

COMPARATIVE ANALYSIS OF WEATHER FORECAST FROM DIFFERENT WEATHER WEBSITES FOR LUDHIANA, PUNJAB

Bhawna Sharma, Kulwinder Kaur Gill* and Sandeep Singh Sandhu

*Department of Climate Change and Agricultural Meteorology
Punjab Agricultural University, Ludhiana-141004, Punjab*

Indian economy is an agricultural economy, so unfavorable weather conditions like drought, thunderstorm, heat waves, cold waves have caused great loss to crop production. Weather is an important phenomenon that determines the chances of success as well as complete failure of agricultural crops. The different weather parameters have great impact on the crops during different stages of crop growth. As climate change is a major concern these days and could hurt farmers' income by up to 20%-25%. Agriculture accounts for 50% of the country's employment and 18% of its GDP and extreme weather events are a great threat to Indian agriculture. Climate change studies showed an increasing trend in average temperature but annual rainfall has shown erratic behaviour. Monsoon friendly crops with a high requirement of water like paddy, sugarcane or other kharif crops can easily be cultivated during southwest monsoon. Some other crop operations like fertilizer application based on wind conditions and irrigation application can be applied or not is also dependent on rainfall prediction. Medium range weather forecasts have made important contribution in agriculture (Das and Sindhu, 2001).

Optimum climatic conditions cause the success of crop and vice-versa. Medium range weather forecast having validity for three to ten days is beneficial for the agricultural crops. The utility of weather forecast further depends upon two factors i.e. accuracy and applicability at micro levels. According to estimate made by the agri-business, 50 to 60 per cent correct and properly accurate forecast can be of economical use (Seeley, 1994). An agriculturally related forecast is not only useful for efficient management of farm inputs but also leads to precise impact assessment (Gadgil, 1989). Most of the farmers in Punjab are smallholder farmers often with limited access to technologies and resources which leaves them increasingly vulnerable to weather and climate fluctuations.

Comprehensive planning to reduce the economic and ecological impacts of extreme events as well as adoption of technologies for improved land and water management to enhance water efficiency in agriculture

are needed. Indiscriminate use of pesticides and fertilizers critically imbalances the biodiversity in the natural ecosystem. Therefore, linking of weather information with the application of agrochemical could maintain the biodiversity and ultimately ecosystem. This requires the accurate information about weather forecast and outreach to farmers/ planners in short interval of time. Mobile based communication system can also be used to get services and information in non interactive mode. This mode is generally used for receiving the weather forecast or warning of weather hazards such as frost, flash flood, and forest fire. Mobile phones based / internet based dissemination systems of services are used in both interactive and non interactive mode. Local weather conditions, type of soil, type of crop and phenological stage, as well as level and type of insect-pest infestation is considered for advising for decision making on sowing, harvesting, irrigation, nutrient management and chemical application.

The study includes the verification of weather forecast received from different sources/ websites (imd.gov.in, weather.com, weatherbug.com, wunderground.com, skymetweather.com, bbcweather.co.uk.in, accuweather.com, mosdac.gov.in) for Ludhiana district, during (2017- 2018) and observed weather data was taken from the meteorological observatory installed at Department of Climate Change and Agricultural Meteorology, Punjab Agricultural University, Ludhiana. The data was divided into four seasons i.e. summer (March-May), monsoon (June-September), post monsoon (October- November) and winter (December-February) as per standard of IMD.

The analysis of weather forecast was done for maximum temperature, minimum temperature and weather remarks by observing 3 day forecast given by different weather websites and comparing it with the actual observed weather data for first, second and third day for Ludhiana district. The analysis was done to judge the accuracy of forecast upto three days and weekly. The forecast data was verified with observed data, using the criteria provided by IMD, New Delhi as well as suggested by Singh *et al.* (1999). The weather forecast of maximum and minimum temperature was categorized as correct, usable and unusable using critical values for error structure (Table 1). Similar methods were used by

*Corresponding author : kkgill@pau.edu

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few researchers (Tripathi *et al.*, 2008; Lunagaria *et al.*, 2009). The qualitative analysis of predicted weather has been carried out on 'Yes' or 'No' event basis for weather remarks. Weekly analysis of forecast was done on the basis of standard meteorological weeks by calculating difference between observed and predicted weather for maximum and minimum temperature, rainfall (Sharma *et al.*, 2020).

