INDIA METEOROLOGICAL DEPARTMENT, METEOROLOGICAL CENTRE JAIPUR

MONSOON REPORT-2020
(RAJASTHAN)

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Rajasthan- 302029

MONSOON REPORT-2020 (RAJASTHAN)

HIGHLIGHT

- The rainfall during monsoon season (June-September, 2020) over the country as a whole was 109% of its long period average (LPA) based on data of 1961-2010. However, for the Rajasthan state this figure came out to 108% of LPA. **The rainfall received over the state was normal (Departure +8% of long period average).**

- Seasonal rainfall was 98% of its LPA over East Rajasthan and 127% of its LPA over West Rajasthan.

- Monthly rainfall received over the state was 105% of LPA in June, 65% of LPA in July, 150% of LPA in August and 115% of LPA in September.

- Southwest monsoon advanced over Kerala on 1st June, and over Rajasthan on 24nd June (2 days behind the normal schedule of 26th June). Thereafter, monsoon covered the entire state by 26th June against normal date of 8th July (about 12 days ahead of normal date).

- Out of total 33 districts, one district received large excess rainfall (Departure +60% or more), 10 districts received excess rainfall (Departure +20% to +59%), 16 districts received normal rainfall (Departure -19% to +19%) and 6 districts received deficient rainfall (Departure -20% to -59%) during the season.

- Monsoon withdrawal commenced from West Rajasthan on 28th September against normal withdrawal date of 18th September (about 10 days behind of normal date) and withdrew from entire Rajasthan on 6th October.

- On a micro level, out of 245 tehsils, 16 tehsils received largely excess rainfall; 54 tehsils received excess rainfall; 98 tehsils received normal rainfall; 75 tehsils received deficient rainfall and 2 tehsils received largely deficient rainfall during the season.

1. Introduction

Rajasthan is located in the western parts of India and agriculture is the mainstay for the people. The greater part of the state falls under Hot Desert and remaining portions of the state falls under Hot Semi Arid. The primary source of water for agricultural production for the most parts of the state is rainfall. It is also the primary source of surface and ground water recharge.

South-West Monsoon (SWM) season is its principal rainy season. The variability of the monsoon makes the region highly vulnerable by the impacts of natural disasters such as droughts and floods. The geographical location of the area, orography and its interaction with the basic monsoon flow is considered as one of prime factors of rainfall variability. Climatologically, the normal seasonal rainfall is 415mm (based upon 1951-2000) and normal onset date is 24 June over Rajasthan. Performance of monsoon during last 10 years over Rajasthan is as follows:

Table: Rainfall during southwest monsoon over Rajasthan in last few years

YEAR	ACTUAL RAINFALL (MM)	NORMAL RAINFALL (MM)	DEPARTURE FROM NORMAL (%)
2010	**539.5**	419	**+28**
2011	590.4	419	+41
2012	464.0	419	+11
2013	527.2	419	+26
2014	420.4	419	0
2015	457.0	419	+9
2016	536.4	419	+28
2017	454.9	419	+9
2018	393.3	419	-6
2019	583.6	415	+41
2020	449.8	415	+8

2. Onset and Advance of southwest Monsoon 2020

It was a good beginning for the season in terms of rainfall with formation and movement of the cyclone Nisarga, over the Arabian Sea in the first week of June. It helped the monsoon to advance into main-land along the west coast. Subsequent features favored timely advance of monsoon. This year SW monsoon entered Rajasthan State from Jodhpur, Udaipur, Kota and Ajmer divisions on 24th June and covered entire State and country by 26th June against normal date of 8th July (about 12 days ahead of normal date). **Isochrones of advance of monsoon 2020 is shown in Fig. 1.**

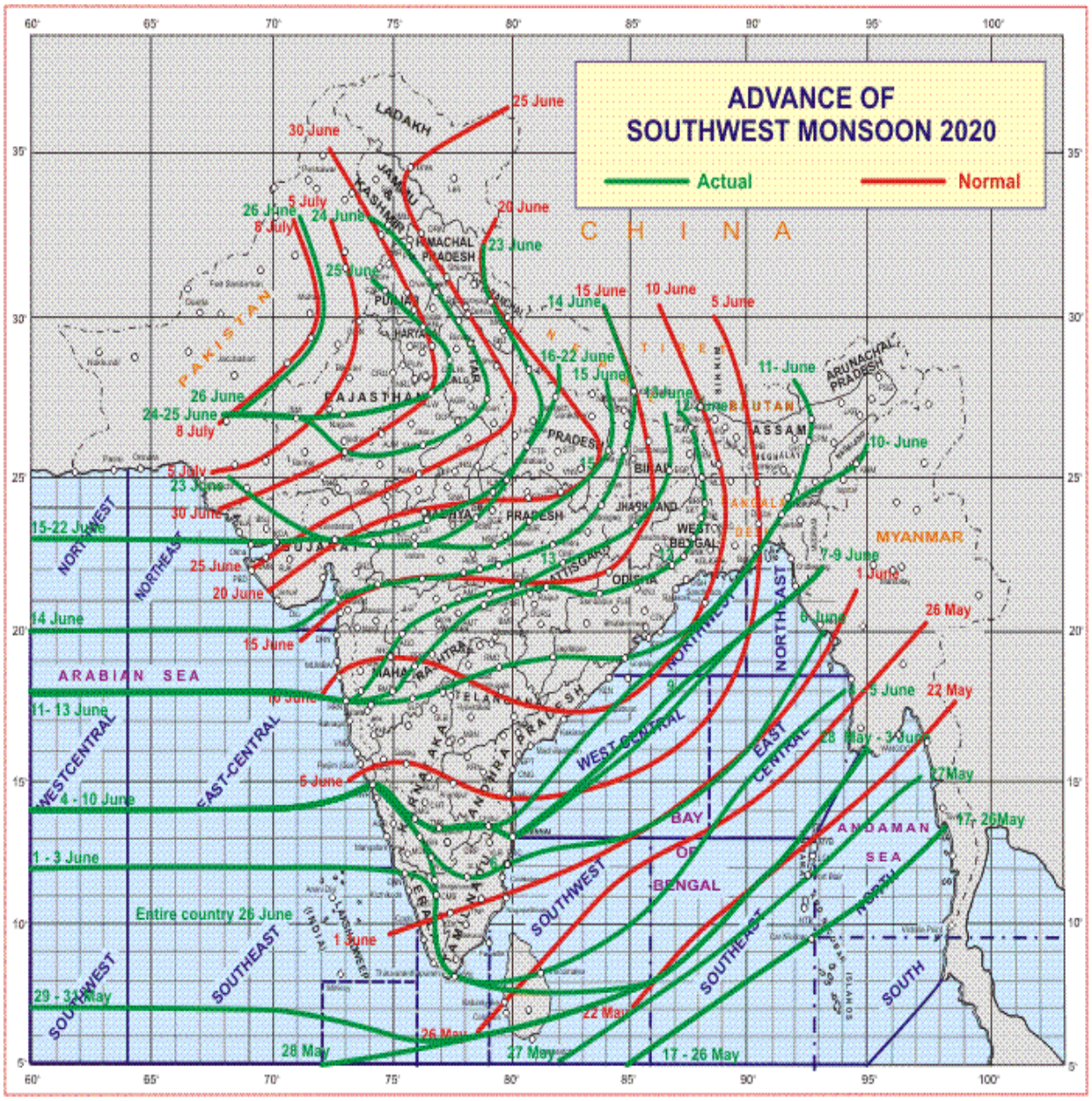

Fig.1: Progress of Southwest Monsoon – 2020

Actual onset & withdrawal dates of SW monsoon over Rajasthan is shown in table 1.

