South-West Monsoon 2011 : A Review* (June 1 to September 30, 2011)

The South-West Monsoon during June-September 2011 was 1 per cent above the LPA (average rainfall of 89 cm during 1941-1990) as against 2 per cent above LPA in June-September 2010. Due to favourable inter-temporal and inter spatial distribution of rainfall during monsoon 2011, area sown during kharif 2011-12 has surpassed that sown during 2010-11 barring that for pulses and coarse cereals. Area sown under most commercial crops has surpassed even the normal sowing area for the season. Improved sowing, in turn, has been reflected in better prospects of kharif harvest as per the First Advance Estimates. Production of kharif foodgrains during 2011-12 is estimated to be 3.1 per cent higher than the record production of 120.2 million tonnes achieved during 2010-11. Higher sowing under commercial crops has also been reflected in estimated increase in production of cotton, jute and mesta, and sugarcane for the kharif season 2011-12. This augurs well for the growth of the agricultural sector during the year 2011-12.

Introduction

Rainfall is an important factor determining the performance of agriculture in India. With merely 44.6 per cent (in 2007-08) of the total cropped area under assured irrigation, Indian agriculture is predominantly rain-fed. Consequently, years of deficient and iniquitously distributed rainfall have invariably been associated with decline in crop/agricultural production (Chart 1).

The pattern of rainfall in India can be classified into two seasons, *viz.*, South-West or the summer Monsoon covering the period June-September and North-East or the winter Monsoon from October to December. The summer Monsoon accounts for about 70-80 per cent of the annual rainfall in the country.

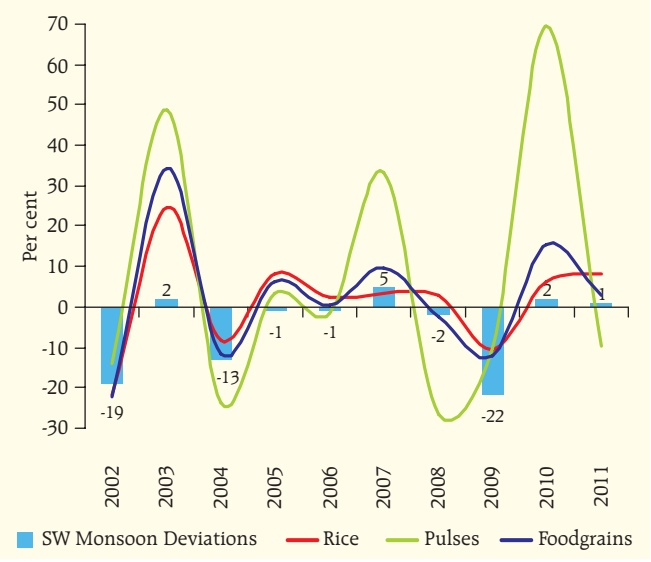
The quantum, spatial and temporal distribution of rainfall during South-West Monsoon has a significant impact on the prospects of *Kharif* crops that are essentially sown in July-August. With the exception of 2009, precipitations during South-West Monsoon have remained close to normal during the four years from 2005 to 2010. Precipitations during the last two years have been above LPA. This has contributed positively to the overall production of *kharif* crops. Resurgence and resilience of the agricultural sector in recent years may be attributed to satisfactory levels of precipitation accompanied by its normal progress and sowing. In the backdrop of these developments, this article provides a detailed review of the performance of South-West Monsoon during June-September 2011.

South-West Monsoon 2011: Highlights

- For the country as a whole, the rainfall for the season (June-September) was 101 per cent of LPA.
- Seasonal rainfall was 107 per cent, 110 per cent, 100 per cent and 86 per cent of their respective LPA over North-West India, Central India, South Peninsula and North-East (NE) India.
- Out of the total 36 meteorological subdivisions, 33 subdivisions constituting 92 per cent of the total area of the country received excess/normal season rainfall and the remaining 3 subdivisions (Arunachal Pradesh, Assam & Meghalaya, Nagaland, Manipur, Mizoram and Tripura (NMMT) constituting 8 per cent of the total area of the country) received deficient season rainfall.
- Monthly rainfall over the country as a whole was 112 per cent, 85 per cent, 110 per cent and 106 per cent of the respective LPA for the month of June, July, August and September.
- The monsoon set in over Kerala on May 29, 2011, three days before its normal date of June 1 and covered the entire country by July 9, 6 days earlier than its normal date of July 15.

