*Short communication*
# Rainfall probability analysis for different agroclimatic zones of Bihar

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Proper management of rain water holds the key for successful planning in agriculture. Right from sowing to harvesting of crop, information on pattern of rainfall distribution and probabilities is essential for avoiding water stress and subsequently raising of good crop. The variability of rainfall both in space and time determines the water balance and irrigation requirements of crops. Various authors have studied the rainfall pattern and distribution for crop planning. Ghadekar and Thakare (1991) worked extensively on the rainfall distribution pattern over Nagpur region of Maharastra. Chattapadhay and Ganeson (1995) studied the variability of annual and seasonal rainfall pattern of coastal Tamil Nadu. Chaudhary and Tomar (1999) developed the stable rainfall period during crop season through an analysis of forty years data over twelve stations of Bastar district. In this paper, an attempt has been made to characterize the rainfall pattern, weekly rainfall probability and moisture availability in different agro-climatic locations of Bihar state. Daily rainfall data of Pusa (database1971-2001), Madhepura (database 1974-2003), Bikramganj (database 1931-2003), Patna (database 1981-2004) and Sabour (database 1972-2001) were collected and analysed. weekly, seasonal and annual rainfall distribution. The weekly rainfall probabilities were calculated using rainfall analysis software.

Among the five selected locations across three agroclimatic zones of Bihar viz zone I, zone II and Zone III. Madhepura ( Zone II) receives highest annual rainfall ( 1546.3 mm) with 84 number of rainy days followed by Sabour (1264.0mm) with 62 number rainy days. Zone IIIB received the lowest amount of rainfall (1034.5mm). About 70 to 90% of annual rainfall are received during monsoon seasaon. The monsoon rains starts between 24 to 26 SMW and ends by 42-44 SMW in different zones of Bihar.

*Weekly rainfall probability analysis*

The analysis of weekly rainfall at different probability level showed that during monsoon season, more than 30 mm rainfall per week is expected at both 50 percent and 75 percent level during $24^{th}$ to $38^{th}$ SMW ( Table 1). The probability of more than 40 mm rainfall per week is expected between $26^{th}$ to $37^{th}$ SMW except at 32 SMW in zone I ( Pusa, Samstipur). In Zone II at Madhepura, 50-70 mm rainfall or more could be expected at 75 percent probability during 25 to $38^{th}$ SMW. At 75 probability, the amount of rainfall greater than 60 mm could be expected in four succeeding weeks from 27 to $30^{th}$ SMW.

In Zone III(A) at Sabour, atleast 30 mm rainfall could be expected during 24-$37^{th}$ SMW. The rainfall amount decreases from $38^{th}$ Week onward. The standing rice crop faces mild or moderate water stress during this period in this region. Week no 26 to 28 had rainfall more than 60 mm at 75 percent probability. However, all other weeks during the monsoon season rainfall receives less than 50 mm. In zone III(B) at Bikaram ganj at least 30 mm rainfall is expected from 26-$37^{th}$ SMW. The rainfall decreases drastically thereafter. The similar trend could be observed at Patna region of Zone III(B).

The cumulative rainfall from $39^{th}$ to $41^{st}$ week (24 Sep to 14 Oct) is highest (79.0 mm ) in Zone II and the lowest (24.0mm) in Zone III. The Zone I received only 41.0 mm rainfall. Rainfall received during this period is crucial to avoid moisture stress in paddy crop which generally fall in milking to dough stage.

*Moisture availability*

As per available moisture, Zone I and Zone IIIA fall under sub humid climate ( Table 2), Zone II under humid climate and zone IIIB under semiarid climatic conditions. The Zone II has the highest length of growing period (223 days) followed by Zone IIIA (216 days). The Lowest period of moisture availability (178 days) falls under zone IIIB.

### REFERENCES

Ghadekar, S.R. and Thakare, K.K. (1991). Some studies on rainfall climatology of Nagpur region. Mausam, 42: 57-64.

Chattapadhyay, N and Ganeson, G.S. (1995). Probability studies of rainfall and crop production in coastal Tamil Nadu. *Mausam.* 4(93):263-274

Chaudhary, J.L. and Tomar, G.S. (1999). Agroclimatic analysis of stable rainfall periods in undivided Bastar district of Chattisgarh region of Madhay Pradesh, India. *Oryza,* 36(1):66-69.