YEAR	ONSET DATE	WITHDRAWL DATE
2001	13 JUNE	24 SEPTEMBER
2002	26 JUNE	16 SEPTEMBER
2003	19 JUNE	19 SEPTEMBER
2004	17 JUNE	08 OCTOBER
2005	26 JUNE	29 SEPTEMBER
2006	29.JUNE	03 OCTOBER

2007	15 JULY	30 SEPTEMBER
2008	10 JULY	29 SEPTEMBER
2009	03 JULY	26 SEPTEMBER
2010	3 JULY	28 SEPTEMBER
2011	22 JUNE	28 SEPTEMBER
2012	5 JULY	26 SEPTEMBER
2013	15 JUNE	17 OCTOBER
2014	3 JULY	28 SEPTEMBER
2015	23 JUNE	29 SEPTEMBER
2016	22 JUNE	12 OCTOBER
2017	27 JUNE	11 OCTOBER
2018	26 JUNE	01 OCTOBER
2019	2 JULY	11 OCTOBER
2020	24 JUNE	6 OCTOBER

3. Chief Synoptic Features

A Severe Cyclonic storm Nisarga was formed over Arabian sea in the first week of June and no significant systems were formed thereafter in the month of June & July. During August, by the formation of back to back low pressure systems over the Bay of Bengal and their movement towards Gujarat and south Rajasthan leads to the good rainfall activities over the state. Monsoon trough was mostly south of the normal position and remained active.

Five low pressure systems formed during 4-10, 9-11, 13-18, 19-26 and 24-31 August 2020 which caused higher than normal rainfall over central and western part of India. Total number of low pressure days was 28 against normal of about 17. It caused 2-3 spells of riverine floods over Odisha, Telangana, Madhya Pradesh, south Gujarat and south Rajasthan.

Table 2: Number of Low-pressure System (LPS) and LPS days in monsoon 2020 with their normal

Category	CS	DD	D	WML	L	Total Monsoon systems in monsoon 2020	Total monsoon low pressure and above system days in monsoon 2020	Long period Average of Total monsoon systems /Days	
June*	1	0	0	0	1	2	7	3	11
July	0	0	0	1	1	2	9	3	14
August	0	0	0	4	1	5	28	4	17
Sept.	0	0	0	1	2	3	11	3	15
Total	1	0	0	6	5	12	55	13	57

*(includes Nisarga that crossed Ratnagiri coast)

4. Rainfall Distribution

The seasonal rainfall over Rajasthan was 108% of its LPA during SW monsoon season 2020, East Rajasthan 98% of its LPA and West Rajasthan 127% of its LPA. Out of 33 districts,1 districts received large excess rainfall, 10 districts received excess rainfall, 16 districts received normal rainfall and 6 districts received deficient rainfall during the season. The district wise seasonal distribution of rainfall is shown in **Fig 2**.

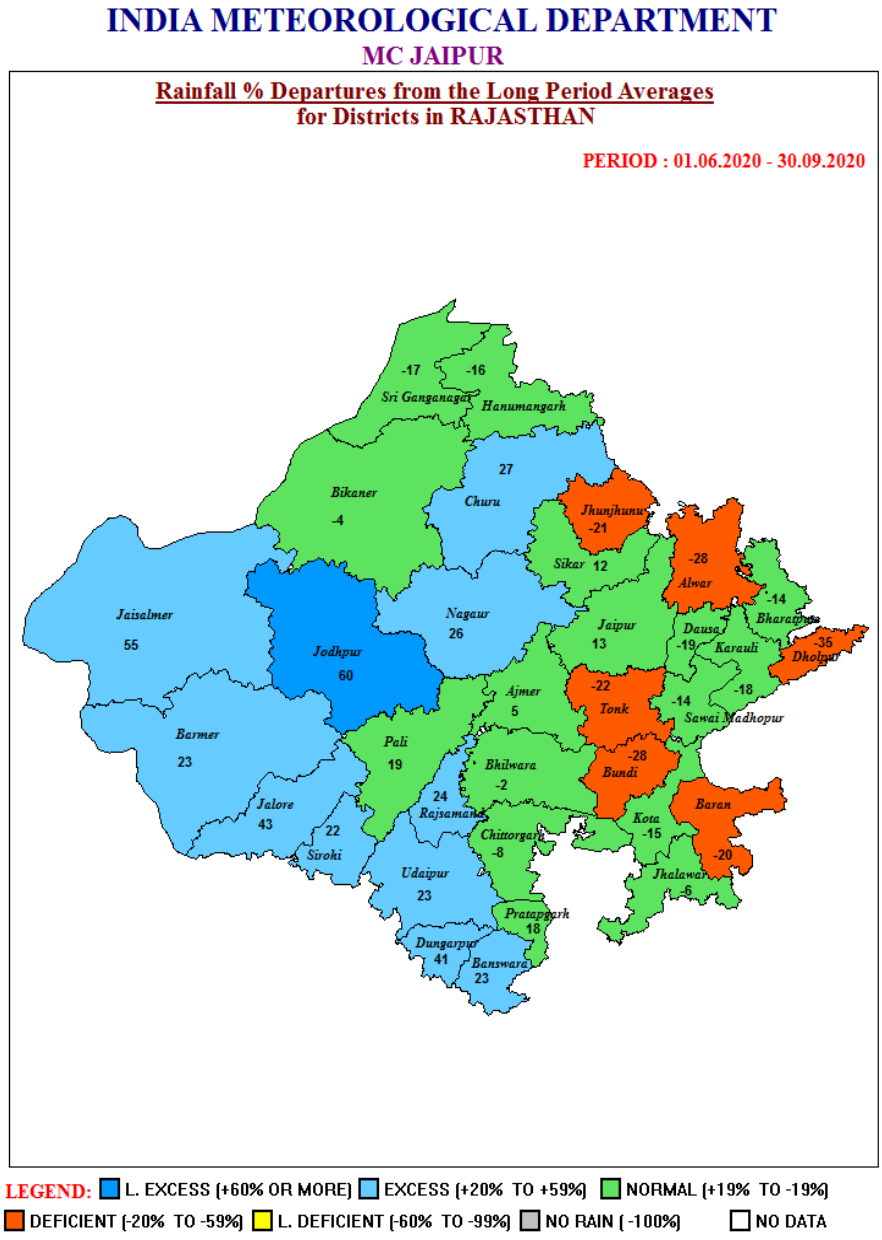

Figure 2: Districtwise rainfall distribution over Rajasthan during southwest monsoon season (June to September) – 2020

It can be seen that most of the districts in West and Southwestern Rajasthan received excess rainfall, North, Central and some parts in East Rajasthan received normal rainfall whereas some districts in East Rajasthan received deficient rainfall. Dholpur district received least rainfall (65% of LPA) and Jodhpur district received highest rainfall (160% of LPA).