* Prepared in the Structural Issues Division, Department of Economic and Policy Research, Reserve Bank of India.

Chart 1: South West Monsoon and Kharif Crops Growth



- The withdrawal of monsoon from west Rajasthan was delayed and it commenced only on September 23, 2011.
- Four depressions formed during 2011 monsoon season as against the normal of 4-6 monsoon depressions per season.

Forecast: South-West Monsoon 2011-12

Based on an indigenously developed statistical model, it was predicted on May 13, 2011 that monsoon will set in over Kerala on May 31, 2011 with a model error of ± 4 days. The actual monsoon onset over Kerala took place on May 29, 2011 two days earlier than the forecast date. Thus this is the seventh consecutive accurate operational forecast for the monsoon onset over Kerala since the issuing of the operational forecast for the event started in 2005.

As per the first stage long range forecast issued on April 19, 2011, the season (June-September) rainfall for the country as a whole was expected to be 98 per cent ± 5 per cent of LPA. In the updated forecast issued on June 21, 2011, the forecast for the country as a whole was revised to 95 per cent ± 4 per cent of LPA. Though the actual season rainfall for the country as a whole (101 per cent of LPA) was within the forecast limits of the first stage forecast, it was 2 per cent higher than the upper limit of the second stage forecast. According to the forecast for the second half of the monsoon season (August-September) for the country as a whole issued in August, rainfall for the period August-September 2011 was estimated to be 90 per cent with a model error of 8 per cent of LPA. This forecast was an underestimate as the actual rainfall over the country as a whole during the second half of the season was 108 per cent of LPA (Table 1).

The long range forecast and the actual rainfall for the country as a whole and the four broad geographical regions are set out in Table 1. The actual precipitation turned out to be higher than the forecast for the four broad geographical regions except for East and North-East India. As regards inter temporal distribution, rainfall was higher than the forecast for the entire period except for the month of July.

Distribution of Rainfall: South-West Monsoon 2011

The season ended with the area-weighted rainfall for the country as a whole at 101 per cent of the LPA. This is the first time in the last one decade that the country has received rainfall above LPA for two successive years. Season rainfall over NE India was

Table 1: Long Range Forecasts and Actual Rainfall

Region	Period	Date of Issue	Forecast (% of LPA)	Actual (% of LPA)
All India	June to September	April 19	98 ± 5	101
All India	June to September		95 ± 4	
Northwest India	June to September		97 ± 8	107
Central India	June to September		95 ± 8	110
Northeast India	June to September	June 21	95 ± 8	86
South Peninsula	June to September		94 ± 8	100
All India	July		93 ± 9	85
All India	August		94 ± 9	110
All India	August to September	August 1	90 ± 8	108
All India	September	September 1	90 ± 15	106

Table 2: Spatial Distribution: Homogeneous Regions 2011

Regions	Actual (mm)	LPA (mm)	Actual to LPA (%)
All India	899.9	887.5	101.4
Northwest India	654.8	615.0	106.5
Central India	1073.6	975.5	110.1
South Peninsula	715.2	715.5	100.0
Northeast India	1233.6	1438.3	85.8

below its LPA by 14 per cent. Season rainfall over south Peninsula was normal. However, the season rainfall over Central India and NW India were 10 per cent and 7 per cent above their LPA values, respectively (Table 2).

Spatial Distribution

The cumulative season rainfall from 1st June to 30th September 2011 was excess in 21 per cent, normal in 71 per cent and deficient in 8 per cent of the total area of the country.