Table 1. Error structure for maximum and minimum temperature

Parameter	Max. / Min. Temp. (°C)
Correct	±1
Usable	±2
Unusable	>2

Maximum Temperature

Comparative analysis of weather forecast of maximum temperature for 1st day

The seasonal forecast of maximum temperature for the 1st day received from different weather websites was compared with the actual observed maximum temperature of Ludhiana district. During the year 2017-18, on an average for the whole year percentage of correct forecast of maximum temperature for the 1st day varied from 3 per cent to 57 per cent. The highest accuracy of 57 per cent was given by weather.com and wunderground.com while lowest was provided by mosdac.gov.in (Table 2). However, when season wise forecast was compared, highest accuracy for the monsoon season was given by weather.com and wunderground.com, which constituted 53 per cent. Whereas, during post monsoon season highest correct forecast was 72 per cent given by skymet weather.com (Singh and Bhardwaj, 2012). Similarly, highest accuracy for the winter season was given by weatherbug.com which amounted to 70 per cent. During summer

season, highest correct forecast was 60 per cent given by weather.com.

Comparative analysis of weather forecast of maximum temperature for 2nd day

During the year 2017-18, on an average for the whole year percentage of correct forecast of maximum temperature for the 2nd day varied from 3 per cent to 56 per cent, highest accuracy of 56 per cent was given by weather.com and lowest by mosdac.gov.in (Table 3). However, comparison of seasonal forecast found that highest accuracy for the monsoon season was given by weather.com, which constituted 56 per cent. Whereas, during post monsoon season, maximum correct forecast was recorded as 61 percent (imd.gov.in, weather.com, weatherbug .com). Similarly, highest accuracy for the winter season was given by weatherbug .com, which amounted to 67 per cent. During summer season, highest correct forecast was 52 per cent (weather.com, wunderground.com).

Comparative analysis of weather forecast of maximum temperature for 3rd day

The maximum temperature analysis was carried out during the year 2017-18, on an average for the whole year percentage of correct forecast of maximum temperature for the 3rd day varied from 28 per cent to 50 per cent, highest accuracy of 50 per cent was given by weather.com and lowest by accuweather.com (Table 4). However, when season wise forecast was compared, highest accuracy for the monsoon season was given by weather.com which constituted 52 per cent. Whereas, during post monsoon season highest correct forecast was 57 per cent (imd.gov.in and weatherbug .com). Similarly, highest accuracy for the winter season was given by weather bug.com, which amounted to 57 per cent. During summer season, skymet weather.com gave the highest correct forecast i.e. 42 per cent.

Table 2. Comparative analysis of 1st day maximum temperature forecast from different websites during 2017-18

Website	Monsoon (Jun-Sep)			Post -monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	41	24	35	57	28	15	40	31	29	33	27	40	33	27	32
Weather	53	27	20	62	18	20	54	31	14	60	21	20	57	25	18
Weatherbug	31	27	42	61	24	15	70	14	17	46	23	31	49	23	28
Weather underground	53	27	20	62	18	20	58	27	16	58	19	23	57	23	20
Sky met weather	45	25	30	72	15	13	40	29	31	46	16	38	49	22	29
BBC weather	47	36	17	67	25	8	58	26	17	50	26	24	54	29	17
Accu weather	30	27	43	39	33	28	17	28	56	18	25	57	25	29	47
Mosdac	2	1	97	0	0	100	1	2	97	7	10	84	3	3	84

Table 3. Comparative analysis of 2nd day maximum temperature forecast from different websites during 2017-18

Website	Monsoon (Jun-Sep)			Post - monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	------(%)-----														
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	39	22	39	61	20	20	31	27	42	36	27	37	40	24	36
Weather	56	21	23	61	18	21	57	24	19	52	27	21	56	23	21
Weatherbug	28	25	47	61	25	15	67	14	19	42	33	25	47	24	29
Weather underground	41	16	43	59	20	21	54	22	23	52	26	22	49	21	30
Skymet weather	40	25	35	51	33	16	39	28	33	41	26	33	42	27	31
BBC weather	44	28	28	57	28	15	50	34	16	41	33	26	47	31	22
Accuweather	30	25	45	46	26	28	19	28	53	20	26	54	27	26	47
Mosdac	5	1	93	0	0	100	0	0	100	2	6	92	3	2	95

Table 4. Comparative analysis of 3rd day maximum temperature forecast from different websites during 2017-18

Website	Monsoon (Jun-Sep)			Post -monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	------(%)-----														
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	26	31	42	57	23	20	28	27	46	35	28	37	34	28	38
Weather	52	12	37	52	25	23	56	20	24	41	30	28	50	21	29
Weatherbug	27	19	54	57	25	18	57	21	22	39	28	33	43	23	34
Weather underground	48	20	33	54	23	23	54	18	28	40	35	25	48	24	28
Skymet weather	40	21	40	44	28	28	27	32	41	42	29	28	38	27	35
BBC weather	41	25	34	49	31	20	50	28	22	36	37	27	43	30	27
Accuweather	34	20	46	43	33	25	22	31	47	16	21	63	28	25	47

