

Forecasting Rainfall for 2010 of Gujarat based on Astro-meteorology

¹M.C. Varshneya, ²V.B. Vaidya, ³Vyas Pandey, ⁴L.D. Chimote, ⁵K.S. Damle,
⁶A.M. Shekh and ⁷B.I. Karande

Anand Agricultural University, Anand – 388 110, Gujarat, India

Gujarat state receives annual rainfall of 828 mm in 35 rainy days with coefficient of variation of 50 %. There is large spatial and temporal variation in rainfall of the state (Anonymous, 2000). The low rainfall areas receiving less than 500 mm rainfall are comprised of Kutch district and western parts of Banaskantha and Patan district and parts of Jamnagar, Rajkot and Surendranagar districts. These are also characterized by arid climate. The high rainfall (> 1000 mm) receiving areas (Dang, Valsad, Navsari and Surat districts) are characterized as sub humid climate. The rest part of the state receives rainfall between 500-1000 mm and generally fall under semi-arid climate (Shekh, 1989).

Considering the abnormality of weather particularly rainfall during the monsoon, Anand Agricultural University, Anand has prepared almanac predicting district wise daily rainfall from monsoon 2007 to 2009 for beneficiaries for the farming community as well as planners. The observed and predicted rainfall was then analyzed for its validity.

Astrological methods of rain prediction:

The various astrological methods for rainfall prediction were discussed in great detail in the proceedings of seminar held at Centre of Advanced Studies in Agricultural Meteorology (CASAM), Pune (MS), on 2-2- 2002 (Varshneya and Vaidya, 2002) and in a lead paper presented in International Conference on 'Agricultural Heritage of Asia' by (Bhat *et al.*, 2005) in which the techniques of rainfall prediction were thoroughly discussed. The planetary chart of time and date of *Chaitra Pratipada* (Ashwini nakshatra) was laid, which indicate overall weather pattern for the year. Such planetary charts are prepared for the time when sun enters each constellation (Nakshatra) and its each quarter, prediction for that Nakshatra is based on this planetary chart. Actual predictions are made using place of each planet and its angle with reference to other planets (Varshneya *et al.*, 2009a).

The traditional astrologers use 'Pratiyuti' (angle of $180^\circ \pm 5$) between the two planets as the most powerful position for weather prediction. Next important parameter is Yuti (angle of $0^\circ \pm 5$) and or Samakranti (same declination, $0^\circ \pm 1$) for weather prediction. Equally important is "Navam-pancham" yoga (angle of $120^\circ \pm 5$) between two planets. Following planets are responsible for weather indicated against them.

1. Sun, Mars and Pluto - Hot temperature
2. Moon, Venus and Neptune- Rain
3. Mercury- Wind

1Vice-Chancellor, Anand Agricultural University, Anand, 2 and 7 Asstt. Professor, Dept. of Agricultural Meteorology, AAU, Anand, 3Professor and Head, Dept. of Agricultural Meteorology, AAU, Anand, 4 Astro-meteorologist, Dombivali (MS), 5Assistant Professor, FPT and BE College, AAU, Anand and 6 Director of Research and Dean PG Studies, AAU, Anand

4. Jupiter - Temperature increase (while retrograde it produces cold)
 5. Saturn - Cold
 6. Harshal - High temperature (Giving damaging effects).
- More number of planets in any one *nadi* gives effect of that *nadi*.

Nakshatra Varsha Almanac:

This Almanac (Varshneya *et al.*, 2002) was designed for farmers to predict rainfall distribution in next rainy season. The techniques gave prediction of onset and withdrawal of monsoon and distribution of rainfall about six months in advance. Pictorial presentation is given to assist farmer in noting indication of commencement and withdrawal of monsoon. So that it is possible for the farmers to change the crops to decide area under *kharif* and *rabi* season. Vaidya (2004) briefly gave the relative advantage of “*Nakshtra varsha*” calendar for Maharashtra.

Validation of AAU’s Monsoon Research Almanac (2005-2009)

Anand Agricultural University, Anand has been predicting rainfall in Gujarat based on astro-meteorological principles and publishing rainfall calendars for farmers. First it was attempted for 8 stations of 8 agro-climatic zones of Gujarat on Nakshatra-charan wise basis which was extended on daily basis in 2006. During 2007 to 2009 the predictions were made for each district on daily basis in which quantitative rainfall predictions for each month were made. The predictions made were validated with actual rainfall recorded in each district (Varshneya *et al.*, 2009b).

