malaria endemic foothill area of Assam), a retrospective analysis revealed that correlation between annualized rainfall and number of confirmed cases of malaria per thousand population year for the study period (1986–2009) was too far weak to be statistically significant ($r = 0.070$; $df = 22$; $P = 0.750$). Similarly correlation between annual number of rainy days and malaria cases for the period (1991–2009) was also not statistically significant ($r = 0.223$; $df = 17$; $P = 0.359$).

The rise in temperatures, however, was observed to be critical for build up of mosquito vector density of *Anopheles minimus*, and onset of transmission of *Plasmodium falciparum* malaria. Monthly distribution of cases revealed that malaria was prevalent throughout the year but there were consistently far more cases of *P. falciparum* during months of high rainfall (April–September) that were significantly correlated with maximum temperatures ($r = 0.997$; $df = 2$; $P = 0.003$). But similar to observation of Akhtar[1], correlations between mean annualized maximum temperature and malaria cases ($r = –0.126$; $df = 17$; $P = 0.607$) for the years (1991–2009) were insignificant.

From the presented data in the given study area, it was apparent that irrespective of the rainfall, even though the disease transmission levels were variable but for the past decade, the transmission trends were clearly declining during which newer interventions based on insecticide-treated nets for vector control, and upgraded drug policy for treatment of drug-resistant cases were incorporated in healthcare services. Similar observations were reported from rain-fed forest related malaria transmission in central India[3]. Thus, unlike dry zones of India, it was revealed that rainfall data alone is not a sufficient indicator for early warning system in the wetland ecosystem, and the long-term malaria control strategy should rely on generation of increased awareness on disease and prevention, focused interventions, healthcare access, and national commitment for increased prosperity, particularly in resource-poor settings.

Similar conclusions were drawn in East Africa where no significant associations were observed in long-term meteorological trends and local malaria resurgences[4]. More often human activities (non-climatic factors) have led to increased mosquito breeding, poverty and physiographic risk factors[5,6]. In present times, we advocate that the understanding of local disease epidemiology and community based interventions such as bioenvironmental approaches and the use of insecticide-treated mosquito nets are important to formulate interventions that are community-based, operationally feasible and sustainable for averting impending disease outbreaks.

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Jhumming, a traditional lifestyle than merely a cultivation method

The traditional slash-and-burn cultivation in hilly areas of northeast India is known as *jhum* cultivation. It is often considered responsible for causing soil erosion, triggering landslide, flash floods and thereby degrading the primary land resource. The productivity is also reported to be very low. Further, it is also held responsible for causing forest fire, depletion of forest resource and degrading the environment. Earlier the *jhum* cycle was about 20–30 years, however, growing human population and increasing anthropogenic pressure on land has reduced the cycle to 2–3 years, thus resulting in the degradation of the ecology and environment of the hilly region[1]. The neglected ember escaping from burning *jhum* transforms the forest cover into ashes. Forest depletion and forest burning also pushes certain important species to extreme limits of extinction.

The various ethnic communities of biodiversity-rich Arunachal Pradesh are practising this system since time immemorial. With 81.22% area under forest cover, Arunachal Pradesh has the potentiality to serve as a treasure trove of germplasm for food plants, medicinal plants, bamboo and cane, orchids, wild animal species and other life forms[2]. However, the rate of forest cover decrease is high in the state, with about 26 km^2 area of forest decreasing between 2001 and 2003 (ref. 3). The main threat for loss of 'green treasure' undoubtedly stems out from *jhum* and forest burning.