Minimum Temperature

Comparative analysis of weather forecast of minimum temperature for 1st day

The percentage of correct forecast for the year 2017-18 was carried out for minimum temperature for the 1st day and it varied from 26 per cent to 51 per cent. The bbcweather.co.uk showed highest accuracy i.e. 51 per cent although lowest was provided by mosdac.gov.in (Table 5). However, on seasonal basis highest accuracy for the monsoon season was given by bbcweather.co.uk, which constituted 55 per cent accuracy. Whereas, during post monsoon season highest correct forecast i.e. 64 per cent was given by imd.gov.in. Similarly, highest accuracy values for the winter season and summer seasons were reported by weather.com (50 per cent) and bbcweather.co.uk (43 per cent), respectively.

Comparative analysis of weather forecast of minimum temperature for 2nd day

When 2nd day forecast for minimum temperature was compared for different websites for Ludhiana during the year 2017-18, it was found that the percentage of correct forecast of minimum temperature for the 2nd day varied from 27 per cent to 51 per cent, being highest by bbcweather.co.uk i.e. 51 per cent and lowest was provided by mosdac.gov.in (Table 6). However, when season-wise forecast was compared, highest accuracy for the monsoon season was given by bbcweather.co.uk, which constituted 57 per cent. Whereas, during post monsoon season highest correct forecast was 57 per cent provided both by imd.gov.in and bbcweather.co.uk. Similarly, highest accuracy for the winter season was given by wunderground.com, which amounted to 49 per cent and 42 percent during summer season given by bbcweather.com.

Table 5. Comparative analysis of 1st day minimum temperature forecast from different website during 2017-18

Website	Monsoon (Jun-Sep)			Post -monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	------(%)-----														
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	47	24	36	64	21	15	44	29	27	36	28	36	46	26	28
Weather	44	34	36	57	30	15	50	20	27	35	29	36	45	28	28
Weather bug	35	40	25	43	34	23	41	23	36	38	27	35	38	32	30
Weather underground	45	30	25	57	30	13	49	21	30	41	20	39	47	25	28
Skymet weather	44	29	27	57	24	18	47	27	27	41	32	27	46	28	26
BBC weather	55	26	18	49	31	10	48	22	30	43	34	23	51	28	21
Accuweather	45	25	31	36	25	39	37	22	41	42	26	32	41	24	35
Mosdac	13	13	73	29	35	35	38	31	31	30	25	45	26	25	49

Table 6. Comparative analysis of 2nd day minimum temperature forecast from different websites during 2017-18

Website	Monsoon (Jun-Sep)			Post monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	------(%)-----														
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	34	26	40	57	21	21	46	28	27	24	37	39	38	28	34
Weather	39	33	28	52	33	15	47	28	26	36	27	37	42	30	28
Weatherbug	35	40	25	48	30	22	39	29	32	38	29	33	39	33	28
Weather underground	42	28	30	51	36	13	49	27	24	39	24	37	44	28	28
Skymet weather	40	32	28	49	33	18	44	23	32	36	28	36	42	29	29
BBC weather	57	23	20	57	31	12	48	24	28	42	37	21	51	28	21
Accuweather	42	27	31	26	34	39	33	24	42	40	25	35	37	27	36
Mosdac	12	11	77	29	32	39	44	29	27	27	19	54	27	21	50

Table 7. Comparative analysis of 3rd day minimum temperature forecast from different websites during 2017-18

Website	Monsoon (Jun-Sep)			Post monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	------(%)-----														
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	37	26	37	49	34	16	33	31	36	30	23	47	36	28	36
Weather	41	32	28	54	31	15	49	24	27	35	25	40	44	28	28
Weatherbug	37	34	29	56	28	16	41	23	36	42	30	28	43	29	28
Weather underground	43	27	30	59	28	13	50	23	27	34	28	36	44	28	28
Sky met weather	44	22	34	51	33	16	46	29	26	32	23	46	42	26	32
BBC weather	50	25	24	61	29	10	47	25	28	45	28	27	50	27	23
Accu weather	45	20	35	18	41	41	32	24	43	40	26	34	36	26	38

Comparative analysis of weather forecast of minimum temperature for 3rd day

During the year 2017-18, on an average for the whole year percentage of correct forecast of minimum temperature for the 3rd day varied from 36 per cent to 50 per cent, highest accuracy was 50 per cent given by bbcweather.co.uk.in and lowest was provided by imd.gov.in (Table 7). However, when season-wise forecast was compared, highest accuracy for the monsoon season was given by bbcweather.co.uk.in, which constituted 50 per cent. Whereas, during post monsoon season highest correct forecast was 61 per cent given by bbcweather.co.uk.in. Similarly, highest accuracy for the winter season was given by wunderground.com which was 50 per cent. During summer season highest correct forecast of 45 per cent was given by bbcweather.co.uk.in.