Among the four regions average accuracy was highest in South Gujarat (56%) and lowest in North Gujarat (50%) for the period from 2005-2009. The validation of this forecast on Yes/No basis for season as a whole for 2009 indicated that accuracy varied between 46 to 57% for different zones. Comparatively, the accuracy of forecast was good in the month of June. The average accuracy of daily rainfall forecast for state as a whole was 64% in June, 55% in July, 51% in August and 34% in September. The skill scores averaged for four months (June to September) indicated that, it was 46%, 49%, 57% and 52% for four regions viz. Middle Gujarat, North Gujarat, South Gujarat and Saurashtra respectively. Gujarat state as a whole has recorded 51% skill score. The validation of rainfall forecast on Yes/No basis indicated that average accuracy varied between 37% (2008) to 62% (2005) for state as a whole. Overall state average skill score was 53%. The data reveals that in years 2007 and 2008, we had correctly predicted the above normal rainfall with more accuracy. The error was below 10%. From the year 2007 to 2009 the average error was -6.0% for state as a whole (Varshneya *et al.*, 2009b).

Methodology Used for preparation of Monsoon Research Almanac-2007-2010:

1. *Nakshatra Pravesh* of Sun: The Kundali at the time of Sun’s entry into each Nakshatra is casted for each required place (*i.e.* district) for the period of Rainy Season. This gives average rainfall for a period of 12-13 days for that Nakshatra, at that place (Varshneya *et al.*, 2008).

2. *Nakshatra Charan Pravesh* of Sun: The Kundali at the time of Sun's entry into each Nakshatra Charan is casted for each required place (i.e. district) for the period of Rainy Season. This gives average rainfall for a period of 2-3 days for that Nakshatra Charan, at that place. Daily rainfall was predicted by using Chandra Nakshatra.
3. A finer astrological technique of *shashthansha* (1/60th part of Rashi) kundali was used to distinguish planetary positions/aspects between two adjoining districts.
4. From each Kundali, various aspects like *Mandal* of the *Lagna*, Planets in *Saptanadi chakra*, *Vedhas* amongst the planets, and different aspects between planets like *Yuti*, *Pratiyuti*, *Navapancham Yoga*, *Kendra Yoga*, etc., are taken into account. Importance is given if a planet changes its direction (*Vakri* or *Margi*), changes Rashi or Nakshatra, or becomes *Asta* or *Udita*.
5. Similarly, *Poornimanta* and *Aamanta* Kundalis were prepared for predictions. Kundalis were also prepared for eclipses. Effects of sighting comets were also considered.

Meteorological inputs used in Monsoon Research Almanac-2007-2010

1. Rainfall probability of getting ≥ 10 mm rainfall in standard meteorological week (SMW) was calculated by Markov chain model, is given for each district (Data of weekly rainfall for 50-100 years was used for analysis).
2. Monthly normal rainfall is given along with projected rainfall for each month for each district.
3. Monthly normal Maximum and Minimum temperature for each district were also given.

Computation of Rainfall Projection: The predicted rainfall intensity on daily basis viz. No rainfall, Low, Medium, Heavy and Very Heavy for each district (26) of Gujarat state from June to October month was used to quantify the rainfall amount of the state. Criteria for quantifying daily rainfall from qualitative prediction for districts under each Agricultural University of the respective region was decided based on frequency analysis for given rainfall intensity and used in the calendar as mentioned in Table 1.

Table 1. Criteria for quantifying daily rainfall from qualitative prediction in different regions of the state.

Sr. No.	Name of Region / SAU	Daily Rainfall quantification (mm)				
		No Rain	Low	Medium	Heavy	Very Heavy
1	Middle Gujarat (AAU, Anand)	0	2	10	35	75
2	North Gujarat (Sardar Krishinagar Dantiwada Agricultural University, SDAU, Dantiwada) and Saurashtra (JAU, Junagadh)	0	2	10	30	50
3	For Kutch district*	0	1	6	25	50
4	South Gujarat (Navsari Agricultural University (NAU, Navsari))	0	6	25	70	100

* Since the rainfall recorded in Kutch is very low, therefore, separate intensity was considered for this district in North Gujarat region.

By using above criteria for each district of the respective region, the monthly rainfall projection was computed and it is given in calendar against the normal monthly rainfall.

Rainfall Forecast – 2010

The astrological features for Monsoon 2010 predictions for Gujarat

In *varshapravesh* kundali of *shake* 1932 (i.e. 2010), *Varun Mandal yog* is present which is good for rainfall. In the *varshapravesh* kundali, major planets like Sun, Moon, Mercury and Venus are in fourth house, which denote good rainfall. In *Mesh pravesh* kundali, *Vayu mandal yog* is present. Also planetary aspects in 1st fortnight of June denote delayed monsoon.

