Journal of Agrometeorology 17 (1) : 133-135 (June 2015)

Short communication

Analysis of rainfall for rainfed rice production in Chhattisgarh state

J.L. CHAUDHARY, NEHA SINHA, S.R. PATEL, SANJAY BHELAWE and N. MANIKANDAN

Department of Agrometeorology
Indira Gandhi Krishi Vishwavidyalaya, Chhattisgarh - 492 012, India
Email : jawaharlal_2007@rediffmail.com

Chhattisgarh state, situated in eastern India stretches between 80Ú 152 to 84Ú 242 E longitude & 17Ú 462 to 24Ú 52 N latitude. It covers total geographical area of about 13.5 million hectare. Rice crop is grown in 3.7 million hectares and rainfed rice production has always remained a challenge in this region. Rice is widely grown during *kharif* season and also as *summer* crop in some regions, while, in *rabi*, farmers grow wheat, mustard and winter vegetables under partially or assured irrigation and *utera* (Lathyrus, chickpea and linseed) under rainfed situation. Different parts of the state receive annual rainfall ranging from about 1600 mm in eastern Bastar region and eastern part of northern hills zones region to about 1000 mm in central and western part of the state which mainly include the Chhattisgarh plains zone. Most of the farmers construct huge bunds in the rice fields and they impound rain water for rice cultivation to avoid the uncertainty factor of monsoonal rainfall. This practice of making huge bunds often becomes adverse for rice crop seedlings as higher bunds submerge the rice seedlings and hence growing of tall, long duration, photo-sensitive varieties which can sustain higher water levels has become a traditional practice of rice cultivation in this area. These varieties generally flower by mid-October and reach physiological maturity by mid-November and hence terminal drought is a recurring feature during flowering phase.

Efforts have been made in this investigation to characterize the rainfall statistics of four districts (Raipur, Bilaspur, Jagdalpur and Ambikapur) of Chhattisgarh using 40 years (1971-2010) rainfall data. The criterion of dependable rainfall period has been established while stable rainfall period calculated as per standard norms (Chaudhary and Tomar, 1999). Weekly rainfall analysis carried out as per weather cock software developed by CRIDA, Hyderabad (Rao et al., 2011). Stable rainfall is considered as the period when the coefficient of variation (CV) is less than 100 % and rainfall quantum is more than 50 mms in a week (Chaudhary and Tomar, 1999). For proper growth and development of rice crop, it was assumed that a minimum 50 mms per week of water requirement is needed with 3 mm of ET and 4 mm of percolation per day (Chaudhary and Tomar, 1999). The dependable rainfall period was calculated particularly with reference to rice production which is defined as the period when weekly rainfall is greater than 50 mm with corresponding probability higher than 60%.

On weekly rainfall analysis as shown in Table-1, it can be very well seen that pre-monsoon activities are starting vigorously at Jagdalpur earlier and long period average (LPA) of Jagdalpur rainfall is more during early growing period of rice. Therefore, there is ample potential of water conservation in Jagdalpur (District Bastar) during early part i.e. 23-26 standard meteorological weeks and even in later part which can be better utilized in reproductive phase and growing period of rice crop in case of dry spells contingencies. Situation during later growing period of rice can be observed and it can be seen during period upto 40th SMW (week ending 7 October), rainfall quantity is less in Bilaspur district as compared to other districts. Rainfall quantity is less in Ambikapur (Surguja district) in later part as there is early withdrawal of monsoon due to which rainfed rice production has remained a challenge in northern hill region and there is urgent need and requirement of water conservation in this region alongwith selection of medium to short duration varieties for successful rainfed rice production. Period of terminal drought at anthesis occuring in rice crop in matching with less quantity of rainfall particularly in 39 and 40 standard meteorological weeks which is leading to less rice productivity in this region.