Weather remarks

Comparative analysis of weather forecast of weather remarks for 1st day

The weather remarks based on occurrence rainfall during the year 2017-18 were analyzed for the whole year and the percentage of correct forecast of weather remarks for the 1st day varied from 24 per cent to 61 per cent. It has been found that the highest accuracy was 61 per cent given by [weather bug.com](http://weatherbug.com) and lowest was provided by accuweather.com (Table 8). However, on seasonal basis some different scenario has come out and highest accuracy was provided by mosdac.gov.in for the monsoon season which constituted 43 per cent. Whereas, during post monsoon season highest correct forecast was 84 per cent given by both weather.com and wunderground.com. For the winter season [weather bug.com](http://weatherbug.com) constituted 83 per cent accuracy of weather forecast while 62 per cent was given by wunderground.com during the summer season.

Comparative analysis of weather forecast of weather remarks for 2nd day

During the year 2017-18, on an average for the whole year the percentage of correct forecast of weather remarks for the 2nd day varied from 25 per cent to 62 per cent; highest accuracy i.e. 62 per cent was given by weatherbug.com and lowest was given by accuweather.com (Table 9). However, when season wise forecast was compared, highest accuracy for the monsoon season was given by weatherbug.com which constituted 39 per cent. Whereas, during post monsoon season highest correct forecast was 85 per cent ([skymet weather.com](http://skymetweather.com), bbcweather.co.uk.in and mosdac.gov.in). Similarly, highest accuracy for the winter season was given by weatherbug.com which was 84 per cent. During summer season, highest correct forecast was 66 per cent, given by weather.com.

Comparative analysis of weather forecast of weather remarks for 3rd day

The percentage of correct forecast of weather remarks for the 3rd day during the year 2017-18 varied from 26 per cent to 60 per cent, being highest for weatherbug.com and lowest for accuweather.com (Table 10). However, when season wise forecast was compared, highest accuracy for the monsoon season was given by weatherbug.com which constituted 37 per cent. Whereas, during post monsoon season highest correct forecast was 88 per cent provided by [skymet weather.com](http://skymetweather.com). Similarly, highest accuracy for the winter season was given by weatherbug.com which was 80 per cent. During summer season, highest correct forecast was 64 per cent given by wunderground.com.

Comparative analysis of weekly forecast from different weather websites

The standard meteorological weeks (SMW) starting from 23rd SMW (4-10 June) 2017 to 22nd SMW (28 may-

Table 8. Comparative analysis of 1stday weather remarks forecast from different websites during 2017-18

Website	Monsoon (Jun-Sep)			Post monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	18	26	56	52	30	18	35	31	34	37	14	49	33	25	42
Weather	29	17	54	84	0	16	69	7	24	61	5	34	56	9	35
Weatherbug	41	24	35	82	16	2	83	12	5	53	22	25	61	19	20
Weather underground	30	18	52	84	0	16	69	4	27	62	7	31	57	9	34
Sky met weather	25	28	47	83	2	15	43	13	44	31	14	55	40	17	43
BBC weather	31	30	39	83	2	15	43	15	42	61	12	27	50	17	33
Accu weather	23	23	54	52	2	46	10	15	85	22	8	70	24	11	65
Mosdac	43	6	51	81	0	19	64	4	32	59	3	38	59	3	38

Table 9. Comparative analysis of 2nd day weather remarks forecast from different website during 2017-18

Website	Monsoon (Jun-Sep)			Post monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	------(%)-----														
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	15	34	51	51	26	23	26	43	31	35	12	53	28	30	42
Weather	31	17	52	82	2	16	69	8	23	66	6	28	58	9	33
Weatherbug	39	20	41	82	16	2	84	11	5	57	27	16	62	19	19
Weather underground	31	15	54	83	2	15	57	17	26	65	6	29	55	11	34
Sky met weather	33	23	44	85	5	10	51	9	40	32	14	54	46	14	40
BBC weather	33	23	44	85	5	10	51	9	40	32	14	54	46	14	40
Accuweather	26	18	56	52	2	46	11	5	84	21	10	69	25	10	65
Mosdac	36	6	58	85	0	15	57	2	41	63	2	35	57	3	40

Table 10. Comparative analysis of 3rd day weather remarks forecast from different website during 2017-18