Table 3: District-wise seasonal rainfall distribution monsoon 2020

CUMMULATIVE RAINFALL STATISTICS AS ON 30/09/2020				
SR NO.	NAME	ACTUAL RAINFALL (MM)	NORMAL RAINFALL (MM)	DEPARTURE FROM NORMAL (%)
1	RAJASTHAN AS WHOLE	449.8	415	8
2	EAST RAJASTHAN	593.5	602.9	-2
3	WEST RAJASTHAN	335.7	265.3	27
DISTRICT WISE RAINFALL (EAST RAJASTHAN)				
1	AJMER	440.7	419.5	5
2	ALWAR	396.8	553.5	-28
3	BANSWARA	1036.4	844.6	23
4	BARAN	621.6	774.5	-20
5	BHARATPUR	468.9	545.2	-14
6	BHILWARA	566	580.4	-2
7	BUNDI	455.8	629.7	-28
8	CHITTORGARH	642.9	699.2	-8
9	DAUSA	476	585.9	-19
10	DHOLPUR	393.3	605.2	-35
11	DUNGARPUR	877.6	624.6	41
12	JAIPUR	566	502.1	13
13	JHALAWAR	792	841.2	-6
14	JHUNJHUNU	319.9	406.1	-21
15	KARAULI	506.7	616.9	-18
16	KOTA	611	716.6	-15
17	PRATAPGARH	1023.2	864.1	18
18	RAJSAMAND	626.1	506	24
19	SAWAI MADHOPUR	528	617.4	-14
20	SIKAR	438.2	391.2	12
21	SIROHI	1023.6	839	22
22	TONK	432.6	557	-22
23	UDAIPUR	725.3	587.4	23
DISTRICT WISE RAINFALL (WEST RAJASTHAN)				
24	BARMER	304.1	247.9	23
25	BIKANER	219.3	229.6	-4
26	CHURU	401.9	315.5	27
27	HANUMANGARH	221.9	263.5	-16
28	JAISALMER	252	162.1	55
29	JALORE	552.6	385.7	43
30	JODHPUR	444.1	278.1	60
31	NAGAUR	441.6	350.5	26
32	PALI	537.8	450.3	19
33	SRI GANGANAGAR	167.3	201.8	-17

The monthly rainfall during monsoon season (June to September) for the State as a whole and its two meteorological sub divisions is given in the table below with respective LPA values.

Table 4: Rainfall during southwest monsoon 2020 over Rajasthan

Month	Actual (in mm)	Long period average LPA (in mm)	Departure from normal %
June	52.9	50.2	5
July	99.5	153.6	-35
August	221.6	147.5	50
September	73.2	63.7	15

Table 5: Rainfall during southwest monsoon 2020 over East Rajasthan

Month	Actual (in mm)	Long period average LPA (in mm)	Departure from normal %
June	73.5	66.8	10
July	117.6	218.9	-46
August	319.8	222.2	44
September	81.1	95	-15

Table 6: Rainfall during southwest monsoon 2020 over West Rajasthan

Month	Actual (in mm)	Long period average LPA (in mm)	Departure from normal %
June	36.5	36.9	-1
July	85.1	101.7	-16
August	143.6	88	63
September	66.9	38.7	73

From the above tables it is observed that Rajasthan received highest rainfall during the month of August, which was 150% of LPA (i.e. excess category). Both East Rajasthan and West Rajasthan received their highest rainfall during month of August which was 144% of LPA (excess) and 163% of LPA (large excess) respectively. The performance of monsoon during 2001-2018 is shown in table 1.

Table 7: Monthwise Highest Rainfall recorded during southwest monsoon 2020

	Station	District	Rainfall Amount(in mm)	Recording Date
June	Mandal	Bhilwara	100	25/06/2020
July	Marwar Jn	Pali	151	25/07/2020
August	Aspur	Dungarpur	362	30/08/2020
September	Er Road	Pali	147	7/09/2020

Weekly rainfall distribution over the two Meteorological sub divisions of the state is shown in the following charts (**Figure 3 to 6**).

