the prediction fiasco. On 8 September 2006 at 0822 h, the Assam Government in particular and the entire nation in general was comforting in a tension-free zone. A geologist from Madras University had predicted the occurrence of magnitude 7.0–8.0 earthquakes near Dibrugarh. In haste to perfection, the scientist had observed that the epicentre of the earthquake would be at a distance of 15 km SW of Dibrugarh. Earthquake occurrence time was given as 0821 h. This observation triggered a wave of fear psychosis and resulted in panic. The Assam State Disaster Management Authority (ASDMA) was on its toes. Schools, colleges, departments, police and other administrative machinery were busy in planning action for any seismic contingency. The electronic media, as usual, gave extensive, unwanted and disproportionately amplified coverage to the so-called scientific prediction. But the earthquake did not occur and the situation turned to normal. At that time some scientists had advocated legal action against the scientist. But no action was initiated or taken.

Whether the prediction of earthquakes attracts any legal provision or whether some legal provision is required to be introduced in the present administrative system needs to be examined. Should this be limited to earthquakes alone or should it cover other natural calamities such as floods, tsunamis, cyclones and cloud bursts? The recent case of devastation in Uttarakhand gives some latent meaning to forecasting. India Meteorological Department (IMD) issues weather forecasts about heavy rainfall one or two days before the event. But till that time (even at present to some extent) the IMD weather forecasts are grotesque and somewhat vague, e.g.. '…there could be heavy rainfall at few places in Himachal Pradesh, Uttarakhand and parts of J&K, Punjab and Haryana…'. Most of the forecasts are primarily based on statistical probability. The predictions are always probabilistic and never deterministic. Bringing the element of precision in forecasting is difficult. One of the major reasons is that the number of observational points is limited over an extensive large area. The length of the fault or of a river is of the order of hundred kilometres, whereas the observational points are of the order of few metres.

India has several institutes, universities and researchers in the field of earthquake. Various funding agencies should come forward to provide grants for earthquake prediction research. Another obstacle is that a number of administrators, engineers and scientists feel that earthquakes cannot be predicted. This ad hoc assumption needs to be wiped out totally if we want to save the lives of people.

Considering the legalities of the L'Aquila earthquake and the Uttarakhand tragedy, and keeping in view the high seismic status of Himalayan states, scientists, academicians, legal experts and administrators must jointly discuss the issue of natural disaster forecasting and also about legal provisions required to be made for forecasting. The ultimate and final aim of such deliberations should be to save human lives during earthquakes and other disasters.

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# Genetic diversity of taro (*Colocasia esculenta* L.) in Mon district, Nagaland, needs attention for its conservation

Mon district in Nagaland, the 'Land of Anghs' is recognized by the Planning Commission of India as one of the most backward districts of the Indian subcontinent. It lies between 26°34′–26°45′N lat. and 94°45′–95°15′E long. It is inhabited by the Konyak tribe occupying a geographical area of about 1786 sq. km and having a population of 250,671 (ref. 1). More than 90% of the population depends on agriculture for its livelihood and jhum (shifting) cultivation is the principal agricultural practice. The district situated in the Indo-Burma region, is the centre of origin of many plant species, of which, taro (*Colocasia esculenta* L.) is one of the important aroids that ranks as the 14th staple vegetable in the world[2]. It is one of the important staple foods of the Konyaks, next to rice. The leaves, petioles, corms and cormels are edible[3], which are rich in carbohydrates, starch, dry matter, minerals and vitamins[4].

Taro belongs to the family Araceae, called as 'tang' by Konyaks, and is cultivated in an area of about 860 ha with an average annual production of 8140 MT (ref. 1). There exists a rich genetic diversity of taro in Mon district that includes edible landraces (*antiquorum* and *esculenta* types), viz. Baishi, Nalon, Tungmei, Pakthung, Yaupe, Pungmantung, Kungnyak, Tuncho, etc. and wild types. In this region, the diversity in taro has evolved through natural process and the available genetic resources have been maintained by the farmers, generation after generation. Over the years, the farmers have identified many landraces or varieties suitable to different land-use systems. Apart from homestead cultivation, taro is cultivated in large scale in jhum fields (Figure 1 *a*) as a mixed crop along with paddy/maize. Normally sowing of the crops is done during January–February. All the landraces of taro are mixed together during planting and the farmers have knowledge that they have inherited to identify a particular landrace amongst the population. The harvesting of taro is carried out during August–December depending upon the maturity of the landraces and thereby meets the food and nutritional requirement of the locals.