Website	Monsoon (Jun-Sep)			Post monsoon (Oct- Nov)			Winter (Dec-Feb)			Summer (March-May)			Whole year (2017-18)		
	------(%)-----														
	C	U	UN	C	U	UN	C	U	UN	C	U	UN	C	U	UN
IMD	18	34	48	52	33	15	18	43	39	37	9	54	28	30	42
Weather	29	18	53	85	0	15	52	15	33	59	5	36	52	11	37
Weatherbug	37	16	47	80	17	3	80	13	7	56	24	20	60	17	23
Weather underground	30	17	53	85	0	15	50	13	37	64	6	30	53	10	37
Sky met weather	30	27	43	88	2	10	43	17	40	37	8	55	45	15	40
BBC weather	29	28	43	83	2	15	40	17	43	59	9	32	48	16	36
Accu weather	28	21	51	57	2	41	13	5	82	15	8	77	26	10	64

3 June) 2018 were taken for analysis. The data was taken from the seven different weather websites on weekly basis and compared with observed data. The analysis was done for maximum, minimum temperature and rainfall variation for the year 2017-18 for Ludhiana district.

IMD (www.imd.gov.in)

The weekly deviations of maximum temperature, minimum temperature and rainfall were worked out for Ludhiana district (Fig. 1). The deviation of maximum temperature for Ludhiana across the standard meteorological weeks (SMW) varied from -4.8 to 6.0°C, whereas, highest deviation was 6.0°C for 4th week during 2018 and lowest was -4.8°C for 27th week during 2017. Similarly, for minimum temperature, deviation varied from -3.1 to 2.7°C, Moreover, highest deviation was 2.7°C for 36th week during 2017 and lowest -3.1°C for 31st week during 2017. Further, rainfall deviation varied from -58.0 to 86.4 mm. Highest deviation was 86.4 mm for 31st week during 2017 and lowest -58.0 mm for 35th week during 2017 (Gill and Kingra, 2010).

Weather channel (www.weather.com)

The weather channel weekly deviations of maximum and minimum temperature were worked out for Ludhiana district (Fig. 2). The deviation of maximum temperature of Ludhiana across the standard meteorological weeks varied from -3.1 to 4.4°C. Whereas, highest deviation was 4.4°C for 4th week during 2018 and lowest was -3.1°C for 29th week during 2017, similarly, for minimum temperature deviation varied from -2.7 to 3.0°C, Moreover, highest deviation was 3.0°C for 22nd week during 2018 and lowest -2.7°C for 29th week during 2017.

Weather bug (www.weatherbug.com)

The weather bug showed weekly deviations of maximum and minimum temperature within the range of 2-4°C for Ludhiana district as presented (Fig. 3). The deviation of maximum temperature across the standard meteorological weeks for Ludhiana varied from -4.1 to 3.7°C. Whereas, highest deviation was 3.7°C for 4th week during 2018 and lowest -4.1°C for 29th week during 2017, Similarly, for minimum temperature deviation