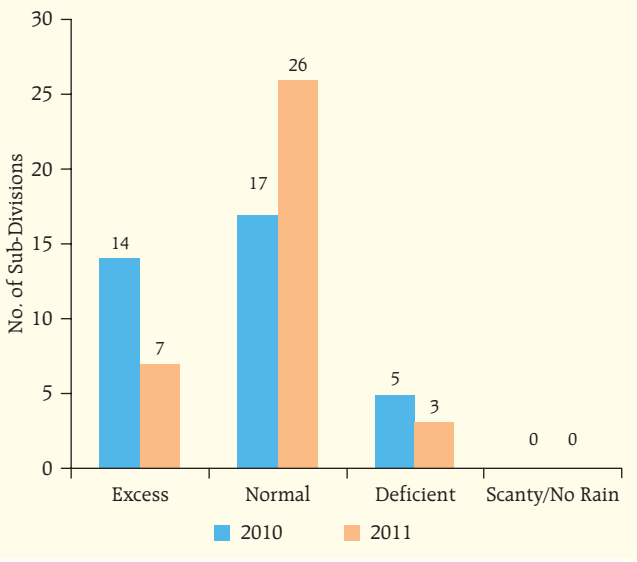
Of the total 36 meteorological subdivisions, 33 subdivisions received excess/normal season rainfall and the remaining 3 subdivisions (Arunachal Pradesh, Assam & Meghalaya, and NMMT) received deficient season rainfall (Chart 2, Table 3 and Statement I).

Temporal Distribution

The cumulative weekly rainfall was above the LPA during the month of June except in the second week. During major part of July and August, the cumulative weekly rainfall was below the LPA. However, from the last week of August, the cumulative rainfall remained above the LPA (Chart 3).

Except for July, rainfall during all other months was above the respective LPA values (Table 4). In June,

Chart 2: South-West Monsoon: Spatial Distribution



excess rainfall was observed over many subdivisions of northern and west coast of the country. Rainfall activity picked up in August. In August, except for 4 subdivisions from Northeast India and 2 subdivisions from north India, the remaining subdivisions received normal or excess rainfall. In September, excess rainfall was observed over subdivisions along the west coast, island subdivisions and many subdivisions from northwest India and east part of the central India. Monthly distribution of rainfall over Northeast India was deficient throughout the season. On the other hand except for few subdivisions from eastern part of central India and 2 subdivisions of Gujarat state, most of the other subdivisions from northwest India and central India received excess or normal rainfall throughout the season.

Table 3: Distribution of Sub-divisions According to Category of Rainfall

Category of Rainfall	Sub-divisions
Excess	Andaman & Nicobar Islands, West Rajasthan, East Rajasthan, Saurashtra & Kutch, Konkan and Goa, West Madhya Pradesh and Coastal Karnataka.
Normal	Sub-Himalayan West Bengal & Sikkim, Gangetic West Bengal, Orissa, Bihar, West U P, East U.P., Jammu & Kashmir, Punjab, Himachal Pradesh, Haryana, Chandigarh & Delhi, Uttarakhand, East Madhya Pradesh, Madhya Maharashtra, Marathwada, Vidarbha, Jharkhand, Gujarat Region, Daman & Nagar Haveli, Chhattisgarh, Coastal Andhra Pradesh, Telangana, Rayalseema, North Interior Karnataka, South Interior Karnataka, Tamil Nadu & Pondicherry, Kerala and Lakshadweep.
Deficient	Assam & Meghalaya, Arunachal Pradesh, Nagaland, Manipur, Mizoram & Tripura

Note: Deficient: –20 per cent to – 59 per cent; Scanty: –60 per cent to –99 per cent; No Rain: –100 per cent (All with respect to the Long Period Average).
Excess: + 20 per cent or more; Normal: + 19 per cent to –19 per cent;
Source: India Meteorological Department.