Despite all odds, *jhumming* enjoys a pivotal position in the tribal societies of hilly northeast India. This strongly confirms that the system is deeply rooted in tradition, culture, beliefs, festivals, legends and myths. The folk songs *eme laamayo eme* and *ojo tojo maaya* of Galo tribes depict different stages of *jhumming*. Abotani, the legendary ancestor of Tani Group, is believed to have been taught *jhumming* techniques by Goddess 'Mopin'. Moreover, *jhum* provides varieties of food items preferred by the tribal people throughout the growing season. The mixed crops raised in *jhum*-field

Jhum cultivation (Daring, West Siang, Arunachal Pradesh).

include paddy, finger millet, maize, jowar, ladies finger, varieties of cucumbers, brinjal, cocona, gourd, bitter gourd, pumpkin, varieties of melon, soybean, beans, varieties of yams, varieties of arums, tapioca, sweet potato, ginger, sugarcane, papaya, local tomato, local onion, garlic, ginger, sesame, lamb's quarter, chilli, mustard, cauliflower, cabbage, leafy mustard, radish, etc. The *jhum* products are also used in ceremonies, occasions, celebrations, etc. The variety of rice and millet grown are considered best for brewing traditional beverages. These traditional crops are reported not growing well in other systems. Thus *jhumming* is a cultural choice and traditional lifestyle rather than a cultivation method. *Jhumming* knowledge is the result of centuries of man–environment interaction.

In Daring area of West Siang District, *jhumming* is done for growing cash crops like chilli which gives an average return up to Rs 35,000 in a season[4]. Due to the undulating hilly terrain, fragile structure, high rainfall and nonavailability of the irrigation facility, settled or terrace cultivation is not feasible. Thus, *jhum* is the only alternative and time-tested means for sustenance of livelihood. Moreover, while slashing forests for *jhumming*, woods are collected for fuel and house construction. The traditional method of piling half-burnt logs perpendicular to the slope direction is effective in breaking speed and continuity of runoff water. It also helps in trapping soil particles being carried away along with runoff. No pesticides and insecticides are used in *jhum*-field. Fences and scarecrows are erected and rituals are performed to protect crops against animals, birds, pests, diseases, etc. The chanting of verses by priest produces sound waves of required frequency to prevent mating of pests. Similarly, smells of certain volatile chemicals are capable of jamming communication between male and female insects[5].

It is because of all these traditional ethos associated with *jhumming*, the efforts of the Government to wean away farmers from *jhumming* remain a total failure. It is not easy to eliminate this practice since it is linked to culture and socio-economic conditions[6]. Although wet-rice cultivation and terraced fields are developed in adjoining valley-bottoms and piedmont areas, *jhumming* is compulsorily seen along hillslopes because of their food taste and cultural choice. Instead of imposing an alien system, therefore, it is imperative to streamline efforts to improve *jhumming* on a more scientific basis. People should be encouraged, through demonstration and incentives, to adopt ecofriendly techniques and conservation methods in the *jhum* beds. This would help not only meeting people's aspiration but protecting environment, sustaining livelihood and, more importantly, maintaining ethnic crop-diversities, precisely the rich ethnobotanies, of the region.

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Grants officers on deputation to national research laboratories

In response to Gowrishankar's article[1], I wish to raise an issue which may not be the first thing that comes to mind while reading this piece, but which is not unimportant. It is the issue of 'alternate careers in science'. I feel that many matters that faculty are required to handle could be handled by non-faculty scientists provided the institution has suitably qualified people on the staff. A reasonable knowledge of science is required to handle scientific meetings, bring out annual reports, prepare fund-raising presentations and so on. (This is aside from the knowledge required to run scientific facilities or to help with technology transfer which have their own specific requirements.) In universities in the West, a Ph D would often be hired for such work. In India our institutions tend to be smaller so that even if a Ph D were hired, there is often no peer group for such a person. The others with a Ph D would either be post-doctoral fellows or faculty. As such, the person may start feeling somewhat lost at least partly due to a lack of true peers. If, as proposed in the commentary, more of such scientists were present on the campus, it will help create such a group. This will also have the benefit of demonstrating such careers to students, helping them to make informed decisions based on what they see: the kind of work done, the pleasure (or otherwise) that these scientists get from their work, how the environment treats them and so on. Were such positions to become common place and the system works well, it may help in a small way to raise India's scientific output since the faculty would have more time to focus on their research and teaching.

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