

# Stars, not sun, predict monsoons accurately



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The Met office in India, as elsewhere in the world, forecasts monsoons based on the Gregorian calendar. But that system has repeatedly proved unreliable. We must look to the nakshatras for solution.

According to the Hindu *panchang*, the month of *sawan* which along with *bhadon* comprises India's monsoon season, began on July 4; rains drenched this parched city on July 5. Was the monsoon on time, or 'delayed' as the Met office kept lamenting? The Union Ministry of Agriculture was clueless how to reassure farmers who sowed the kharif crop too early.

CK Raju, who played a key role in building India's first super-computer, Param, and received the Telesio-Galilei Academy of Science's gold medal for 2010 for discovering and correcting a mistake made by Albert Einstein, says the monsoon was similarly 'delayed' in 2003, 2004, 2006, 2009, and 2010. Each time, the rains eventually belied the Met office's predictions of drought.

This is because the Gregorian calendar on which the scientific community relies is not suitable for such calculations. India must first decide if the monsoon synchronises with the tropical or sidereal year. The tropical (solar) year is the length of time the sun takes to return to the same position in the cycle of seasons as seen from earth, such as from one vernal equinox to the next.

It is not wholly synchronous with the earth's orbit around the sun (sidereal, actual year) due to the precession of the equinoxes, and is around 20 minutes shorter (the difference can accumulate over long periods). Indian astronomy rests on the sidereal year; a better method of timekeeping as the sun's transit against fixed stars (*nakshatras*, for example, *Dhruv-tara*) is easy to observe and traditionally determined sowing and harvesting activities.

Europe was aware that it lacked the knowledge to precisely calculate the length of either the tropical or sidereal year, which India knew from at least the third century. Hence the Gregorian calendar reform committee headed by Christoph Clavius tried to consult Indian calendrical sources; just prior to the calendar reform of 1582, his student Matteo Ricci was in India, scouting calendrical manuals in Cochin!

The Gregorian calendar reform was needed because the Julian calendar fixed the length of the year very crudely as the Romans were weak with fractions; so the calendar slipped roughly one day every 128 years. By 1582



CE, it had slipped about 10 days out of phase in the 1250-odd years since the Council of Nicaea fixed the date of Easter by fixing the date of the vernal equinox on XII calends (March 21). By the end of the 16th century, the vernal equinox fell around March 11 on the Julian calendar.

The Gregorian reform corrected this anomaly by advancing the calendar by 10 days, and by making every centennial year not a leap year unless divisible by 400 (for example, 2000). It thus came closer to a more accurate figure for the fractional part of the length of the tropical year. The correction was vital for the practical purpose of fixing latitude from observation of solar altitude at noon, necessary for navigation which was then extremely important for Europe which lagged behind the Indians and Arabs.

Shockingly, after independence, the Indian calendar reform committee adopted the Gregorian calendar and said the seasons depend on the tropical year! Superficially, the tropical year seems supported by astronomical treatises like *Surya Siddhanta* and *PancaSiddhantika*, but the passages have been misunderstood. Anyway, even prior to

every year the monsoon arrives in harmony with the *panchang*, though 'scientists' keep bleating about 'delays'. Refusing to learn from experience or history, they have ruined farmers and harvests.

The keynote of the Hindu calendar is the monsoons on which agriculture rests, and not summer or winter which may be relevant in Europe. Monsoons depend upon the wind regime. The global circulation of wind is not decided solely by the position of the sun. Hot air rises at the equator, but does not descend at the poles. Due to the Coriolis force, the earth's rotation causes air to be deflected and to descend before the Horse-Latitudes (sub-tropical latitudes between 30 and 35 degrees north and south). Thus, the monsoons also depend upon the Coriolis force, which is an inertial force. Since the only possible inertial framework is one fixed relative to the distant stars, the Coriolis force relates to the sidereal motion of the earth, and monsoons relate to the sidereal year. Had monsoons related to the tropical year, the cumulative difference between the tropical and sidereal year would have put the Indian calendar out of phase. This never happened.

By forcing farmers to abandon the ancient *nakshatra*-governed seasons in favour of the tropical year, Nehruvian secularism and scientific temper have compromised our food security. An eerie coincidence that has facilitated the eclipse of agriculture from public consciousness is the virtual disappearance of rural symbols once associated with major political parties — cow and calf (Congress); plough and farmer (Janata, Lok Dal), while the sickle of the communist parties has degenerated into an offensive weapon. This is a telling comment on the growing urban bias in our polity and our distorted understanding of the economy, the adverse effects of which have already come to haunt us.

Two decades of liberalisation-globalisation and thousands of crores of 'incentives' later, the service and the manufacturing sectors have failed to promote growth or made a dent in unemployment nationwide. The economy is gasping for a good monsoon to lift it out of the present morass. Can we at least now trash the liberalisation-era myth that there is no link between agriculture and growth?

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*Varahamihira* and the *PancaSiddhantika*, Aryabhata explicitly advocated the sidereal year; Marxist historians concur that Indian agriculture was linked to the *nakshatras*.

Modern India has not seriously studied the monsoons, though even today good monsoons drive the economy. The late Meghnad Saha believed heat balance alone mattered in configuring the monsoons; CK Raju thinks wind regime is the key, but says major research is necessary to establish a paradigm. The ancients coped by creating over 5000 *panchang*s, each 'corrected' to account for latitude (hence the Kerala monsoon arrives much before rains in Delhi) and longitude. There is a powerful cultural context here — the Indian calendar revolves around the rainy season (*varsha*) as the year (*varsh*) relates to rain. It is eternally relevant for agriculture as poor calculations can wreak havoc through mistimed agricultural operations.

The Nehruvian quest for "scientific temper" led to slavish adoption of the Gregorian calendar for calculating the seasons and monsoon rhythm, though objective analysis shows that