for the period from 1931 to 1980 were used for the analysis. The dates of onset, withdrawal and duration of the monsoon for Indore were analysed. Using simple frequency, based on weekly rainfall data from 1931 to 1980, probabilities were calculated to obtain different amount of rainfall during 22 standard meteorological week (SMW) to 42 SMW. The period of adequate/excess water availability was obtained by subtracting potential evaporation from precipitation for the meteorological weeks 26 to 39 making the crop growing season.

Table 1 gives the analysis of onset, withdrawal and duration of south-west monsoon. The early onset increases the length of growing season while delayed onset reduces the length of cropping season. However, the crop yield pattern shows no appreciable difference between normal and early monsoon years (Sastri, 1986).

Table 1. Onset, withdrawal and duration of south-west monsoon at Indore

| Particulars   | Onset          | Withdrawal    | Duration (days) |
|---------------|----------------|---------------|-----------------|
| Median date   | 18 June        | 23 Sept       | 99              |
| Mean date     | 19 June        | 21 Sept       | 98              |
| SD (days)     | 9 days         | 10 days       | 14              |
| CV (%)        | 47             | 44            | 44              |
| Earliest date | 29 May (1938)  | 16 Aug (1979) | 140 (1938)      |
| Latest date   | 12 July (1906) | 15 Oct (1938) | 59 (1965)       |

Meteorological weeks 26-39 constitute the period of surplus rain water (Table 2). This period is favourable for the crop growth in Indore region. Based on the infor-

Table 2. Probabilities of rainfall, potential evapo-transpiration and the availability of surplus water in crop season (weeks 26-39) at Indore

| Meteorological week | Probability (%) of rains |      |      |       |       |       |       |       |    |    |    |    | Potential evapo-transpiration | Rainfall | Surplus water |  |  |
|---------------------|--------------------------|------|------|-------|-------|-------|-------|-------|----|----|----|----|-------------------------------|----------|---------------|--|--|
|                     | Any rain                 | 3 mm | 5 mm | 10 mm | 15 mm | 20 mm | 25 mm | 30 mm | 8  | 9  | 10 | 11 |                               |          |               |  |  |
| 1                   |                          |      |      |       |       |       |       |       |    |    |    |    |                               |          |               |  |  |
| 22                  | 30                       | 18   | 16   | 14    | 14    | 12    | 12    | 12    | 10 | 10 |    |    |                               |          |               |  |  |
| 23                  | 60                       | 56   | 44   | 32    | 20    | 12    | 10    | 10    | 6  | 6  |    |    |                               |          |               |  |  |
| 24                  | 80                       | 72   | 66   | 50    | 44    | 38    | 34    | 34    | 32 | 32 |    |    |                               |          |               |  |  |
| 25                  | 84                       | 80   | 82   | 64    | 58    | 58    | 58    | 58    | 52 | 52 |    |    |                               |          |               |  |  |
| 26                  | 92                       | 88   | 82   | 74    | 70    | 70    | 70    | 70    | 60 | 60 |    |    |                               |          |               |  |  |
| 27                  | 96                       | 94   | 92   | 90    | 88    | 84    | 84    | 82    | 78 | 78 |    |    |                               |          |               |  |  |
| 28                  | 100                      | 94   | 94   | 92    | 80    | 74    | 72    | 72    | 72 | 72 |    |    |                               |          |               |  |  |
| 29                  | 96                       | 88   | 84   | 80    | 76    | 70    | 70    | 70    | 68 | 68 |    |    |                               |          |               |  |  |
| 30                  | 98                       | 90   | 88   | 82    | 76    | 72    | 72    | 68    | 64 | 64 |    |    |                               |          |               |  |  |
| 31                  | 100                      | 92   | 92   | 82    | 78    | 72    | 72    | 70    | 62 | 62 |    |    |                               |          |               |  |  |
| 32                  | 98                       | 96   | 94   | 90    | 74    | 70    | 70    | 62    | 60 | 60 |    |    |                               |          |               |  |  |
| 33                  | 98                       | 90   | 84   | 76    | 74    | 66    | 64    | 64    | 58 | 58 |    |    |                               |          |               |  |  |
| 34                  | 94                       | 88   | 78   | 78    | 64    | 58    | 56    | 54    | 54 | 54 |    |    |                               |          |               |  |  |
| 35                  | 96                       | 92   | 84   | 74    | 64    | 58    | 56    | 54    | 54 | 54 |    |    |                               |          |               |  |  |
| 36                  | 92                       | 90   | 86   | 80    | 66    | 60    | 56    | 54    | 54 | 54 |    |    |                               |          |               |  |  |
| 37                  | 90                       | 82   | 78   | 68    | 64    | 62    | 54    | 50    | 50 | 50 |    |    |                               |          |               |  |  |
| 38                  | 96                       | 76   | 70   | 62    | 60    | 48    | 44    | 44    | 44 | 44 |    |    |                               |          |               |  |  |
| 39                  | 72                       | 64   | 58   | 48    | 46    | 34    | 32    | 30    | 30 | 30 |    |    |                               |          |               |  |  |
| 40                  | 66                       | 48   | 40   | 34    | 26    | 24    | 22    | 20    | 20 | 20 |    |    |                               |          |               |  |  |
| 41                  | 44                       | 42   | 40   | 30    | 28    | 22    | 20    | 16    | 16 | 16 |    |    |                               |          |               |  |  |
| 42                  | 26                       | 20   | 20   | 12    | 12    | 10    | 10    | 4     | 4  | 4  |    |    |                               |          |               |  |  |

