

species and managing honey-bee colonies in the plantations can substantially increase the productivity of small cardamom.

Rajesh Tandon (Delhi University) discussed the ecological and evolutionary consequences of nectar robbing and the mechanism by which plants circumvent and minimize the adverse effects of nectar robbing on their fitness. He also gave a hands-on training on the plant-pollinator network analysis in the R platform.

Plants are able to activate defence mechanisms against various forms of insect attacks. Insects release various elicitors along with other components that induce defensive response in plants. The defence mechanisms could be direct or indirect. In indirect mechanism the plants 'call' for help from other organisms, such as predators and parasitoids by releasing some volatiles or other chemicals. Sujatha Deshpande (St Xavier's College, Mumbai) unravelled the chemical interaction taking place in the tri-trophic interaction.

Giby Kuriakose (Sacred Heart College, Cochin) gave an outline on the diversity

of pollination syndromes seen in the plant kingdom. Taking the case of orchid pollination system, he explained deception as a pollination mechanism. Solomon Raju (Andhra University) stressed the relevance of studying the reproductive biology of several endemic plant species seen in the Eastern Ghats of India, a forgotten landscape. He explained the dispersal modes and seed predation systems in the plants of the Eastern Ghats.

Lectures were devoted to plant-microbial interactions also in the workshop. N. M. Sudheep and Jasmine Shah (Central University of Kerala) emphasized that many insect-plant interactions are facilitated by the above and below-ground endophytic fungi and other microbes. They are growth promoters and help in the germination of several hard seeds because of their enzymatic action.

The workshop had several field and laboratory-oriented practical experiments. Participants were trained in the basics of bee systematics, the pollination experiments, pollination efficiency of visitors, pollen-pistil interactions, acetolysis as a tool to study the pollen structure and

architecture, collection methods of pollinators, dispersal and seed predation experiments, basics of transgenics, enzymatic action of endophytic symbiotic fungi and R statistical package.

Participants and resource persons were given an opportunity to visit and interact with farmers, particularly the precision and hitech farmers at the M.S. Swaminathan Research Foundation (MSSRF), Wayanad. The polyhouse vegetable growers are producing several exotic varieties of vegetables, but most of them are pollinator-dependent. Currently, the farmers are practising manual pollination. The interaction with the resource persons gave a framework for the way forward to enhance the pollinator fauna in polyhouses through participatory research. V. Sivan and C. S. Dhanya (MSSRF) gave a guided tour through the well-planned botanical garden of the Foundation.

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## MEETING REPORT

### Reconstruction and rehabilitation of disaster-affected landscape of Kedar valley, Uttarakhand\*

A workshop was held recently to get an overview of the relief and recovery actions undertaken by the Uttarakhand Government, to seek feedback from the affected people on the issues of reconstruction and development, employment, livelihood and income-generation activities,

and also to take stock of the ground realities in the disaster-affected areas of Kedar Valley, Uttarakhand. The workshop offered a platform for sharing experiences regarding the disaster, lessons for reconstruction, livelihood improvement and short- and long-term recovery for sustainable development, disaster mitigation, preparedness and management system for the future. It brought together around 180 participants comprising local people from 25 villages, representatives of the Government (both State and Central), NGOs and other stakeholders who had actively participated in relief and recovery efforts in the state.

The first technical session covered measures for reconstruction and restoration of disaster-affected areas. R. K.

Maikhuri (Convener of the workshop), while welcoming the dignitaries and participants, highlighted the major issues, concerns and challenges with regard to reconstruction, development and livelihood of the disaster-affected areas of Kedar valley. He mentioned that the region requires high priority for natural resources management and community-based action plans. Restoring ecological balance, undertaking bioengineering measures for treating the affected and vulnerable areas should form the basic strategies, he added. These issues are to be given serious thought for revival of traditional customs and agro-ecological land use, terrain and habitat restoration through planting of suitable multipurpose trees, input of science and technology interventions in integrated rural

\*A report on the two-day regional workshop on 'Reconstruction, development and livelihood in disaster-affected areas of Kedar Valley' held at the Rural Technology Centre, Triyuginarayan, Rudraprayag District during 29-30 September 2014, jointly organized by the G.B. Pant Institute of Himalayan Environment and Development, Garhwal Unit, Srinagar (Garhwal) and the Department of Political Science, H.N.B. Garhwal University, Srinagar (Garhwal) and sponsored by the Indian Council of Social Science Research, New Delhi.

development programmes and skill/capacity building and empowerment of rural communities with livelihood-related options. Maikhuri said that greater focus needs to be given to the eradication of poverty and malnutrition, women empowerment and natural resources conservation and management with regard to reconstruction of the disaster-affected areas. He also mentioned that there should be eco-friendly and climate-resilient development of the region through responsive community participation and responsible governance.

Annpurna Nautiyal (H.N.B. Garhwal University (HNBGU), Sringer (Garhwal)) presented the key elements of the Indian Council of Social Science Research project, underscoring the need for right practices and timely action for reconstruction of the disaster-affected areas. She threw light on India's policy with respect to forest, environment and disaster and its implementation while citing the example of Kedarnath disaster and emphasized that strong corrective measures are required in future. She said policies need to be amended and new laws and acts should be enacted so as to protect the natural environment as well as save the life of people living in the ecologically fragile regions. The focus of this research project is to identify the gaps between environmental policies and human actions in the disaster-affected areas of Rudraprayag and the impact particularly on women and how they cope with the strategies.