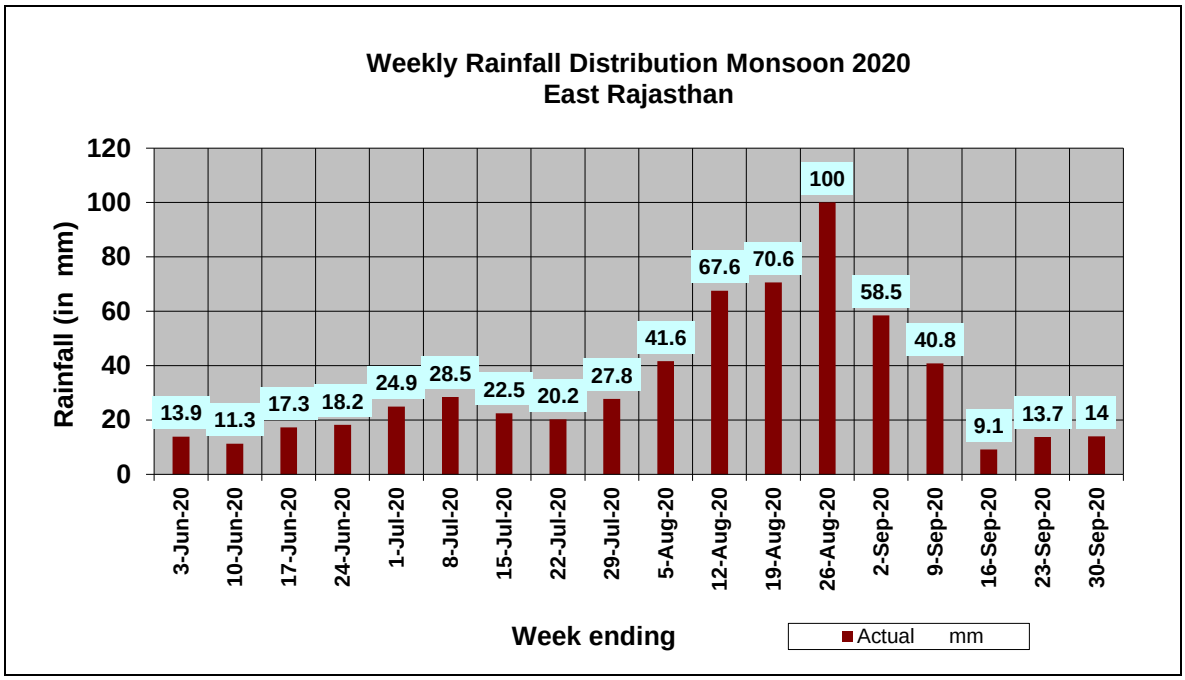

Fig.3 Weekly rainfall distribution over East Rajasthan Monsoon 2020

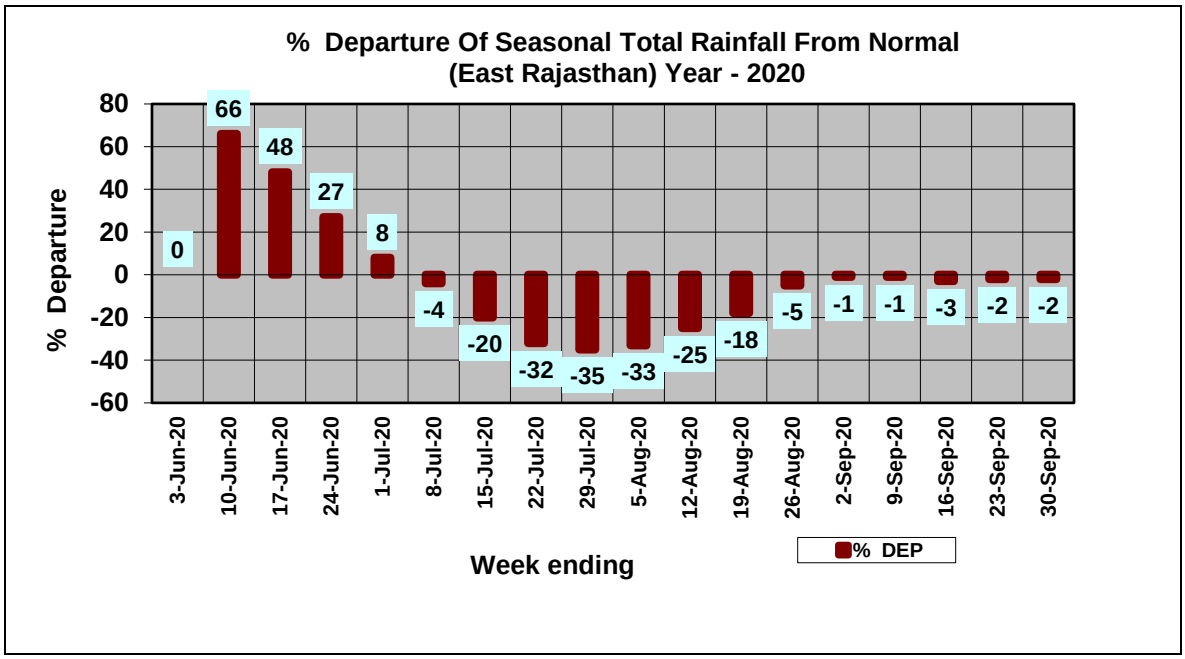

Fig. 4 Percentage departures of cumulative seasonal rainfall over East Rajasthan

The highest rainfall (100 mm) was received during the week ending 26th August 2020 over East Rajasthan.