**Table 1:** Mean weekly rainfall and its probability of occurrence at 50 and 75 percent level during monsoon season.

| SMW | Pusa Mean rainfall | Pusa Rainfall at 50 % prob | Pusa Rainfall at 75 % prob | Sabour Mean rainfall | Sabour Rainfall at 50 % prob | Sabour Rainfall at 75 % prob | Bikramganj Mean rainfall | Bikramganj Rainfall at 50 % prob | Bikramganj Rainfall at 75 % prob | Patna Mean rainfall | Patna Rainfall at 50 % prob | Patna Rainfall at 75 % prob | Madhepura Mean rainfall | Madhepura Rainfall at 50 % prob | Madhepura Rainfall at 75 % prob |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 12.9 | 3.0 | 0.0 | 21.9 | 5.6 | 4.9 | 2.5 | 0 | 0 | 11.7 | 8.0 | 0 | 33.5 | 16.0 | 10.0 |
| 23 | 22.9 | 19.0 | 19.0 | 29.3 | 6.5 | 6.5 | 10.8 | 9.0 | 3.0 | 13.3 | 12.0 | 8.0 | 18.3 | 56.0 | 50.0 |
| 24 | 31.1 | 29.0 | 29.0 | 38.9 | 35.8 | 34.5 | 18.5 | 19.0 | 16.0 | 26.3 | 33.0 | 29.0 | 62.5 | 43.0 | 36.0 |
| 25 | 48.8 | 41.0 | 38.0 | 44.3 | 41.2 | 32.5 | 38.4 | 38.0 | 29.0 | 34.7 | 50.0 | 37.0 | 48.0 | 70.0 | 60.0 |
| 26 | 59.9 | 45.0 | 40.0 | 80.9 | 79.6 | 61.2 | 62.5 | 54.0 | 51.0 | 65.3 | 45.0 | 41.0 | 66.8 | 73.0 | 56.0 |
| 27 | 93.2 | 61.0 | 58.0 | 75.2 | 68.7 | 60.5 | 71.0 | 51.0 | 45.0 | 86.0 | 66.0 | 66.0 | 68.4 | 66.0 | 63.0 |
| 28 | 74.5 | 58.0 | 54.0 | 90.0 | 81.3 | 72.0 | 101.8 | 54.0 | 48.0 | 82.7 | 70.0 | 66.0 | 68.1 | 66.0 | 60.0 |
| 29 | 76.2 | 61.0 | 48.0 | 60.9 | 58.7 | 43.2 | 66.5 | 61.0 | 54.0 | 80.3 | 62.0 | 54.0 | 101.3 | 90.0 | 73.0 |
| 30 | 66.4 | 58.0 | 54.0 | 72.2 | 65.0 | 45.2 | 78.2 | 74.0 | 67.0 | 70.6 | 70.0 | 70.0 | 103.2 | 73.0 | 66.0 |
| 31 | 65.1 | 61.0 | 45.0 | 84.7 | 79.8 | 48.2 | 60.5 | 58.0 | 45.0 | 68.6 | 62.0 | 58.0 | 81.5 | 70.0 | 50.0 |
| 32 | 54.2 | 48.0 | 38.0 | 51.2 | 48.2 | 32.2 | 51.9 | 48.0 | 35.0 | 46.4 | 50.0 | 37.0 | 71.5 | 63.0 | 53.0 |
| 33 | 79.4 | 54.0 | 54.0 | 61.5 | 54.4 | 36.7 | 53.3 | 45.0 | 32.0 | 60.6 | 58.0 | 37.0 | 52.1 | 70.0 | 53.0 |
| 34 | 72.3 | 51.0 | 48.0 | 70.1 | 60.2 | 40.2 | 62.5 | 51.0 | 48.0 | 74.4 | 62.0 | 54.0 | 83.9 | 80.0 | 70.0 |
| 35 | 66.5 | 64.0 | 48.0 | 40.5 | 37.2 | 30.7 | 58.4 | 58.0 | 51.0 | 52.3 | 41.0 | 41.0 | 86.2 | 66.0 | 60.0 |
| 36 | 75.7 | 64.0 | 58.0 | 52.2 | 45.9 | 34.7 | 65.5 | 51.0 | 45.0 | 59.4 | 54.0 | 54.0 | 73.2 | 60.0 | 50.0 |
| 37 | 66.9 | 48.0 | 45.0 | 51.2 | 44.8 | 36.5 | 57.4 | 41.0 | 38.0 | 50.3 | 58.0 | 41.0 | 60.7 | 56.0 | 56.0 |
| 38 | 42.8 | 41.0 | 32.0 | 43.1 | 40.5 | 28.5 | 32.3 | 35.0 | 29.0 | 50.4 | 41.0 | 33.0 | 66.3 | 56.0 | 50.0 |
| 39 | 27.5 | 19.0 | 16.0 | 46.4 | 42.6 | 29.5 | 22.0 | 19.0 | 12.0 | 31.1 | 20.0 | 16.0 | 66.2 | 43.0 | 40.0 |
| 40 | 35.3 | 22.0 | 19.0 | 43.7 | 41.4 | 19.7 | 20.7 | 9.0 | 9.0 | 21.6 | 25.0 | 16.0 | 56.4 | 36.0 | 26.0 |
| 41 | 15.0 | 12.0 | 06.0 | 23.3 | 21.7 | 12.7 | 8.2 | 3.0 | 3.0 | 20.6 | 4.0 | 0 | 46.5 | 13.0 | 13.0 |
| 42 | 16.4 | 12.0 | 12.0 | 20.2 | 15.8 | 12.5 | 6.7 | 3.0 | 3.0 | 12.3 | 12.0 | 8.0 | 23.3 | 3.0 | 3.0 |

**Table 2:** Moisture availability period at different agroclimatic zones of Bihar

| Location | Zone | Mean annual rainfall | Mean annual PET | Climate | Length of rainy season | Soil moisture storage | Post monsoon and winter rainfall | Length of growing season |
|---|---|---|---|---|---|---|---|---|
| Pusa | Zone I | 1234.7 | 1763.8 | Subhumid | 115.0 | 150.0 | 48.9 | 181 |
| Madhepura | Zone II | 1546.3 | 1820.0 | Humid | 134.4 | 150.0 | 115.0 | 223 |
| Sabour | Zone IIIA | 1264.0 | 1376.2 | Humid | 120.0 | 150.0 | 137.7 | 216 |
| Bikramganj | Zone IIIB | 1034.6 | 1635.7 | Semiarid | 126.0 | 100.0 | 55.1 | 178 |