

## **Local resource-based livelihoods & hill specific technologies bring new hope for disaster hit Kedar Valley**

Kedar valley, the famous tourist place in Uttarakhand used to offer diverse income options to its local inhabitants, like running hotels, lodges, tea stalls, shops as well as working as porters, horse owners, palanquin bearers (dandi), basket chair (kandi), travel guides, priests, and so on. The economy of the region was to a larger extent based on pilgrimage tourism.

But, due to recent devastating floods, many hotels, lodges and shops were damaged at Kedarnath, Rambara, Gaurikund, Sonprayag including human settlements and agricultural land downstream. Besides, people lost their livestock, particularly ponies and buffaloes affecting their livelihoods.



### **Harnessing local Bio-resources: Affordable & Appropriate Technology Interventions**

Offering succour at this juncture, G B Pant National Institute of Himalayan Environment and Sustainable Development, Garhwal Regional Centre, initiated technology-led skill development programs for local people at Rural Technological Centre (RTC), Triyuginarayan in Uttarakhand with support from the Department of Science and Technology (DST) to address local livelihoods challenges by harnessing potential of locally available bio-resources through Science and Technology interventions by adding value to local resource and skill for mini and micro-enterprise creation. In this process, need-based hill specific technologies were scaled up and delivered with a strong social engineering component. These technologies were effectively adopted and replicated by the people locally for their livelihood gain and income generation in the Kedar Valley.

Under the action research project, 15 appropriate, cost-effective, and hill specific technologies including protected cultivation, organic compost, and bio-fertilizer, off-farm technologies and other supporting technologies, were in-housed and demonstrated. These simple technologies have been adopted and replicated by the people locally for their livelihood enhancement and income generation in nearby villages as well. Training on other livelihoods activities, such as water harvesting, multipurpose tree plantation, bamboo propagation, drip irrigation and handicraft making were also imparted in the RTC. The basket of technologies established in RTC at Triyuginarayan comprises of various

components for increasing yield, such as protected cultivation technologies through polyhouse, polypits, vermicompost, biocomposting and income-generating activities such as vegetable cultivation, cash crop cultivation, integrated fish farming, floriculture, and mushroom cultivation to supplement income locally. Under conditions which protect crops from severe stress of low temperature, frost, and pathogens in hill conditions, about 4-5 fold increase in production of vegetables and ornamental flowers has been reported.

Around ten skill-development-cum-training programs and five skill-development programs have been organised in last two years benefitting a total of 758 participants (356 women and 402 men) from 20 villages of Kedar Valley on diverse areas, such as bio-prospecting of agro- and wild bio-resources, medicinal plants (MAPs) cultivation and water resource management.

More than 13 potential wild edible bio-resources like Meridian Fennel, Indian Bay Leaf, and so on were identified for local value addition and edible product development. Farmers and the local youth were trained in sustainable harvesting of the resources and preparation of a variety of edible products with quality control such as juice, squash, jam, jelly, pickle, spice and condiments as a source of income with local market outreach during the pilgrimage tourism season.

Under such initiatives, an appropriate technology package of practice has been developed to advance the cultivation and flowering of Gainda (*Tegetus erecta*) between May to November by raising seedlings under protected and open conditions for promoting its large scale cultivation in the villages located along the routes of Kedar Dham to benefit local people for such livelihood diversification options in village setting itself.

A water harvesting tank of 2.0 lakh litre capacity was constructed at RTC, which is presently catering to the drinking water and kitchen garden needs of 15 households, which has helped in increasing vegetable production in the Dhaknu area of the Triyuginarayan village all through the year by 28 to 35%. Availability of drinking water throughout the year has reduced the drudgery and hardship of women and reduced the instances of water-borne diseases, and also saving of about Rs 1.25 lakhs for 15 households towards the construction of drinking water pipelines.

A total of 29 households adopted large scale cultivation of *Valeriana wallichii*, a rhizome herb used in cosmetics, and GBPIHED, Kosi initiated buy-back arrangement with companies like Emami for marketing. A small nursery of multipurpose tree species like Nepalese alder, birch was raised for distribution to local community and farmers for the restoration of the flooded rural landscape in the valley following agroforestry & restoration ecological approaches.

### **Scaling up bio-enterprises: Community as Changemakers**



Interventions for livelihoods diversification using local resources and skills have changed the lives of affected people in the region to strengthen the local economy—for instance, Smt. Vineeta Devi, Shri Omkar Gairola, and Shri Ramkrishna Bhatt of Triyuginarayan village and many other farmers of the nearby villages affected by the disaster were trained in fabrication and use of cost-effective polyhouses, and nursery techniques of improved vegetable production, such as tomato, hybrid cucumber, capsicum, peas, green vegetables and so on. It has been estimated that cultivation of off-seasonal vegetables under polyhouse condition has provided a monetary return of around Rs. 28,809 as an additional income per household in a year.

Shri Yogesh Joshi, a graduate and unemployed youth of Sankri village of Guptakashi, was trained in value addition of locally available agro and wild bio-resource based edible product development, and value-chain addition of the produce. In 2017, he started small micro-enterprises in the name of Vishwanath Product and is now earning a profit of Rs.567000 per year by selling various value-added products involving skilled people from the village itself. Similarly, Laxmi Prasad Ghildiyal of Triyuginarayan village and six youth of the nearby villages who lost their tea shops and restaurants as well as their horses and ponies in the floods, started small micro-enterprise or edible product development using local agro and wild bio-resources earning about Rs. 375985 per year

Activities such as establishing a unique demonstration model on the integration of medicinal plant cultivation with the horticultural system as a potential option to increase per unit area production and income were undertaken under which seedlings were distributed to the villagers for large scale cultivation. Value-added products from medicinal and aromatic plants and wild edible plant species for more employment and income generation were developed in the RTC. About 65 households in the villages have started small scale income-generating activities based on locally available bio-resources for marketing as well as for their consumption all through the year with an average income of about Rs 26400 per farmer. In Triyuginarayan village, Shri Raghunath Gairola who lost a pair of horses and a buffalo in the disaster had adopted nursery raising techniques of medicinal plants and off-seasonal vegetable cultivation as a source of income and livelihoods through which he is earning about Rs. 38260 /year as an additional income.

### **Process Approach: Effective Technology Delivery & Adoption**

Above interventions have been taken under the Technology Intervention for Mountain Ecosystem and Livelihood Enhancement through Action Research & Networking (TIME-LEARN) programme of Science for Equity Empowerment and Development (SEED) Division, DST, through the project being implemented by G B Pant National Institute of Himalayan Environment and Sustainable Development, Kosi, Garhwal. The action research project has addressed the livelihood and socio-economic development-related challenges. It has also explored the suitable and affordable technology options and opportunities for sustainable development of disaster-affected rural landscapes of Kedar valley in Uttarakhand.

The process for skill development of rural communities has been adopted with a bottom-up approach & enabling technologies based on indigenous knowledge linking management practices and informal institutions; supplementing and complementing the people's worldview with the scientific knowledge and involving people in all stages of technology development, implementation and sustainability evaluation with socio-economic and ecological considerations.

The capacity building and skill development of stakeholders of disaster-affected villages of Kedar valley through on-site training and action research on livelihood enhancement using simple technological intervention with proper hand-holding has helped not only in providing a viable alternatives to local people to reduce their dependence on forest resources and promoting climate-resilient technologies but also contributing to address various Sustainable Development Goals and mountain development inclusively and sustainably.