Chart 3: South West Monsoon 2010: Temporal Rainfall Pattern

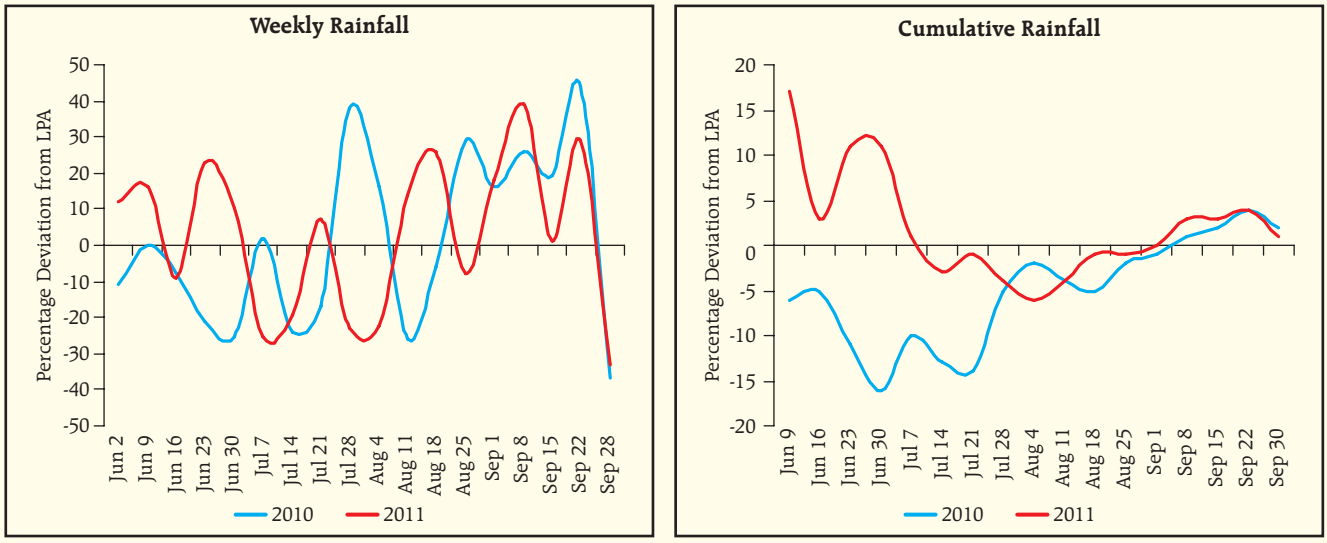


Table 4: Monthly Rainfall Over the Country- 2011

June: 12 per cent above LPA	July: 15 per cent below LPA
August: 10 per cent above LPA	September: 6 per cent above LPA

Production Weighted Rainfall Index

The foodgrains production weighted rainfall index (PRN) is constructed by the Reserve Bank based on the weighted average of actual rainfall received by the States where weights are taken as the average share of food grains production by particular State in the overall foodgrains production[1]. As per this index, the rainfall during South-West monsoon 2011 was 1 per cent above normal as against 2 per cent below normal the previous year (Chart 4).

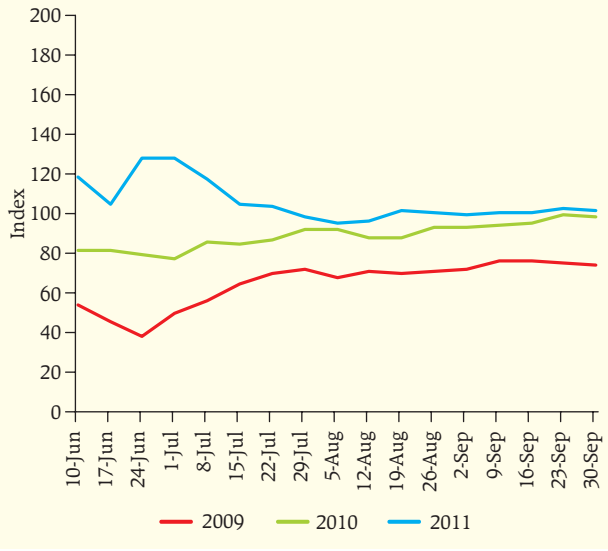
Reservoir Status

In India, the Central Water Commission monitors the total live water storage in the 81 major reservoirs with a full reservoir level (FRL) of 151.77 billion cubic metres (BCM), which accounts for around 67 per cent of the total reservoir capacity of the country. As on September 29, 2011 water stock (storage to live capacity) in these 81 major reservoirs was 87 per cent of the FRL as against 75 per cent during the corresponding period last year and the average storage to live capacity during the last ten years of 67 per cent (Table 5).