With the concept, stable rainfall period for the four districts of Chhattisgarh are worked out and is shown in Table 2. Therefore as observed, the stable rainfall period is more at Jagdalpur due to early onset of SW monsoon in southern part of the state with consistency in rainfall and assured quantum of rainfall over long term database. This is followed by Ambikapur and Bilaspur. At Raipur the stable rainfall period is lowest among the four districts probably due to the fact that there is less consistency in rainfall over

Table 1 : Weekly average rainfall pattern in representative districts of Chhattisgarh state

SMW*	Station			
	Rai-pur	Bilaspur	Jagdalpur	Ambikapur
22	8.5	4.2	27.5	5.2
23	26.4	8.3	36.9	13.5
24	37.4	33.8	61.8	41.7
25	57.2	55.3	62.3	73.6
26	70.5	85	72.6	88.1
27	56.8	77.9	71.1	72.6
28	79.8	78.1	69.4	105.9
29	73.8	88.4	90.4	82.3
30	69.4	77.2	84	97.5
31	81.4	81.3	82.7	91
32	76.9	74.7	91.4	87.5
33	80.2	71.9	68.7	81.7
34	53.9	59.6	69.9	69.2
35	67.7	64.5	74.9	67.2
36	51	67.8	63	88.2
37	54.5	61.7	46.3	52.6
38	38.4	28.5	44.9	42.2
39	21.4	13	27.7	20.5
40	20.2	16.8	34.9	24.4

* SMW= Standard meteorological weeks , 23 week=4-10 Jun

Table 2 : Stable rainfall periods in different districts of Chhattisgarh

S No.	Station	Stable rainfall period
1 .	Raipur	3 July - 8 Sep. (27-36 SMW)
2 .	Bilaspur	20 Jun - 10 Sep. (25-36 SMW)
3 .	Jagdalpur	13 Jun - 11 Sep. (24-36 SMW)
4.	Ambikapur	21 Jun - 15 Sep. (25-37 SMW)

long term database due to which CV factor is greater than 100% till 26 SMW. The rice varieties are to be selected based on the stable rainfall period and therefore it can be interpreted that the crop duration should be based on stable rainfall period. Stable rainfall period is found lower at Raipur and therefore rice varieties with drought resistance in mid-duration period and genetic trait of lesser water requirement during early part of growth cycle need to be selected in this region. Also another feasible strategy is to alleviate this limitation is to harvest excess rainwater in a farm pond or OFR (On Farm Reservoir) during wet season and use conserved water for crop production in both wet (as insurance against drought) and dry seasons by adopting suitable crop and cropping systems (Rathore et al. 1996**).**

Table 3 : Weekly dependable rainfall in different stations of Chhattisgarh state

SMW	Station			
	Raipur	Bilaspur	Jagdalpur	Ambikapur
22	0	0.8	12.9	0
23	3.6	1.2	15	1.3
24	15	9.2	25.8	11
25	32.2	39.6	42.6	29.6
26	34	44.8	35.3	50.2
27	42.8	48.7	42.1	47.2
28	55.9	50.8	52.8	51.8
29	44.6	72.7	70.8	51.5
30	38	57.5	69.5	69.5
31	39.5	47.1	67	59.9
32	51.5	53.9	58.9	61.7
33	49.5	43.4	47.9	58
34	32	39.3	49.7	35.5
35	48.5	35.1	52.8	30.8
36	35.4	46.6	42	59.6
37	20.8	26.6	36.3	26.8
38	3.8	8.8	23.2	16.7
39	6.4	3.2	11	4
40	6.2	1.8	8.2	5
Ann	559.7	630.1	779.8	670.1

Dependable rainfall quantum has been calculated and shown in Table-3. Rainfall quantity has been calculated for the weeks having more than 60 % probability of rainfall which means this is the minimum quantity of rainfall which can be expected for a particular week in 3 out of 5 years. Jagdalpur station representing Bastar Plateau agro-climatic zone is having the highest potential of dependable rainfall and the duration is a prolonged one as compared to other stations which is a fortunate situation as far as management aspects in terms of rice production are concerned. Raipur and Ambikapur stations having the least duration of dependable rainfall and therefore rainfed rice production remaining a challenge particularly in northern hill zone due to higher run-off losses.

ACKNOWLEDGEMENT

Authors are thankful to Dr. V.U. M. Rao, Project Co-

ordinator (Agromet.), Central Research Institute for Dryland Agriculture, Hyderabad for the guidance and motivation while documenting and revision of the manuscript.

REFERENCES

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

Rathore, A.L., Pal, A.R., Sahu, R.K. and Chaudhary J.L. (1996). On-farm rainwater and crop management for improving productivity of rainfed areas. *Agric. Water Manage.* 31: 253-267.

Rao, V.U.M., A.V.M.S. Rao, G.G.S.N. Rao, T. Satyanaryana, N. Manikandan and B. Venkateswarlu, I. Ramamohan. (2011). Weather Cock software. Central Research Institute for Dryland Agriculture, Hyderabad.

Received : January 2014 ; Accepted : February 2015