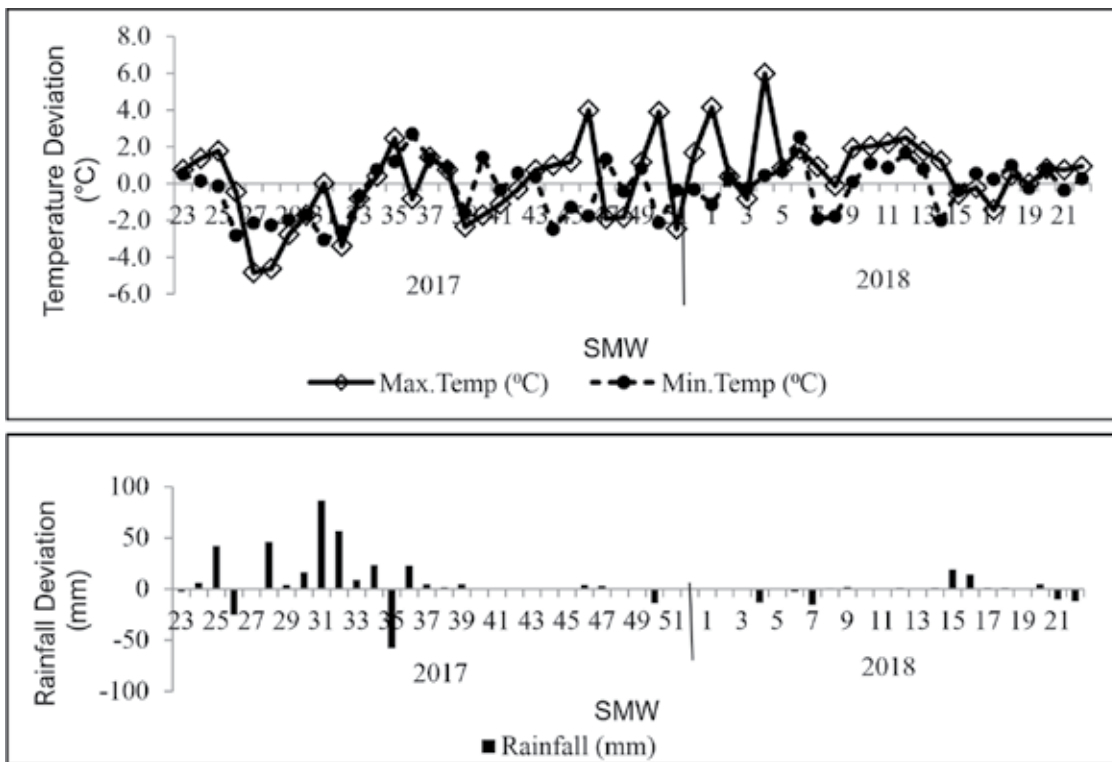


Fig. 1. Weekly deviations of forecast for temperature and rainfall during 2017-18

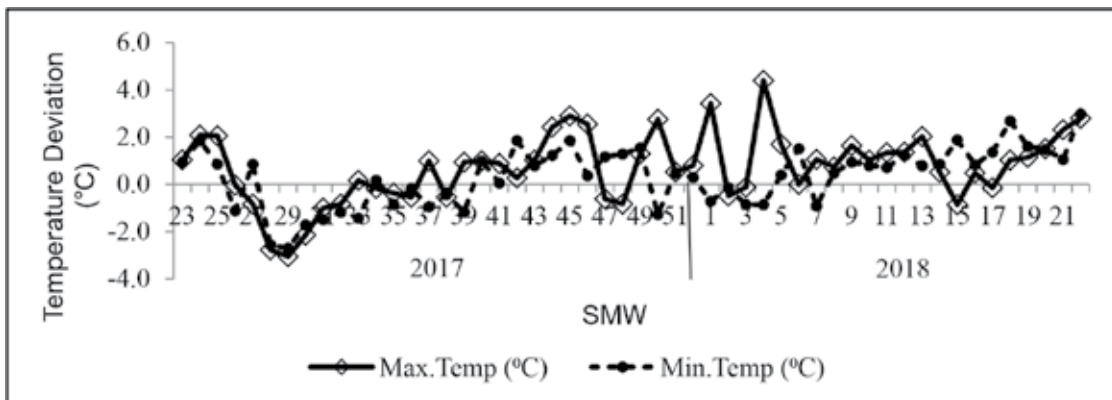


Fig. 2. Weekly deviations of forecast for temperatures during 2017-18.

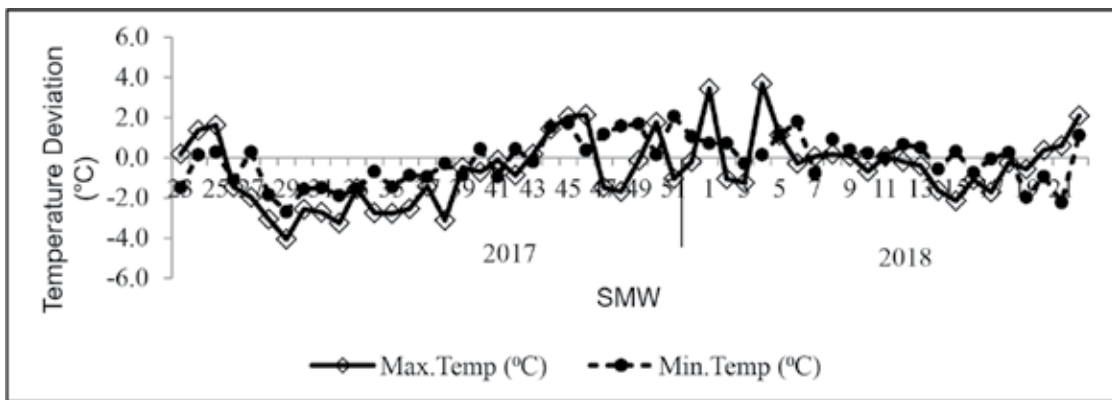


Fig. 3. Weekly deviations of forecast for temperatures during 2017-18.

varied from -2.7 to 2.1°C, Moreover, highest deviation was 2.1°C for 51st week during 2017 and lowest -2.7°C for 29th week during 2017.

Weather wunderground (www.wunderground.com)

The Ludhiana data showed more weekly deviations of maximum and minimum temperature (Fig. 4). The deviation of maximum temperature across the standard meteorological weeks for Ludhiana varied from -3.5 to 4.7°C. Whereas, highest deviation was 4.7°C for 4th week during 2018 and lowest -3.5°C for 28th week during 2017. Similarly, for minimum temperature deviation varied from -3.1 to 3.1°C. Moreover, highest deviation was 3.1 °C observed for 22nd week during 2018 and lowest -3.1°C for 28th week during 2017.