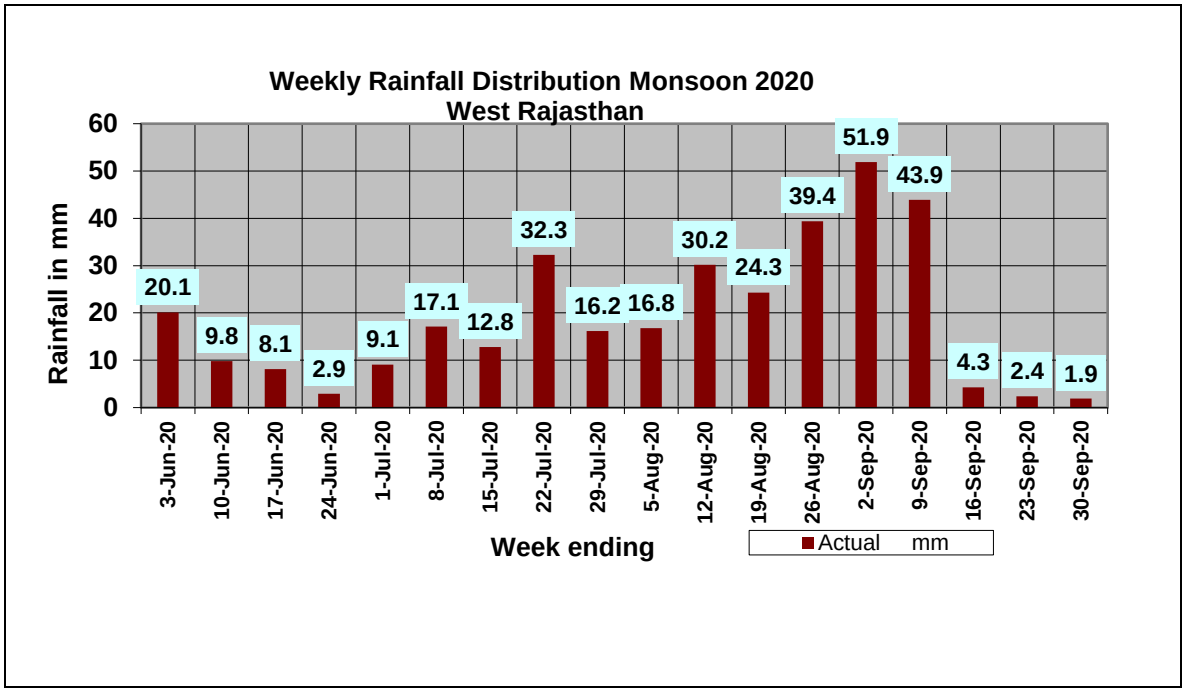

Fig.5 Weekly rainfall distribution over West Rajasthan Monsoon 2020

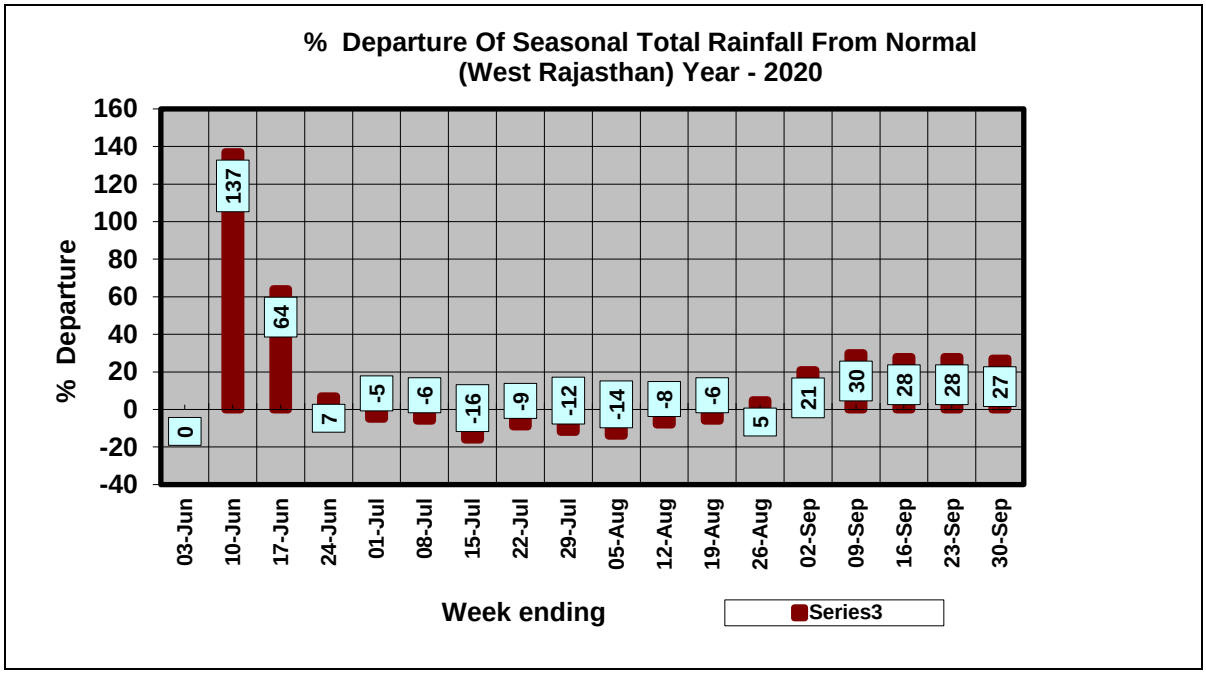

Fig. 6 Percentage departures of cumulative seasonal rainfall over West Rajasthan

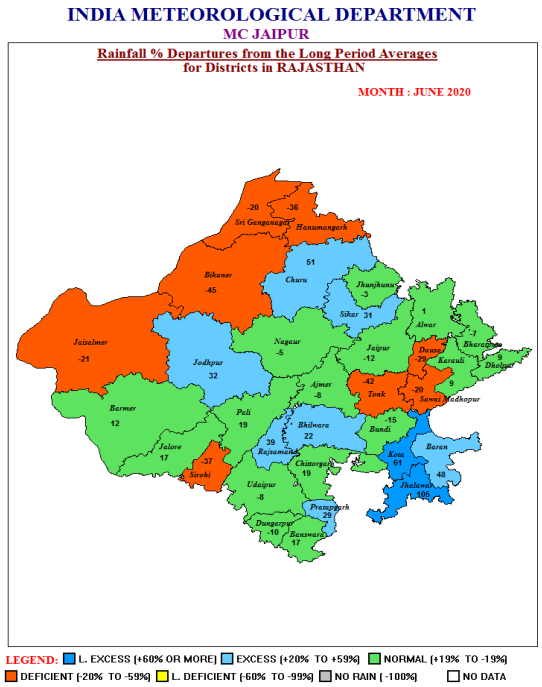

Fig.7 Districtwise Monthly Rainfall Distribution Over Rajasthan – June

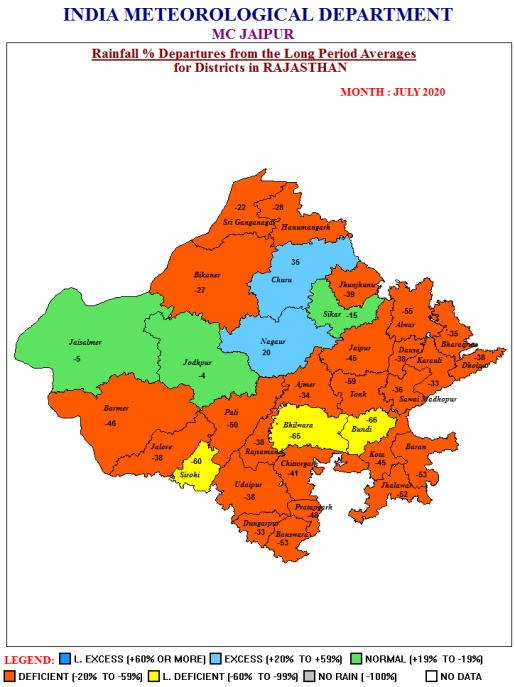

Fig. 8 Districtwise Monthly Rainfall Distribution Over Rajasthan - July

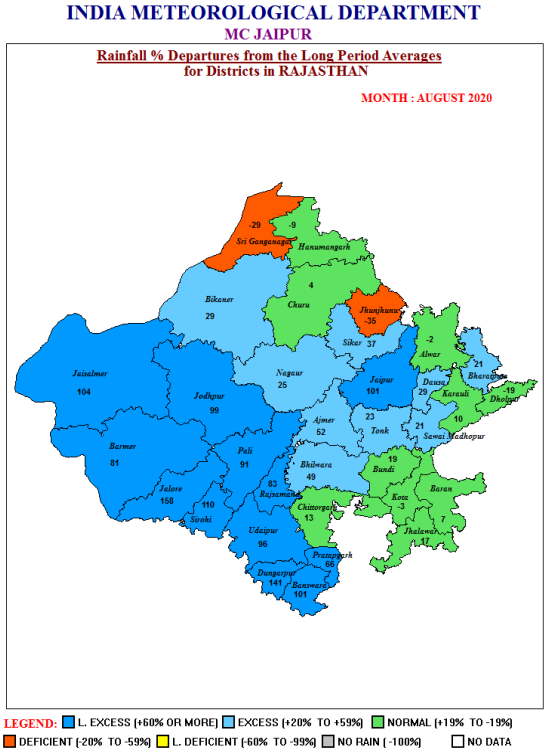

Fig. 9 Districtwise Monthly Rainfall Distribution Over Rajasthan - August

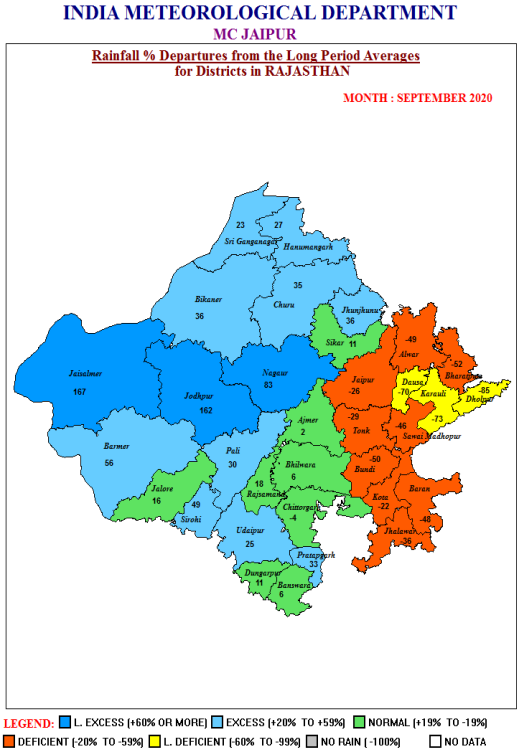

Fig. 10 Districtwise Monthly Rainfall Distribution Over Rajasthan - September

Table 8: Districtwise Monthly Rainfall Distribution Over Rajasthan (June-September)

	JUNE	JULY	AUGUST	SEPTEMBER
LARGE EXCESS	2	0	12	3
EXCESS	7	2	9	10
NORMAL	16	4	10	8
DEFICIENT	8	23	2	9
LARGE DEFICIENT	0	4	0	3

During the 2020 monsoon season West and East Rajasthan subdivisions received excess and normal rainfall as shown in **Figure 11** .