mation of surplus water period given in the Table 2, appropriate crop plans for the location were laid down and the experiments were conducted. On the basis of experimental observations obtained under aberrant and normal weather conditions and the analysis of results, some inferences are drawn :

- ( i ) The crop varieties of about 100- day duration may be successfully harvested at Indore.
- ( ii ) For sowing, a rain spell of at least 20 mm in two consecutive days (Virmani, 1975) to 25 mm in the week (Raman, 1974) is desirable. Accordingly, the suitable time/period for sowing kharif crops in Indore district is meteorological week 26 which has 70% probability of getting more than 25 mm of rains (Table 2).
- ( iii ) Crop planning under aberrant weather conditions : The common aberrant weather conditions which affect the dryland farming in semi-arid conditions of Indore region zones are categorized as here under :
  - ( a ) Delayed onset of monsoon : From the results it is observed that normal date of onset of monsoon (normal date 18 June) can be as early as 29 May and as delayed as 12 July. The late onset reduces the growing period. Under delayed monsoon conditions, maize, pigeon pea and soyabean can be sown upto mid July and sunflower up to the end of August.
  - ( b ) Breaks in the Rainfall : During Kharif, usually one or two dry spells are experienced. Short duration breaks may not be of serious concern. However, the long duration dry spells create water stress for plants which reduce agricultural production. Yield of drought tolerant crops may not be seriously affected, but it is adversely affected in cases of sensitive crops. Even in tolerant crops, the drought may be hazardous at critical stage of growth. Therefore, crop planning may be done in such a way that the probable period of dry spell may not coincide with such critical stage of the crop.

If the break in rainfall occurs within ten days of sowing, it is best to resow with subsequent rains rather than allowing inadequate plant population leading to poor harvest. On the other hand if the crop is in advanced stage then ratooning and/or thinning operation should be adopted. Inter-cropping systems such as pigeon pea + soyabean and maize + soyabean, improve the crop production in areas which face breaks in rains frequently. Life saving irrigation with stored run-off water is also recommended for saving the crops. If the break in monsoon is quite brief soil mulching is found advantageous for storing water in soil profile for an extended period.

- ( c ) Withdrawal of Monsoon: In the case of early termination of monsoon crops require some soil moisture for the maturity. Attempt should be made to store the moisture by runoff recycling and use of mulches. In case harvested runoff water is not used for kharif crop, it can be used for pre-planting irrigation of rabi crops.

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#### REFERENCES

- Cochemean, J. and Franquin, P. 1967. A study of the semi-arid area south of the Sahara in West Africa FAO/UNESCO/WMO/inter agency project, pp. 117-129.
- Hargreaves, C.H. 1971. Precipitation, dependability and potential for agricultural production of the Indian-sub-continent. Proceedings of the Symposium on Recent Advances in Tropical Ecology. 144-153.
- Raman, C.R.V. 1974. Analysis of Commencement of monsoon rains over Maharashtra State of Agricultural Planning. Scientific Report No. 216. India Meteorological Department, Poon. pp. 24.
- Sastri, A.S.R.A.S. 1986. Agro-meteorology of rice in Central India - A peripheral view. Technical publication of ZARS, JANKVV, Raipur Campus, India, pp. 31.
- Virmani, S.M. 1975. The Agricultural climate of Hyderabad region in relation to crop planning. International Crop Research Institute for semi-arid tropics, Hyderabad, pp. 54.