Skymet weather (www.skymetweather.com)

The weekly deviations of maximum and minimum temperature were worked out for Ludhiana district (Fig. 5). The deviation of maximum temperature across the standard meteorological weeks for Ludhiana varied from -3.5 to 6.8°C. Whereas, highest deviation was

4.7°C for 4th week during 2018 and lowest -3.5°C for 28th week during 2017. Similarly, for minimum temperature deviation varied from -3.1 to 1.9°C. Whereas, highest deviation was 1.9°C for 51st week during 2017 and lowest -3.1°C for 31st week during 2017.

BBC weather (www.bbcweather.co.uk.in)

The BBC weather weekly deviations of maximum and minimum temperature for Ludhiana district (Fig. 6) were quite reliable. The deviation of maximum temperature for Ludhiana varied from -1.6 to 3.9°C. Whereas, highest deviation was 3.9°C for 37th week during 2017 and lowest -1.6°C for 17th week during 2018. Similarly, for minimum temperature deviation varied from -2.3 to 2.7°C. Whereas, highest deviation was 2.7°C for 49th week during 2017 and lowest -2.3°C for 19th week during 2018.

Accuweather (www.accuweather.com)

The weekly deviations of maximum and minimum temperature were worked out for Ludhiana district (Fig. 7). The deviation of maximum temperature across the standard meteorological weeks for Ludhiana varied

