

Short Communication

Verification of medium range rainfall forecast under south Saurashtra agro climatic zone, Gujarat

D.D.SAHU, M.C. CHOPADA and H.L. KACHA

Agrometeorology Cell, Department of Agronomy

Junagadh Agricultural University, Junagadh

(Email: ddsahu1950@yahoo.co.in)

Agriculture in many parts of the country, especially in the arid and semi arid regions is risky because of highly variable weather. In some countries as much as 80% of the variability in agricultural production is due to uncertainty in rainfall. A timely medium and seasonal rainfall forecast could permit farmers to adjust cropping patterns and plan agricultural operations in order to benefit fully from adverse weather conditions. In spite of improved varieties and cultivation practices, favourable weather is must for good harvest. Though rainfall of different amounts are received throughout the year, the rainfall during the South West monsoon season is the most important of all the weather elements as the country's agricultural production is dependent on its amount and distribution (Rao. *et. al.*, 1999). The National Centre for Medium Range Weather Forecast (NCMRWF) was established in 1988 under the Department of Science and Technology, New Delhi to issue location specific medium range weather forecast of six weather parameters like rainfall and cloudiness, maximum and minimum temperature, wind direction and speed in different agro climatic zones.

The reliability and accuracy of weather forecasts were analysed by several workers (Chauhan. *et. al.*, 2008, Lunagaria. *et. al.*, 2009, Chaudhary. *et. al.*, 2010, Khichar. *et. al.*, 2010, Mishra. *et. al.*, 2010, and Kaur and Singh, 2010) for different agro climatic zones in India. The rainfall is the most vital weather parameters of all. Hence, the timely and accurate rainfall forecast is most important for crop production. In this paper, the accuracy and success of rainfall forecasting during various seasons at Junagadh has been analysed and discussed.

The climate of Junagadh is tropical semi-arid with mean annual maximum and minimum temperature of 34.8°C and 16.9°C respectively. The average annual precipitation is 902.6mm (1957-2009) with a coefficient of variation 47 per cent. Winter sets in the month of November and continues till the middle of February. January is the coldest month with mean minimum temperature varying from 10.6 to 12.2°C.

Medium range forecast of rainfall occurrence and amount from the period from 1996 to 2009 for Junagadh (21°

30° N latitude, 70° 31' E longitude, 83 m amsl) representing the south Saurashtra agro climatic zone, was compared with the observed values. To assess the accuracy, success and degree of error of rainfall forecast different verification methods given by NCMRWF (Singh *et. al.*, 1999) have been used. The correct and usable cases were summed up to indicate percent usability of the forecasts. The ratio score, varies from 0 to 100 percent, indicate the degree of accuracy of weather forecast in percentage. Higher ratio score indicated better accuracy. The HK score varies from -1 to +1 through zero which indicates the degree of success of forecast with zero indicating no skill, negative indicating failure and positive values indicating success of forecast. The RMSE values show the degree of error in the forecast. Higher values indicate more error between observed and forecast values.

The year wise quantitative (correct and usable) analysis results are presented in Table 1 for four seasons. The results indicated that during monsoon season which is the main rainfall season recorded the lowest percent of usability varying from 29 % in 2007 to as high as 90 % in the year 2002. Similar results have also been reported by Chaudhari, *et. al* (2010) for high rainfall zone of Konkan in Maharashtra and Singh *et. al.* (2005) for mid hill region of Himachal Pradesh and Lunagaria *et. al* (2010) for middle Gujarat agro climatic zone of Gujarat.