On June 28, Sun and Mercury are in conjunction. Hence onset of monsoon will be around this period. Also on July 8, Venus and Neptune are in conjunction. This condition is also favorable for monsoon. On 9 August, Jupiter and Venus are in opposition and on 20 August, Mars and Venus are in Conjunction. Both the conditions being unfavorable for rains, decrease in rainfall around these dates is expected. On 3rd September, Sun and Mercury are in conjunction and on 21 September, Sun and Jupiter are in opposition. Both the conditions are favorable for rainfall. Hence good rainfall is expected in the month of September this year. On 30 September Sun and Saturn are in conjunction and on 3 October, Mars and Venus are in conjunction. Both the conditions are not favorable for

rainfall. On 17 October Sun and Mercury are in conjunction and on 29 October, Sun and Venus are in conjunction. Both the conditions indicate rainfall in this period.

Throughout the rainfall period, many planets are in sajal nadis which indicate above normal monsoon.

Salient features of rainfall prediction for Gujarat State-2010

1. Overall monsoon rainfall will be above normal by **31%** for the state as a whole, except for Kutch, Junagadh and Panchmahal districts.
2. This year there will be late onset of monsoon starting from 4th week of June to 1st week of July.
3. One or two dry spells observed in most of the districts in this monsoon which will affect the crops.
4. Chances of getting pre-monsoon rain at many places in May 2010.
5. There will be less rainfall in June, 2010, Onset of monsoon in Gujarat is expected in last week of June, 2010.
6. There will be highest rainfall in South Gujarat, i.e. +44.5%, followed by Saurashtra with +32.2%.
7. Between June and September, September will get highest amount of rainfall (double the normal) followed by August (+89%).
8. Sufficient drinking water will be available till next summer i.e. till June 2011.

Table 2. Rainfall projection for four regions of Gujarat for 2010 (June-Oct.)

Sr. No	Region	Rainfall Projection (June-Oct.) (mm)	Normal Rainfall (mm)	Rainfall Projection (% departure from normal)
1	Middle Gujarat	905.3	796.6	13.7
2	North Gujarat	696.3	575.5	21.0
3	South Gujarat	2071.7	1433.7	44.5
4	Saurashtra	767.1	580.4	32.2
	State	1110.1	846.5	<u>31.1</u>

References:

- Anonymous, 2000. Climatic Resources, In “Natural Resources of Gujarat- Agro-ecological data base for regional planning”. Joint publication of Soil and Water Management Research Unit, GAU, Navsari and NBSS and LUP, Regional centre Udaipur, GAU and ICAR publication, pp. 23-39.
- Bhat, V.V., V.B. Vaidya and R.M. Joshi. 2005. “Indian technology for rain prediction and water management”. In Proceedings of International Conference on “Agricultural Heritage of Asia” held during 6-8 December, 2004, published by Asian Agri-History Foundation, Secunderabad (India), ed. by Y.L. Nene, pp. 137-146.
- Shekh, A.M. 1989. Agro-climatology of Gujarat, Resource Management Program, ICRISAT, Patancheru, AP, India.
- Vaidya, V.B. 2004. Long range forecast of monsoon with Astronomy and local observations for Maharashtra. A short communication published in Asian Agri-History, Vol 8(4), pp. 323-324.
- Varshneya, M.C., V. V. Bhat and R. M. Joshi. 2002. ‘Nakshatra-Varsha almanac’ prepared for Maharashtra. pp.1-22.
- Varshneya, M.C. and V.B. Vaidya. 2002. Proceedings of seminar on “Prediction of rainfall based on astrological methods and local practices” on 02-02-2002, organized by CASAM, AC, Pune, Ed. by M.C. Varshneya and V.B. Vaidya as MPKV/RES pub. No. 39, pp. 1-112
- Varshneya, M.C., V.B. Vaidya, Vyas Pandey, A.M. Shekh and B.I. Karande. 2008. Validation of Astrometeorological Rainfall forecast for Gujarat. *Journal of Agrometeorology*, Vol 10, Special issue-part II, pp.345-348.
- Varshneya, M.C., V.B. Vaidya, Vyas Pandey, L.D. Chimote, K.S. Damle, A.M. Shekh and B.I. Karande. 2009a. Forecasting of Rainfall for Gujarat Based on Astrometeorology. *Asian Agri-History*, 13(1), pp. 25-37.
- Varshneya, M.C., V.B. Vaidya, Vyas Pandey and Kedar Damle. 2009b. *Validation of rainfall forecast predicted by AAU’s Monsoon Research Almanac-2009*. In Abstracts and Souvenir of 4th National Seminar on “Agrometeorology – Needs, Approaches and Linkages for Rural Development” held during 26-27 November, 2009 at CCS Haryana Agricultural University, Hisar (India), T₃A₁, pp. 73.

This paper was prepared recently by the authors and submitted to Varsha Vidnyan Mandal, Junagadh, conference to be held on 29-05-2010 at Junagadh (Gujarat). They may publish it in abstract form. We got permission to give here the full paper. KS.