Utilising biodiversity in Uttarakhand by promoting traditional crops

During a long period of interaction with the local population in the state of Uttarakhand, the TERI team learnt that certain crops and agronomic practices that had been practiced from time immemorial had been discontinued for some decades now. These traditional crops were rich sources of many important nutrients and had the added advantage of being disease-resistant and drought-tolerant, among other important attributes. With the advent of cash crops, these cropping systems were no longer lucrative and a monocropping culture had taken over.

Thus, this project was envisaged to provide sustainable solutions to issues related to local food security for the farmers. The main objective was to revitalize traditional crops and practices to improve nutritional and environmental security in a sustainable manner and utilise biodiversity through harmonization of indigenous traditional knowledge with scientific methodology. So it was becoming imperative to conserve these accessions and also document them so as to make them available for future use. TERI, with the financial support of Louis Dreyfus Foundation, made efforts to revive them. The benefits envisaged from the project, which started in 2015, were:

- Improving nutrition of the local population
- Enhancing resource-use efficiency
- Protecting the environment
- Conserving traditional knowledge and practices

The intended beneficiaries of this project were 2,000 families and around 8,000 indirect beneficiaries.

In the first phase of the project, Supi, Satbunga, Sunkiya, Chaukhuta, Kokilbana, Majheda, and Gajar villages of the Ramgarh block in Nainital district were covered. The second phase expanded to Majuli, Dini (Talla), Dini (Malla), Mahtolia, Nagdal, Jalna, Silalekh and Managher villages of Dhari block.

The first step was to collect seeds of various traditional crops from various districts of Kumaon region and create awareness amongst women and children about their nutritional benefits in

parallel. Therefore, land races of these crops were collected and their cultivation was facilitated, which led to developing a live seed bank of these valuable assets.

Amongst women and children, the younger women, even if they knew about the dishes prepared from these crops, were unaware about their health and nutritional attributes. Hence, involving them was an important part of the project, and so a number of meetings were organised with various self-help groups in different villages to create awareness about traditional food items. The shifting pattern of traditional crops towards the present conventional cropping cycle and their effect on human health was discussed. All the women agreed with the changes in food system, and showed an interest in incorporating traditional foods in their present food habits and requested for provision of traditional seed for cultivation in their fields.

Hence, the young women and children benefitted from this discussion and their awareness about these nutritious foods increased.

In another initiative, an awareness campaign was started for schools in the area regarding the nutritive value of the traditional crops in Uttarakhand.

Quiz competitions were also organized on the same in three schools in which 431 students were covered and the winners given awards. In the last phase, a cookery competition was conducted in schools. Recipes were invited from students and preparations from selected recipes were called for the competition.

Students at a cookery competition at a local school

For ages, farmers of the region had cultivated and harvested Barahanaja (a mix of 12 grains and pulses, sown simultaneously in one field) during monsoon. This tradition of mixed cropping provided protection against total crop failure and was an effective instrument of food security. This eco- friendly agronomic system was more sustainable and viable than current practices. Some of these crops were amaranth (*Amaranthus oleracea*), buckwheat (*Fagopyrum esculentum*), naked barley (*Hordeum himalayens*), maize (*Zea mays*), kidney bean (*Phaseolus vulgaris*), horsegram (*Macrotyloma uniflorum*), various types of traditional soybean (*Glysine soja*, *Glysine max*, *Glysine*), adjuki bean (*Vigna angularis*), blackgram (*V. mungo*), cowpea (*V. unguiculata*), pigeon pea (*Cajanus cajan*), perilla (*Perilla frutescens*), sesame (*Sesamum indicum*), tickweed (*Cleome viscosa*), hemp (*Cannabis sativa*), roselle (*Roselle*, *Hibiscus subdarifa*) and cucumber (*Cucumis sativus*).

Hence, it was proposed that this traditional system be tested along with various combinations of fodder, pulse and cereal crops in different sowing methods to find out which combination gave the best results in terms of economic or production benefits. The 12 crops of finger millet, perilla, horsegram, amaranth, foxtail millet, maize, kidney bean, black soybean, oats, sesame, uradbean and green gram were chosen.

Some of the traditional crops grown as part of the project

As work progressed, it was observed that some years experienced long periods of dry weather, which took a toll on the crop growth and eventually on production. Hence, it was thought to provide farmers with innovative and low-cost solutions to water scarcity in order to strengthen the entire

value chain. Various options were envisaged, the first being polyethylene sheet-lined tanks and rooftop precipitation harvesting infrastructure. Although these tanks had already been provided to certain farmers through government initiatives, the numbers were very few and it was for the first time that these tanks were connected to rooftop harvesting systems. Artificial recharge by rooftop harvesting offered an option to store water during the months that surplus water is available to be used when water resources are scarce. Farmers could store 12,500 litres of rainwater in these tanks. Around 150 farmers benefitted from this initiative.

Another significant advantage of this effort was to check soil erosion. One can trap 152 kg soil loss every year and reduce surface flow of water. Hence in total, 15.2 tons of soil was trapped by 100 installed tanks, which is again brought into field during annual cleaning of the tanks, as measured by soil erosion measurement instruments.

In cold regions, under sunny conditions, solar greenhouses can provide a suitable micro-climate for perennial production of vegetable crops, even with outside temperature at night plummeting to minus 15°C, using the passive solar principle (heat is accumulated during daytime in the insulated wall and released at night).

The design is adapted to the specific area, utilising locally sourced materials. The size too is adjustable and depends on the farmers' strategy. Farm productivity is increased in off-season too and there is more diversified vegetable production by two approaches:

- Leafy vegetables and aromatics in winter
- Seedlings in early spring that can be sold and/or transplanted in open field for early production

Based on this approach, two passive solar greenhouses (PSGH) were built with the technical knowhow imparted by GERES, a French NGO. One was established at Supi Research Centre and the other at a farmer's field in Sunkiya. The following results were obtained from the PSGH:

- Germination of most crops occurred earlier and in a better percentage as compared to a conventional polyhouse
- Better seedling growth
- Less insect pest and disease damage observed
- Higher production
- More than double the returns from a tunnel house

Impact

A survey was also carried out to assess the impact of the project interventions with 100 direct beneficiaries of the project. Approximately 1,000 farmers were surveyed with an average family size of five persons per family. The survey results showed the following salient points:

- More than three times increase in area of pulse crops and coarse cereals
- Due to increased awareness about multiple ways of value addition for finger millet in farmers, the maximum area of under this crop increased
- Available quantity of production of coarse cereals and pulses was 182 and 34 tons respectively
- The average amount of seed in pulse crops reserved for sowing by the farmer himself, kept aside for sustenance and sold to other agency/market was 24, 106 and 106 kg respectively.
- The average quantity of seed in coarse grains reserved for sowing by the farmer himself, kept aside for sustenance and sold to other agency/market was 18, 82 and 82 kg respectively.
- The farmers could also earn additional income from sale of seeds of traditional crops
- The quantity of produce kept by the farmers as seed will save almost ₹3,000 in seed purchase for the next year
- The seeds saved for next year shall be sufficient for more than 400 and 1,500 hectares of sowing for pulses and coarse cereals respectively
- Around 97 per cent of the respondents said their dependency on buying groceries was reduced
- Almost all the respondents were aware of the names of the dishes made from traditional crops as well as their recipes. However, only 60 per cent were aware of the nutritional benefits
- Around 90 per cent of the respondents said they became aware about the traditional cropping system of Barahnaja after the project
- Around 46 per cent of the respondents said they were consuming food prepared from traditional crops twice a week