Progress of Sowing and Kharif Production Estimates

Favourable progress of monsoon during June-September 2011 was reflected in higher *kharif* sowing. Latest sowing position indicates that sowing of all crops during the current *kharif* season as on October 14, 2011 was 101.3 per cent of the normal level against 98.9 per cent last year. *Kharif* sowing under foodgrains was 97.0 per cent of normal area as against 96.0 per cent during the corresponding period last year. Consequently, production of *kharif* foodgrains in 2011-12, as per the

Chart 4: Production Weighted Index Rainfall



[1] A Production Weighted Rainfall Index of 100 indicates normal rainfall, where normal represents average of last 10 years' production weighted rainfall.

Table 5: Reservoir Status

Status	01.10.2007 (81 Reservoirs)	01.10.2008 (81 Reservoirs)	01.10.2009 (81Reservoirs)	30.9.2010 (81 Reservoirs)	29.9.2011 (81Reservoirs)
Total Live Storage (BCM)	120.12	111.96	90.48	114.45	131.49
Percentage to Live Capacity at FRL (Per Cent)	79	74	60	75	87

Source: Central Water Commission.

First Advance Estimates, is estimated at 123.9 million tonnes, 3.1 per cent higher than *kharif* foodgrains production of 120.2 million tonnes during 2010-11. Besides foodgrains, increased production has been estimated for total oilseeds, cotton, jute & mesta, and sugarcane (Table 6).

Conclusion

The South-West Monsoon during June-September 2011 was 1 per cent above LPA as against 2 per cent above LPA in June-September 2010. Timely arrival and normal progress of monsoon combined with equitable spatial distribution has contributed favourably to *kharif* sowing in 2011-12 which has surpassed the area sown during 2010-11 barring that for pulses and coarse cereals. Improved sowing, in turn, has been reflected in better prospects of *kharif* harvest as per the First Advance Estimates. Good rainfall in the months of August and September and improved water reservoir position is likely to have a favourable impact on *rabi* crops as well. This augurs well for the growth of agriculture sector in 2011-12.

Table 6: Kharif 2011-12: Production and Area Sown

(Area in Million hectares Production in Million Tonnes)

Crop	Sowing as on October 14, 2011				2010-11	2011-12
	Normal	2010	2011	Per cent of Normal 2011	Fourth Advance Estimates	First Advance Estimates
1	2	3	4	5	6	7
Total Foodgrains	**71.97**	**69.06**	**69.81**	**97.0**	**120.20**	**123.88**
of which			*(1.1)*			*(3.1)*
Rice	39.36	35.65	38.61	98.1	80.65	87.10
			(8.3)			*(8.0)*
Coarse Cereals	**21.97**	**21.22**	**20.03**	**91.2**	**32.43**	**30.42**
			(-5.6)			*(-6.2)*
Jowar	3.43	3.06	2.63	76.7	3.48	3.00
Maize	6.96	7.58	7.54	108.3	16.32	15.86
Cereals	**61.33**	**56.87**	**58.64**	**95.6**	**113.08**	**117.52**
			(3.1)			***(3.9)***
Total Pulses	**10.65**	**12.19**	**11.17**	**105.0**	**7.12**	**6.43**
of which			*(-8.3)*			*(-9.7)*
Tur	3.54	4.57	3.88	109.5	2.89	2.90
Urad	2.24	2.54	2.34	104.4	1.40	1.17
Moong	2.56	2.82	2.37	92.8	1.52	1.20
Total Oilseeds	**17.72**	**17.52**	**18.05**	**101.9**	**20.85**	**20.89**
of which			***(3.1)***			***(0.2)***
Groundnut	5.15	4.99	4.30	83.5	5.66	5.62
Castorseed	0.78	0.88	1.28	164.6	1.34	1.70
Sesamum	1.80	1.71	1.63	90.9	0.88	0.73
Soyabean	8.83	9.32	10.29	116.5	12.66	12.57
Cotton#	**9.36**	**11.02**	**12.06**	**128.9**	**33.43**	**36.10**
			(9.4)			*(8.0)*
Jute & Mesta##	**0.92**	**0.86**	**0.93**	**100.7**	**10.58**	**11.22**
			(7.2)			***(6.0)***
Sugarcane (Cane)	**4.60**	**4.94**	**5.09**	**110.7**	**339.17**	**342.20**
			(3.0)			***(0.9)***
All Crops	**104.56**	**103.41**	**105.94**	**101.3**	–	–
			(2.4)			