The corresponding qualitative analysis results (Ratio score, HK score and RMSE) for 14 years (1996 - 2009) are presented in Table 2. During monsoon season the ratio score varied from 60 to 81 %, HK score from 0.19 in 1998 to 0.68 in 2009 indicating degree of success of rainfall forecasting. The RMSE value was the lowest (8.71) in the year 1999 which recorded the lowest rainfall of 361.2 mm indicating the lowest difference between the observed and forecasted rainfall values. The RMSE values were higher in the years from 2003 to 2009 being the highest (31.52) in the year 2007 (1411.0 mm). Thus, the critical examination of the results revealed that the usability percentages were higher and RMSE values were lower in the low rainfall years and

Table 1: The usability (%) of rainfall forecast at Junagadh

Year	Pre monsoon	Monsoon	Postmonsoon	Winter
1996	100	43	91	97
1997	93	78	94	98
1998	-	72	87	95
1999	100	87	94	100
2000	94	73	-	100
2001	90	90	91	100
2002	100	90	100	100
2003	100	68	98	100
2004	97	78	98	98
2005	100	62	96	99
2006	96	41	100	100
2007	99	29	100	99
2008	99	48	97	97
2009	100	56	87	100
Mean	98	65	95	99
LTA	5.4	863.0	45.8	2.7

RD= Rainy Days, *LTA*= Long Term Average (1957-2009)

Table 2: The qualitative analysis of South-West monsoon rainfall forecast

Year	RS	HKS	RMSE	Amount (mm)	Days
1996	81	0.58	14.0	717	34
1997	62	0.23	19.5	813	38
1998	60	0.19	11.8	835	42
1999	72	0.43	8.7	361	30
2000	68	0.41	13.9	532	30
2001	71	0.41	13.2	808	42
2002	71	0.41	13.9	536	21
2003	72	0.43	26.7	1241	43
2004	69	0.38	17.5	924	45
2005	68	0.36	25.0	1130	41
2006	76	0.52	20.5	1086	52
2007	67	0.28	31.5	1411	48
2008	70	0.42	27.3	1204	43
2009	80	0.68	20.0	825	32
Mean	70.5	-	-	887	39

vice-versa at Junagadh.

90-93.

REFERENCES

- Chaudhari, J.N., Zagade, M.V., Mahadkar, U.V. and Talathi, M.S. (2010). Assessment of weather based Agromet advisories in high rainfall zone of Konkan in Maharashtra. *In: Agro meteorological services for farmers*, (ed. Vyas Pandey), AAU, Anand. pp 172-177.
- Chauhan, V.S., Chaudhary, G.B. and Pandey, V. (2008). Medium range weather forecast verification for middle Gujarat region. *J. Agrometeorol., (Special issue)*. pp. 90-93.
- Khichar, M.L., Singh, Diwan and Ram Niwas. (2010). Verification of medium range weather forecast for Western zone of Haryana. *In: Agro meteorological services for farmers*, (ed. Vyas Pandey), pp 195-200.
- Kaur Parminder and Singh, Harminder (2010). Reliability and success of rainfall forecasting in different years for mid -hill sub humid sub temperate zone of Himachal Pradesh. *In: Agro meteorological services for farmers*, (ed. Vyas Pandey), AAU, Anand. pp. 227-233.
- Lunagaria, M.M., Mishra, S.K. and Pandey, V. (2009).

Verification and usability of medium range weather forecast for Anand region. *J. Agrometeorol., (Special issue)*: Vol. 11. pp. 228-233.

- Mishra, S.K., Tripathi, P., Mishra, S.R. and Mishra, A.N. (2010). Seasonal verification of scores for medium range weather forecasting for Eastern Uttar Pradesh. *In: Agro meteorological services for farmers*, (ed. Vyas Pandey), AAU, Anand. pp. 201-209.
- Rao, GGSN, Rao, Kesava, Rao, AVR, Ramakrishna, Y.S. and Victor, U.S. (1999). Resources characterization of dry lands. *In: Fifty years of dry land agricultural research in India*. Ed. H.P. Singh et. al., CRIDA, Hyderabad.
- Singh, S.V., Rathore, L.S. and Trivedi, H.K.N. (1999). Verification of medium range weather forecasts. *In: Guide for agro meteorological services. National Centre for Medium Range Weather Forecasting*. Department of Science and Technology. Government of India. pp. 73-93.
- Singh, Rana Ranbir, Rajendra, Prasad and Suresh, Kumar

Received : October 2010; Accepted : March 2011