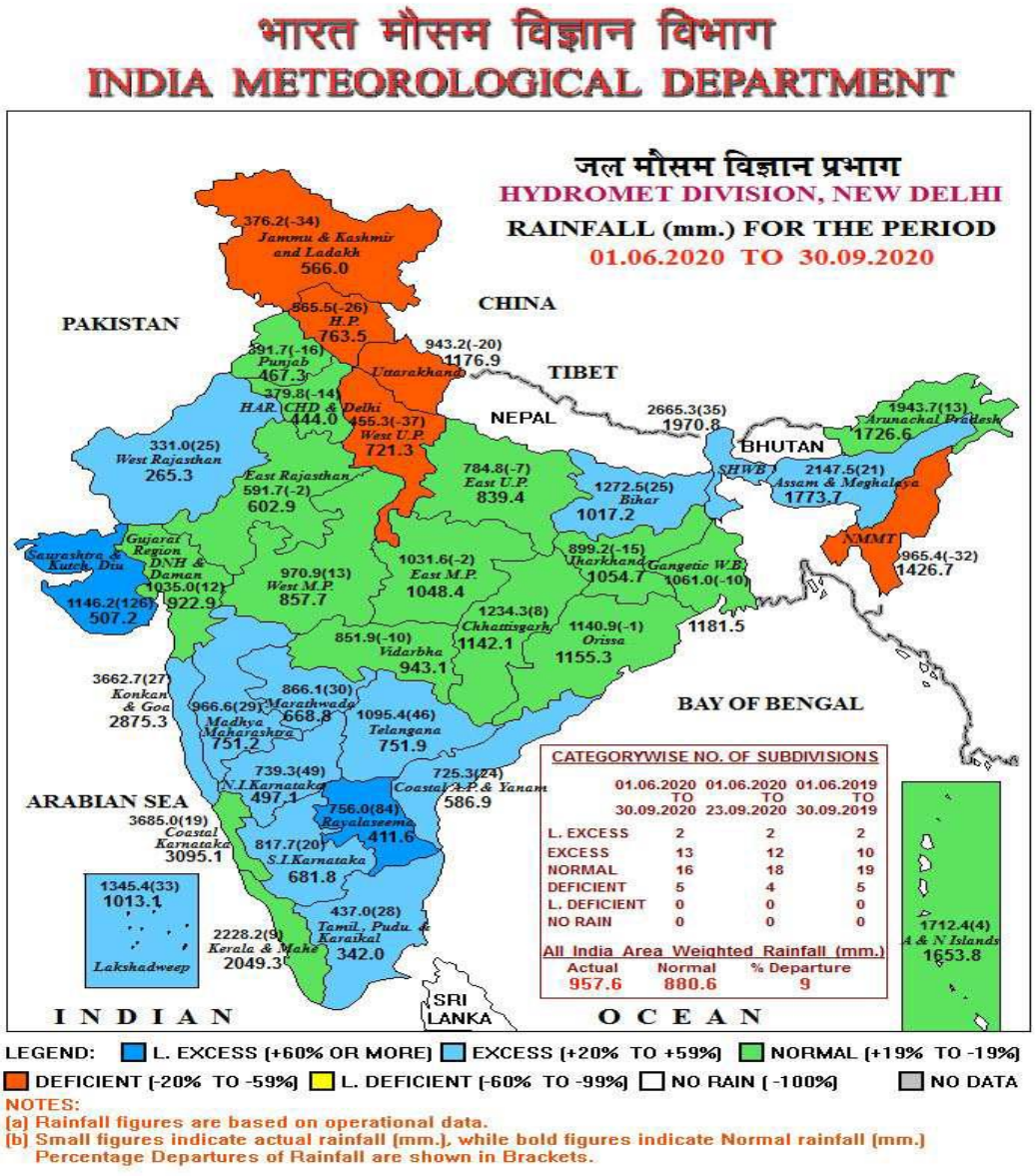

Fig.11 Subdivision Wise Seasonal Rainfall Distribution Over India (June-September 2020)

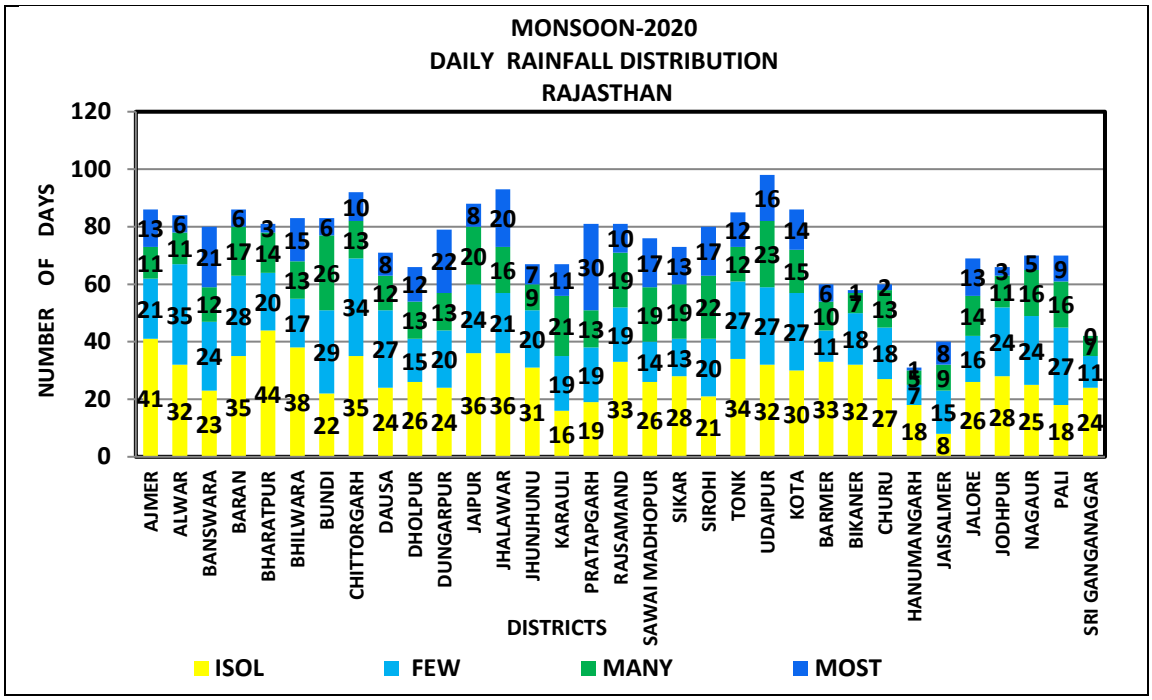

Fig.12 Districtwise Daily Spatial Rainfall Distribution

Fairly wide spread to wide spread rainfall occurred on 6 days (minimum, at Hanumangarh) to 43 days (maximum, at Pratapgarh) over different districts in Rajasthan during the whole monsoon season. Pratapgarh district got wide spread rainfall on 30 days (highest) during the whole season.