: Million bales of 170 kgs. each.
: Million bales of 180 kgs. each.
Note: Figures in parentheses are percentge change over previous year.
Source: Ministry of Agriculture, Government of India.

Statement - I: Basic Rainfall Data (Cumulative)

Sr. No.	Sub - Divisions	June 1 to September 30 , 2011				June 1 to September 30 , 2010			
		Actual (mm)	Normal (mm)	% deviation from Normal		Actual (mm)	Normal (mm)	% deviation from Normal	
1	2	3	4	5	6	7	8	9	10
1.	Andaman & Nicobar Islands	2300.4	1682.5	37	E	1769.5	1693.1	5	N
2.	Arunachal Pradesh	1342.7	1768.0	-24	D	1589.3	1709.5	-7	N
3.	Assam & Meghalaya	1226.9	1792.8	-32	D	1501.3	1951.6	-23	D
4.	Nagaland, Manipur, Mizoram & Tripura	1087.9	1496.9	-27	D	1277.1	1398.7	-9	N
5.	Sub-Himalayan West Bengal and Sikkim	1865.1	2006.2	-7	N	2194.0	1925.7	14	N
6.	Gangetic West Bengal	1394.7	1167.9	19	N	788.0	1140.6	-31	D
7.	Orissa	1099.9	1149.9	-4	N	992.7	1169.3	-15	N
8.	Jharkhand	1101.5	1091.9	1	N	644.0	1084.4	-41	D
9.	Bihar	1057.6	1027.6	3	N	794.0	1024.3	-22	D
10.	East Uttar Pradesh	820.2	897.6	-9	N	702.1	909.6	-23	D
11.	West Uttar Pradesh	724.0	769.4	-6	N	771.5	771.0	0	N
12.	Uttarakhand	1454.3	1229.1	18	N	1690.3	1208.1	40	E
13.	Haryana, Chandigarh & Delhi	379.2	466.3	-19	N	565.5	467.3	21	E\
14.	Punjab	459.3	491.9	-7	N	459.0	495.7	-7	N
15.	Himachal Pradesh	732.5	825.3	-11	N	882.6	773.9	14	N
16.	Jammu & Kashmir	520.9	534.6	-3	N	673.9	524.2	29	E
17.	West Rajasthan	401.2	263.2	52	E	443.1	262.5	69	E
18.	East Rajasthan	828.6	615.8	35	E	660.9	630.3	5	N
19.	West Madhya Pradesh	1079.1	876.1	23	E	752.1	903.4	-17	N
20.	East Madhya Pradesh	1221.4	1051.2	16	N	919.9	1087.5	-15	N
21.	Gujarat Region, Daman, Dadra & Nagar Haveli	901.3	901.0	0	N	1011.1	910.4	11	N
22.	Saurashtra & Kutch	719.4	473.5	52	E	1005.9	487.1	107	E
23.	Konkan and Goa	3716.3	2914.3	28	E	3437.4	2799.5	23	E
24.	Madhya Maharashtra	761.1	729.3	4	N	838.5	701.1	20	E
25.	Marathwada	632.8	682.9	-7	N	904.1	711.1	27	E
26.	Vidarbha	897.5	954.6	-6	N	1216.3	974.9	25	E
27.	Chhattisgarh	1220.4	1147.3	6	N	1034.6	1203.2	-14	N
28.	Coastal Andhra Pradesh	537.8	581.1	-7	N	836.7	575.3	45	E
29.	Telangana	665.5	755.2	-12	N	1013.3	766.6	32	E
30.	Rayalaseema	379.1	398.3	-5	N	518.9	380.8	36	E
31.	Tamil Nadu & Pondicherry	298.9	317.2	-6	N	403.8	313.7	29	E
32.	Coastal Karnataka	3775.9	3083.8	22	E	3245.3	3174.1	2	N
33.	North Interior Karnataka	440.1	506.0	-13	N	617.3	491.0	26	E
34.	South Interior Karnataka	640.2	660.0	-3	N	742.2	672.2	10	N
35.	Kerala	2215.1	2039.6	9	N	1933.3	2139.7	-10	N
36.	Lakshadweep	1014.1	998.5	2	N	1152.6	985.2	17	N
E : Excess, *i.e.*,+20% or more				**7**				**14**	
N : Normal, *i.e.*,+19% to -19%				**26**				**17**	
D : Deficient, *i.e.*,-20% to -59%				**3**				**5**	
S : Scanty, *i.e.*,-60% to -99%				**0**				**0**	
NR: No Rain, *i.e.* -100%				**0**				**0**	
	TOTAL			**36**				**36**	

