Sustainable farming system for balanced ecosystems

The small farmers of Central Himalayan region are achieving high level of diversification through rotation of pure crops in space and time, and through mixed cropping systems. The system with a potential to feed the hill population and conserve natural resources, requires serious attention from the policy makers, to survive.

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The Central Himalayan mountain region (Uttarakhand State) is well known for its rich and diverse natural resources. Large sections of the Himalayan population largely depend upon agriculture based activities for their livelihoods. Traditional agro ecosystems in the Himalayas constitute interlinked production systems like crop husbandry, animal husbandry and forests. Inaccessibility, environmental heterogeneity and ecological fragility favoured the evolution of subsistence production systems, sustained with organic matter and nutrients, derived from forests. The traditional settled agriculture of this region exhibits a great deal of diversity in crop composition and crop rotations. Even though holdings are small, the number of crops cultivated by a household may vary from 17-30. A high level of diversification is achieved through rotation of pure crops in space and time, and through mixed cropping systems.

Hill farmers of Uttarakhand evolved, through centuries of informal experimentation, a system of agricultural production that is most suitable for the prevailing undulating, sloppy lands with poor soil depth and fragile ecosystem. Its chief feature is conserving soil, its surface and subsoil fertility through application of organic manure and plant biomass. Both rainfed and irrigated agriculture are important agricultural land-use systems in the region.

Crop rotations for maintaining soil fertility

In most of the cases, the land of the villages in mountain region is divided into two parts (sars). Rice is grown in one part and mixed cropping is done in another. In a typical two-year crop rotation cycle, in the month of April of year one, wheat is sown (in the land which was lying fallow after the mixed cropping was over in the month of October), which is harvested in the month of October. After harvesting the wheat crop, paddy is sown in the same land which is harvested in April. During the second year, mixed crops of millet, pseudomillet and grain legumes are grown on the same piece of land. After harvesting these crops in October, the land is left fallow for six months, till March. In this process, farmers raise three crops in two years. In this way, the same crop is repeated after one and half year, on a particular piece of land. This crop rotation is an important feature of the system and helps to maintain the diversity of species grown, and in management of soil fertility. Importance of pulses (legumes) as a "Soil Fertility Maintainer" cannot be ignored which is an important part of crop rotation.

Mixed cropping for diversity and food security

Mixed cropping of millet and pseudomillet with grain legumes is a common and very important practice in traditional Himalayan cropping systems. The traditional intercropping practiced here is a heterogeneous mixture of various local legume and non-legume crops and is locally termed as "*Barahnaj*". It means traditionally more than twelve grains and pulses are harvested in the monsoon season from same field which is an effective mechanism to avert total crop failure to ensure food security. *Elusine coracana*, *Amaranthus spp*, *Chenopodium album*, *Hordeum vulgare*, *Pisum arvense*, *Vigna mungo*, *Macrotyloma uniflorum*, *Phaeolus vulgaries*, *Glycine max*, *Perilla frutescens*, *Sesmum indicum*, *Cajanus cajan*, *Vigna angularis*, *Vigna unguiculata* etc., constitute the principal crops of *Barahnaj* system of the central Himalaya in Uttarakhand. Mixed cropping in addition to enhancing biological yields, also improves food security.

Building soil fertility

Several forms of organic farming are being successfully practiced in diverse climatic conditions, particularly in rainfed, tribal, mountainous and hilly areas of the state. Among all farming systems, organic farming is gaining popularity among farmers. It is managed through use of farm yard manure, which is one of the most useful and significant indigenous methods practiced almost in all the villages of the region, This system is further supported through mixed cropping systems and crop rotations to maintain the soil fertility and agrobiodiversity.

The organic products are gaining worldwide popularity due to high nutritional value and having no harmful effect on human beings. Proper processing and selling through organized channels could enhance market value of their products. Farmers have created marketing network through various NGOs - 'Uttarakhand Mahotsav' in Dehradun, 'Gaucher mela' in Garhwal region and 'Pithoragarh mela' in Kumaon region of Uttarakhand. Even the International Trade Fair in Delhi creates some space for such products. These platforms are enabling farmers to access quicker benefits.

The need for recognition

The importance of mountains for human subsistence cannot be overlooked. Mountains are the direct life-support base for people living in the region and also provide goods and services to majority of the population. The hill agroecosystems with traditional crops are ecologically and economically viable and have the potential to support the food requirement in the Himalayan region. So, the sustainability of agriculture is directly linked to the surrounding ecosystems and sustainable livelihood of the region.

However, in the recent past, agriculture has been ignored by almost all the governments, both at the state as well as the national levels. Despite the fact that Uttarakhand is a predominantly mountainous state, it has no mountain agriculture specific development policies. There are many studies that tell us that the future is bright, but there is a need to follow the right policies, implement strong institutional initiatives, research and to incorporate some positive options.

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