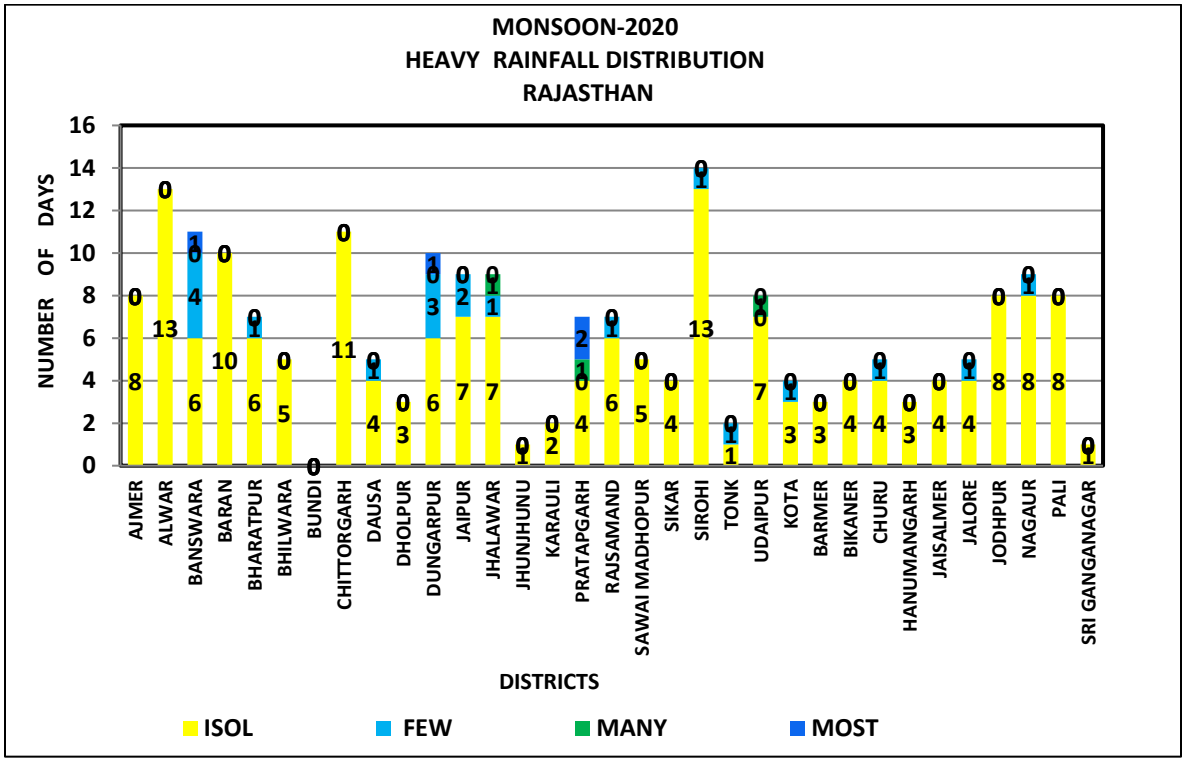

Fig.13 District wise Daily Heavy Rainfall Distribution

Pratapgarh district received heavy rainfall at most places on 2 days(highest) in the season. Other district that received heavy rainfall at most places are Banswara and Dungarpur(1 day each). Jhalawar, Pratapgarh and Udaipur received heavy rainfall at many placrs on 1 day each during the season.

MONSOON 2020 TEHSILWISE RAINFALL DISTRIBUTION

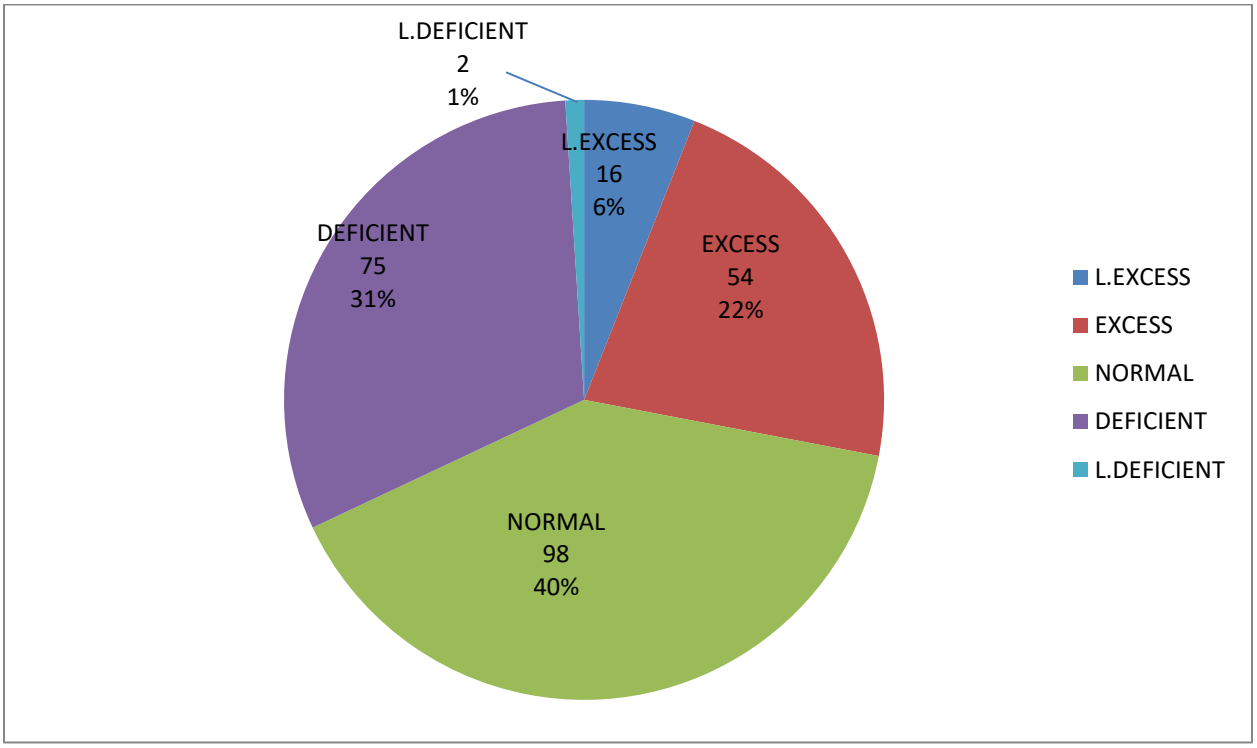

Fig.14 Tehsilwise Seasonal Rainfall Distribution

16 tehsils received large excess, 54 tehsils received excess and 98 tehsils received normal rainfall during the season. The rainfall was deficient in 75 tehsils and it was largely deficient in 2 tehsils. The worst affected districts during this season were Sri Ganganagar in West Rajasthan and Dholpur in East Rajasthan. Out of 9 tehsils in Sri Ganganagar district, 1 tehsil got largely deficient and 6 got deficient rainfall whereas all 5 tehsils in Dholpur district got deficient rainfall. The daily rainfall timeseries is shown in **figure 15 to 17** for East Rajasthan, West Rajathan and Rajathan respectively.

5. Performance of Monsoon:

The rainfall during monsoon season (June-September) over the country as a whole was 109% of its long period average (LPA). However, for the Rajasthan state this figure came out to 108 % of LPA. The rainfall received over the state was normal. Daily performance of monsoon over Rajasthan as whole is shown in figure below.

