save extensive loss by controlling the temperature inside them. It is aptly known as the 'poor man's growth chamber'. It is a simple, inexpensive and effective technique for raising and protecting plant material from severe winter temperature. It has an added advantage of CO_2 fertilization effect and reduced need for watering. There is less insect and disease damage and uniform plant size. The low-cost, polyethylene-lined tanks for water harvesting are imperative for overcoming water scarcity by accumulating rainwater and rooftop run-off.

4. Briquette fuel from waste, especially pine needles and agricultural weeds: Extensive areas of mixed forests are being replaced by pine due to acidification of soil by pine needles. Briquettes made of pine needles and weeds can be used for cooking and warming up homes in winter. Frequent removal of needles will lower the acidification effect on soil.

5. Zero-energy cool chamber is an on-farm storage chamber that works on the principle that evaporation causes cooling. It is constructed with locally available materials that keeps the temperature 10–15°C less than the ambient temperature and maintains high humidity and helps preserve field harvest of fruits and vegetables.

6. Utilization of grassland and wasteland for fodder cultivation and biodiesel-yielding plants such as *Jatropha curcus* and rehabilitation of degraded land.

However, small landholdings and non-availability of good-quality planting material are major issues of concern and have resulted in much lower success, especially in the agrofood-processing venture. Dissemination and adoption of new technologies has always been a problem in this region due to low educational level, lack of awareness and reluctance towards modernization, lack of market network coupled with poor training/extension facilities extended due to hostile climate, difficult terrain and remoteness.

These hindrances can be overcome by strengthening farm-management practices through vigorous extension education and training for the growers. Cooperatives and contract farming may solve the problem for small landholding to improve yield and quality. Major agrofood-based industries need to come forward and actively participate as well as share both the risks and profits to boost the economy of the region. The government needs to ensure a fair marketing network for the produce.

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Sacred groves in Meghalaya

Indigenous knowledge systems or traditional practices of different communities are so valuable that they are the source of solution of many present-day problems. Sacred groves (SGs) in India refer to tracts of usually virgin forests of varying sizes which are communally protected, and which usually have a significant religious connotation for protecting the community[1]. Biologically they are rich patches of undisturbed forests and serve as a natural habitat for many endemic, rare, primitive and economically valuable plants along with a good number of wild animals, birds, reptiles, amphibians, variety of butterflies and insects[1–6].

The people of Meghalaya practice an age-old tradition of preserving primary forest patches near their settlements as part of their culture and religious belief. These fully developed, virgin forest patches popularly known as SGs are called Law Kyntang, Law Lyngdoh and Law Niam in Khasi, Khloo Blai, Khloo Blai Lyngdoh in Jaintia and Kanggimin Bol-Waarangni Biap and Asang Khosi in the Garo Hills[2–4,7]. The indigenous people of Meghalaya believe that their sylvan deities live inside these SGs. They also believe that these deities would be offended if any damage is caused to the plants and animals in these SGs. Hence nobody collects anything from the forest, not even fallen branches of trees[3]. Trees like *Castanopsis tribuloides* var. *ferox* (Fagaceae) are not allowed to be cut by the local people[8]. The power over these forests and responsibilities for their maintenance are designated by the village council[7].

According to the State Forest Department, SGs cover an approximate area of 1000 sq. km in the State. Tiwari *et al.*[2] have documented 16 SGs in Garo Hills, 48 in Khasi Hills and 15 in Jaintia Hills. Barik *et al.*[4] reported 12 new SGs from Khasi Hills. SGs are the remnants of relict virgin forests which are quite different from the surrounding degraded forests. Thus these serve as micro-level biodiversity hotspots[1–7]. Haridasan and Rao[9] reported the occurrence of about 54 species of rare and threatened plants in the SGs of Meghalaya.

In a recent study carried out for the documentation of the ethnobotanical wealth of Jaintia hills[7], seven new SGs were identified, viz. Khloo Blai Lyngdoh Nongbah, Khloo Lyngdoh Poh Nongrim Mukhla–Nongbah Elaka (Figure 1), Khloo Blai Lyngdoh Nongjngi, Khloo Blai Poh longniang Nongjngi, Khloo Blai Lyngdoh Nongthymme Nongjngi–Nongjngi Elaka, Khloo Blai Lyngdoh Mynso–Mynso, Elaka and Khloo Basan Shangpung–Shangpung Elaka.

Thus SGs serve as a gene bank of the ecosystem in a degraded environment, signifying some religious and ritual centric beliefs or taboos. However, a religio-

Figure 1. Khloo Lyngdoh Poh Nongrim Mukhla sacred grove of Nongbah Elaka.

socio cultural transformation in the state in the last century, has led to an erosion of traditional thoughts. Population expulsion and unemployment also compel people to exploit these SGs, leading to a rapid dwindling of many rare and threatened taxa of both plants and animals from the region. In this context, an extensive awareness programme is needed to educate the locals about SGs. The State Forest Department and MoEF can join hands with the local NGOs to create a network of all the SGs and bring them under State-sponsored conservation programmes. The Tourism Department also should come forward to focus on SGs as a destination for tourists. The local community should be provided with adequate funds and the responsibility to manage the SGs. This will help in the protection of the SGs. Eco-restoration and afforestation programmes of the government conservation agencies should also include these degraded SGs.

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Threat to medicinal plants of Kumaon Himalaya

The biological diversity in the Indian Himalayan Region (IHR) has been a source of medicine for millions in the country and elsewhere. At present, the pharmaceutical sector is using 280 medicinal plant species, out of which 175 are from the IHR[1]. This region supports approximately 1748 plant species of known medicinal value[2].

At present we are witnessing a sharp decrease in the biological species all across the globe, especially in the Kumaon region, perhaps as it forms one of the major hotspots among all sectors of the western Himalayas. The 2007 IUCN Red data list reveals that the number of threatened plant species is increasing gradually (http://www.iucnredlist.org). The region has developed endemic flora and shrinkage of natural habitats. Many of these endemic species of drug plants have become scarce and need adequate protection. Destructive harvesting of the medicinal plants has posed a serious threat in the Kumaon Himalaya. Another important reason is the over-exploitation and unscientific tapping by the local tribal groups, which has resulted in the loss of important gene pools and in turn a loss of irreplaceable capital. The major tribal communities like Bhotias, Boaxas, Tharus, Rajis, Jaunsaries, Shaukas, Kharvar and Mahigiri rely heavily and directly on these genetic species and ecosystem diversity to support their livelihood. Lack of alternate income forces them to over-exploit natural resources. Destructive nature of use pattern, i.e. roots (10%), whole plant (16%), bark/wood/resin (19%) indicates threat from harvesting. Hence, deliberately or unknowingly, they are causing huge problems to the medicinal plants. Further, the study trips planned by various Indian universities and other organizations for students to explore and collect different plant species in their natural habitats are also responsible for the loss of important plant species. Plant collection is the prime objective of such trips and they put tremendous pressure on the natural habitat of plants, thus leading to biodiversity loss. It is of utmost importance that the diversity of these medicinal plants should be conserved for future use. For this, efforts should be devoted to the preservation of types in natural habitats. Awareness should be enhanced among the local people and tribal communities through common meetings. They should be engaged at every stage in the programmes planned to improve the natural resources and biodiversity. Tours should be planned in such a way that the plants in the wild are not harmed. A broad base and long-term strategy should be formulated for the conservation of medicinal plants in the Himalayan region. Thus the loss of biological species is not only an ethical tragedy, but also a social, economic and cultural one.

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