M. S. M. Rawat (former Vice-Chancellor, HNBGU) discussed the green road concept and approach which is the need of the hour in the hilly regions. He mentioned that road alignment and road construction are major tasks in the mountain slopes which require bio-geoengineering measures and skills. He stressed that all roads must be laid under an overall environmental framework of the green road concept. It has components in the construction and maintenance phases, first with cut and fill technology, limited blasting, stabilization of cut slopes, etc. and the maintenance phase consisting of slope treatment, strip plantation and vegetation management.

Meera Kainthura (District Disaster Management Officer, Rudraprayag) highlighted that Uttarakhand is vulnerable to several forms of natural disasters, including flash floods, earthquakes, landslides, cloud bursts, forest fires, and many disas-

trous events which cause a series of direct and indirect losses to property, infrastructure, human and animal lives. She also stated that strong mechanisms need to be developed to counteract natural disasters by (a) avoiding hazardous zones through identification of risks and vulnerable areas, (b) design and use of appropriate technologies for constructing building and infrastructure at acceptable cost, (c) developing community-based disaster management action plans and creation of village/town-level disaster intervention team, and (d) develop capacity of government and village institutions and individuals.

The second technical session focused on disaster risk reduction and vulnerability of the people. D. P. Dobhal (Wadia Institute of Himalayan Geology, Dehradun) highlighted that disaster management as commonly understood includes response, relief and rehabilitation. He emphasized that there is a need to check on haphazard construction such as roads and tunnels which need to be done only after a thorough check on the environmental feasibility and vulnerability of the region. These must include topographic maps, geomorphology maps and overburden maps. He also mentioned that the knowledge of what needs to be done to prevent loss due to disaster or extreme events is commonly available. Despite that, implementation is not satisfactory. In this regard, he mentioned that political will is necessary to ensure implementation of appropriate policies for increasing resilience to disaster.

Prakash Maithani (Ministry of Non-Conventional Energy Resources (MoNER)) highlighted that hydropower is the best source of energy, if judiciously developed and harnessed. However, very large projects need to be relooked and possibly converted into a chain of smaller river projects even at the cost of reducing the power output and increase in unit cost. He emphasized that in the hills other sources of energy, particularly solar energy, need to be harnessed for which MoNER has developed several developmental programmes.

The third technical session focused on issues related to livelihood, traditional knowledge and policy gaps. Rama Maikhuri (HNBGU) mentioned that short-, medium- and long-term innovative approaches are urgently needed for reconstruction and development to evolve strategies to identify and develop suitable

options of livelihood that are sustainable even for a depleted resource base and do not seriously impinge upon a fragile resource base. Restoring psychological and social balance in the case of widows and orphaned children through appropriate institutional and medico-psychological interventions, besides their economic rehabilitation, needs to be ethically and emotionally explored, she added.

M. C. Nautiyal (High Altitude Plant Physiology Research Centre), emphasized that all reconstruction activities must maintain a balance between economy and environment and there is need to evolve a region-specific model of sustainable development such as (a) use of resources to produce niche products, horticulture, medicinal herbs and plants, micro-hydropower and eco-tourism and (b) applications and use of eco-friendly technologies for livelihood improvement, developmental and reconstruction activities to be undertaken in a highly decentralized manner at micro-macro level following village cluster approach.

Ramesh Chandra (District Livestock Officer, Rudraprayag), mentioned that the rural sector is dependent on animal husbandry as an integral part of the agriculture-based activities for its livelihood. In the present situation, reconstruction of approach roads may take more time and in such conditions transportation of materials is expected with the use of ponies and horses. Hence these animals will be given priority in the restoration and reconstruction of the disaster-affected areas. Keeping this in view, he informed that the state has sanctioned a scheme to motivate locals for promoting livestock-based livelihood.

D. R. Purohit (HNBGU) highlighted that the history of Uttarakhand is full of disasters and it is possible to draw lessons from the Kedarnath tragedy. He stressed that the local people living in villages have traditional knowledge, experience and traditional wisdom and thereby have developed strategies to cope with recurring disasters and minimizing their impact. In fact, in the globalized world with neo-liberal policies where resources and nature are seen as a commodity, we have underestimated and forgotten the societal capacities to cope with disasters. In fact, without understanding the ecology of the region, we have been adopting policies of unregulated exploitation of natural resources and encouraging unplanned township and

urbanization in a fragile environment. The Uttarakhand disaster has brought out the fact that the degree of devastation beyond Gaurikund was not only because of the natural system; it was also due to ignorance of the people who constructed their hotels/lodges adjacent to the river bank/on river beds. The short-term economic profits have been chosen at the cost of ecology and environment of the region. The past history of disasters may guide us in the reconstruction efforts of this region.

Rakesh Bhatt (Utsav Group) mentioned that about 2 lakh people engaged

in agriculture, horticulture and livestock management have lost their livelihood and about 83,320 households have lost their tourism-based livelihoods; these are causing a threat of forced migration. According to reports, in Rudraprayag district more than 300 families have migrated from their native places and within 5–6 years, there may be a major demographic shift from the hills to the plains as well as towards townships of the hills. Therefore, there is an urgent need to create employment and livelihood opportunities through science and technological interventions in disaster-

affected areas in particular and Uttarakhand in general.

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