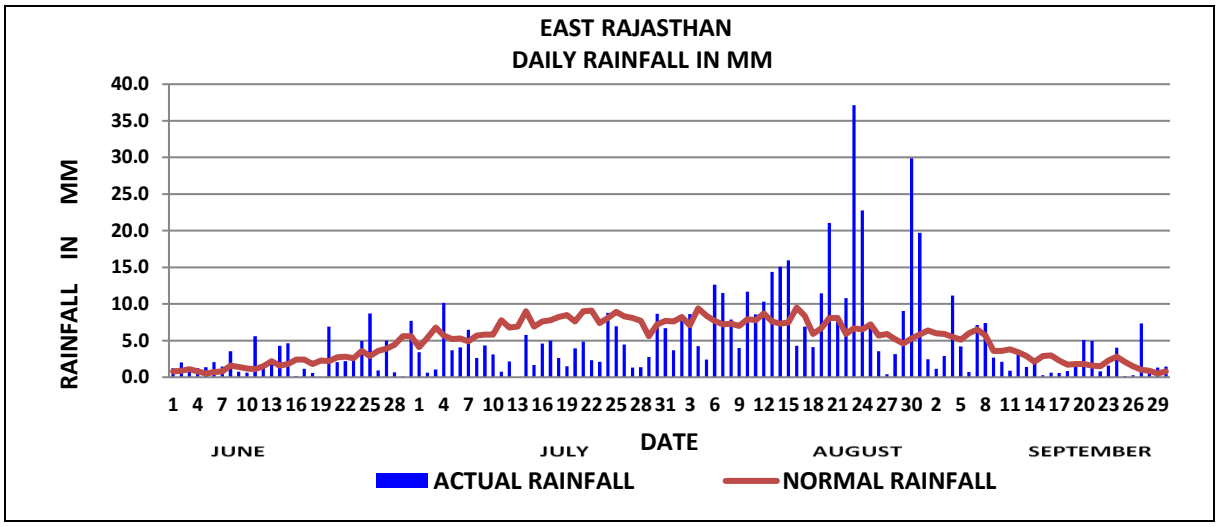

Fig.15 Daily Average Rainfall over East Rajasthan

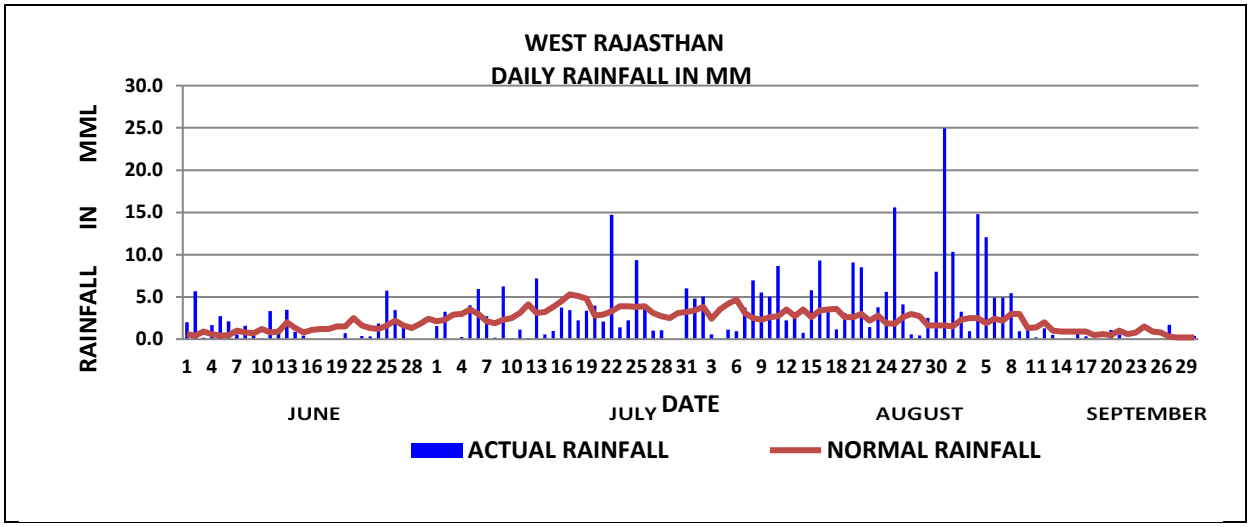

Fig.16 Daily Average Rainfall over West Rajasthan

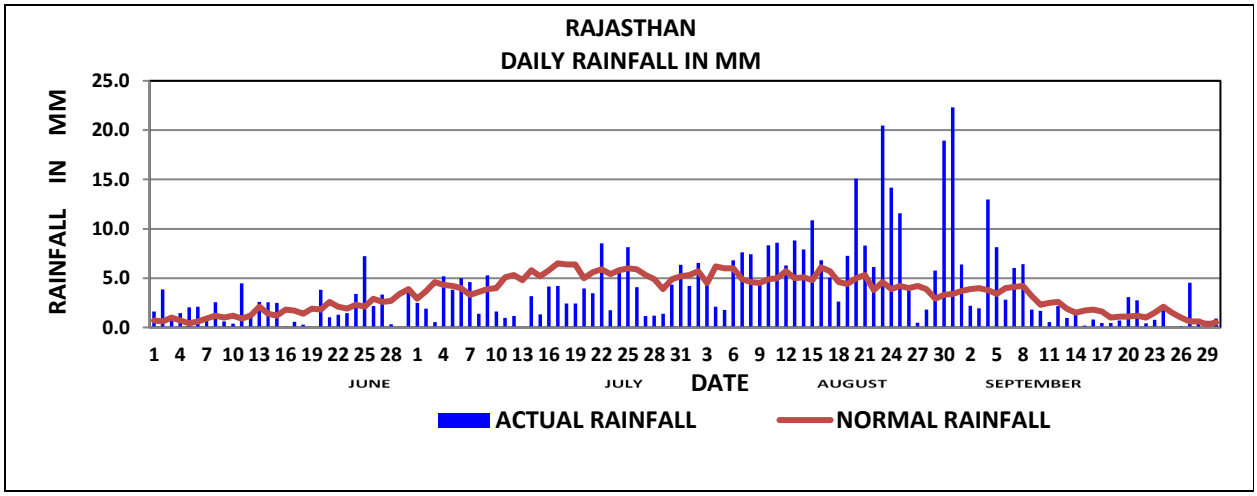

Fig.17 Daily Average Rainfall over Rajasthan

6. Withdrawal of southwest Monsoon

Monsoon withdrawal commenced from West Rajasthan on 28th September against the normal date of 17th September with a delay of around 11 days. Withdrawal has been delayed mainly due to active monsoon trough in association with the formation of 2 low pressure systems in Sept 2020. It withdrew from West Rajasthan on 3rd October and completely withdrew from Rajasthan on 6th October with a delay of around 1 week. **Isochrones of withdrawal of monsoon 2020 are shown in Fig. 18**.

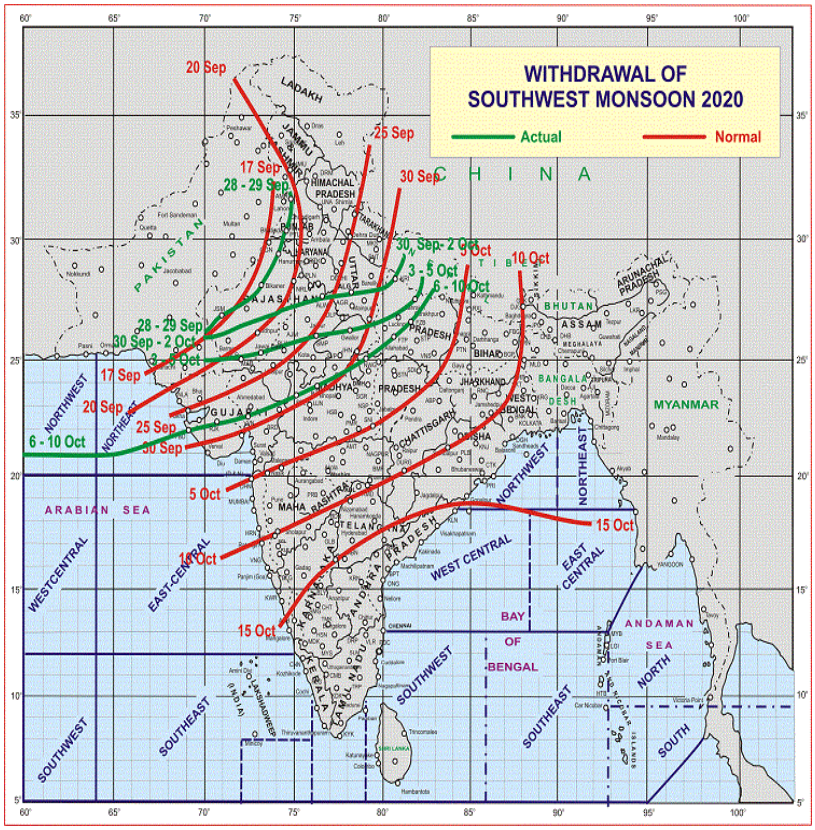

Fig.18: Isochrones of withdrawal of southwest monsoon – 2020

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