Source: India Meteorological Department.

Statement - II: State-wise Distribution of Number of Districts with Excess, Normal, Deficient, Scanty and No Rainfall

Sr. No.	States	Period from: 01.06.2011 to 28.09.2011						
		E	N	D	S	NR	ND	Total
1	2	3	4	5	6	7	8	9
1	A & N Island (UT)	1	2	0	0	0	0	3
2	Arunachal Pradesh	1	2	8	1	0	4	16
3	Assam	0	7	17	0	0	3	27
4	Meghalaya	0	3	1	1	0	2	7
5	Nagaland	0	0	3	0	0	8	11
6	Manipur	0	1	0	0	0	8	9
7	Mizoram	0	0	1	0	0	8	9
8	Tripura	0	3	1	0	0	0	4
9	Sikkim	0	3	1	0	0	0	4
10	West Bengal	9	9	1	0	0	0	19
11	Orissa	4	22	4	0	0	0	30
12	Jharkhand	6	12	6	0	0	0	24
13	Bihar	9	18	11	0	0	0	38
14	Uttar Pradesh	9	40	21	1	0	0	71
15	Uttarakhand	7	6	0	0	0	0	13
16	Haryana	1	11	9	0	0	0	21
17	Chandigarh (UT)	0	1	0	0	0	0	1
18	Delhi	1	4	4	0	0	0	9
19	Punjab	4	11	4	1	0	0	20
20	Himachal Pradesh	1	8	2	1	0	0	12
21	Jammu & Kashmir	3	12	2	2	0	3	22
22	Rajasthan	29	4	0	0	0	0	33
23	Madhya Pradesh	25	24	1	0	0	0	50
24	Gujarat	10	12	4	0	0	0	26
25	DNH & Daman(UTs)	0	2	0	0	0	0	2
26	Diu(UT)	0	1	0	0	0	0	1
27	Goa	1	1	0	0	0	0	2
28	Maharashtra	7	26	2	0	0	0	35
29	Chhattisgarh	3	14	1	0	0	0	18
30	Andhra Pradesh	1	18	4	0	0	0	23
31	Tamil Nadu	5	12	15	0	0	0	32
32	Pondicherry (UT)	1	0	1	0	0	2	4
33	Karnataka	3	16	11	0	0	0	30
34	Kerala	3	9	2	0	0	0	14
35	Lakshadweep(UT)	0	1	0	0	0	0	1
	Total	**144**	**315**	**137**	**7**	**0**	**38**	**641**

E: Excess; N: Normal; D: Deficient; S: Scanty; NR: No Rain; ND: No Data.
Source: India Meteorological Department.