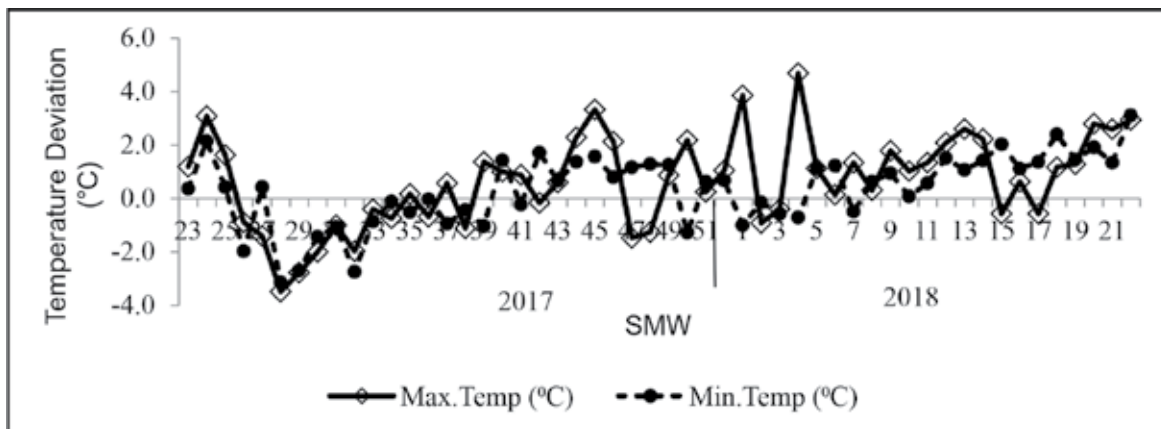


Fig. 4. Weekly deviations of forecast for temperatures during 2017-18

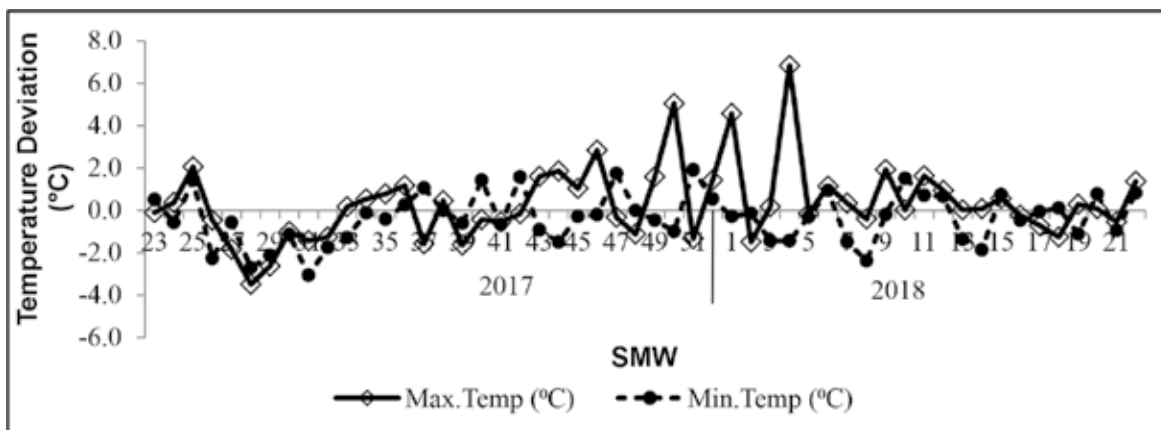


Fig. 5. Weekly deviations of forecast for temperatures during 2017-18

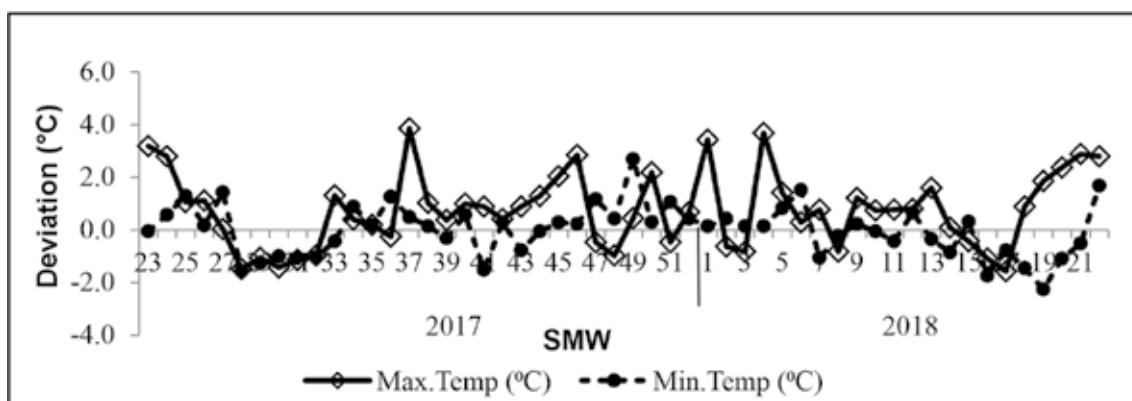


Fig. 6. Weekly deviations of forecast for temperatures during 2017-18.

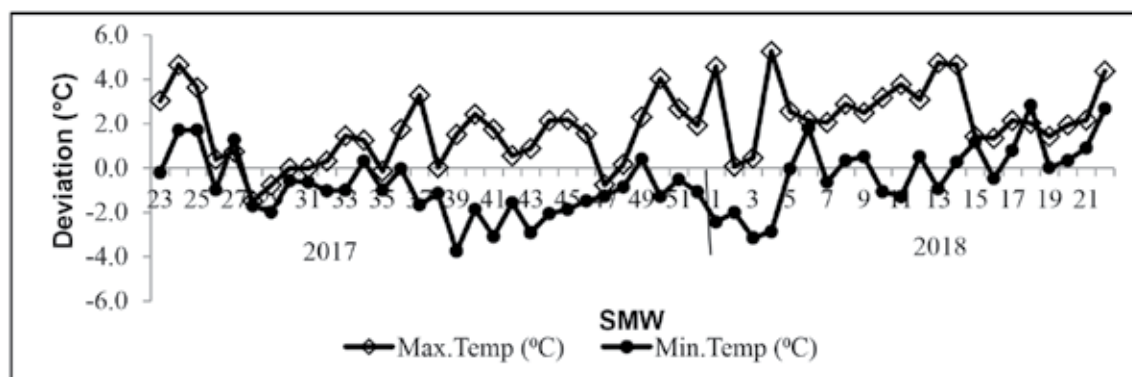


Fig. 7. Weekly deviations of forecast for temperatures during 2017-18.

from -1.5 to 5.3°C, whereas, highest deviation was 5.3°C for 4th week during 2018 and lowest -1.5 °C for 28th week during 2017. Similarly, for minimum temperature deviation varied from -3.7 to 2.8°C. Moreover, highest deviation was 2.8°C for 18th week during 2018 and lowest -3.7 °C for 39th week during 2017.

To conclude, the study was conducted to assess the accuracy of weather forecast provided by different sources for different time intervals. It has been found that weather forecast given by IMD and other different websites varies with time interval as well as for different weather parameters. The analysis showed that for maximum temperature weather.com and wunderground.com gave highest accuracy for 1st day but for 2nd and 3rd day only weather.com gave the highest accuracy. For minimum temperature forecast, bbcweather.co.uk gave the highest accuracy for all the three days (1st, 2nd and 3rd day). Weatherbug.com gave the highest accuracy for the weather remarks forecast of 1st, 2nd and 3rd day. The farmers need both weather and climate services for better crop production through different modes of communication. Agromet Advisory services for agriculture that is, the provision of accurate and locally-appropriate climate and weather information play a vital building block for increasing the resilience

of communities to climate change, diseases, and disasters.

Authors' contribution

Conceptualization of research work and designing of experiments (KKG, SSS); Execution of field/ lab experiments and data collection (BS); Analysis of data and interpretation (BS, KKG, SSS); Preparation of manuscript (BS, KKG)

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