The landraces available in the farmers' field, homestead gardens and forest areas vary in their yield (50–650 g/plant), moisture content (60.21–87.14%), dry matter (12.86–39.79%), starch (17.30–32.14 g/100 g) and total sugars (3.3–8.9 g/100 g). All the plant parts

**Figure 1.** ***a***, Mixed cultivation of taro and paddy in jhum. ***b***, Leaves and petioles. ***c***, Marketing of corm.

(Figure 1 *b* and *c*) are used for preparation of many ethnic foods, such as anishi, tungkungsui, tungrhak, tunguhok, phalougan, phaloou, etc. The leaves, petioles and damaged tubers are fed to the pigs after cooking with local edible grasses.

As of now, little or no attention has been given for the conservation of taro in the region. This has resulted in loss of many valuable genetic resources. The continuous loss of genetic diversity might be attributed to *Phytophthora* leaf blight, corm borer, introduction of high-yielding varieties, changing food habits of the youth, practice of shifting cultivation and such other factors. Therefore, urgent measures need to be initiated for collection, characterization, documentation and conservation of these valuable germplasm, either *ex situ* or *in situ*. To begin with, ICAR Research Complex for NEH Region, Nagaland Centre has initiated collection, characterization and documentation of these vast germplasms under a project approved by the Protection of Plant Varieties and Farmer's Right Authority, New Delhi.


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# Climate change and high-altitude wetlands of Arunachal Pradesh

The high-altitude wetlands (HAWs) are an important category of natural wetlands found mainly in the higher reaches of the Himalayas. HAW is a generic term to describe areas of swamp, marsh, meadow, fen, peat-land or water bodies located at an altitude higher than 3000 m amsl, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or saline. In general, HAWs are areas located at altitudes between the continuous natural forest border and the permanent snow-line[1] (Figure 1).

Arunachal Pradesh is ranked second in India after Jammu & Kashmir with 1672 HAWs covering a total area of 11,864 ha, accounting for about 7.6% of total wetland area of the state. Most of the wetlands are small in size (below 10 ha), there are no large-sized wetlands (above 500 ha) in the state. Only three wetlands having an area of 100–500 ha have been observed[2]. However, very little information is available for most of these wetlands due to the remoteness, harsh climatic condition and inaccessibility of the terrain of the region. None of the HAWs of the state is considered under the Ramsar site.

The HAWs of Arunachal Pradesh play a significant role in maintaining hydrological and ecological balance in the upstream and downstream regions. They are the source of many major rivers like Tawangchu, Nyamjangchu, Kameng, Subansiri, Siang, Dibang and Lohit, all important tributaries of the Brahmaputra[3]. They support rich diversity of gymnosperms, rhododendrons and rare medicinal plants species and provide suitable habitat for rare and threatened high-altitude fauna like red panda (*Ailurus fulgens*), takin (*Budorcas taxicolor*), Chinese goral (*Nemorhaedus griseus*), red goral (*Naemorhedus baileyi*), wild dog (*Cuon alpinus*), snow leopard (*Panthera uncia*) and musk deer (*Moschus chrysogaster*)[4]. HAWs are considered as sacred by the Buddhist community, especially in Tawang, West Kameng, West Siang and Lohit districts of Arunachal Pradesh. They are also considered as carbon sinks.

The Indian Himalayan Region (IHR) is sensitive to climate change. According to the Indian Network for Climate Change Assessment report, the annual mean surface air temperature is projected to increase from 0.9° ± 0.6°C to 2.6° ± 0.7°C