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Climate-Smart Agriculture for Attaining Food Security in the Fragile Himalayan Ecosystem

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Himalaya is one of the most fragile ecosystems of the world. Meanwhile, it is one of the hotspots of agro-biodiversity, where a number of crop cultivars/races including food grain, oilseeds, pulses, fruits, and vegetables grow in the different altitudinal gradients from the river valley regions (<300 m) to mid-altitudes, the highlands, and the alpine grasslands (up to 3400 m). These are traditional crops with high nutritional values. Practicing agriculture is the main occupation and the major option of livelihoods of the inhabitants. During the recent past, the human population has grown up, which has put lots of pressure on the cropped land. Further, due to warming of the river valleys and mid altitudes and large climate variability, production and yield of crops have decreased and many cultivars have vanished from the locations where they grow earlier. As a result, the people of the Himalayan region are facing acute food insecurity and malnutrition and they have out-migrated to the other areas of the country for a safe livelihood.

Climate-smart agriculture is one of the approaches for coping with climate change and variability in the region. Under this approach, more arable land can be added under irrigation mainly in the valley regions and the other suitable areas. It can be done through a suitability analysis of the arable land. The second factor is that because there is a global warming phenomenon taking place, agro-ecological zones have been shifted towards the higher altitudes – from the river valleys to the highlands. There are examples of citrus, nut, and apple fruits grown areas, which have shifted about 200 m to 400 m higher from the altitudes they grew earlier. Under such a situation, crop suitability analysis can be done, which means that within the changing climate and its high variability, which crops can grow at what altitudes. Further, the slope aspect is another driver that impacts crop suitability along the latitudes. This can be taken on account at the time of crop suitability analysis.

In the Himalayan region, an area under alluvial plains and the river valley terraces is quite less. However, irrigation facilities are substantial and therefore paddy rice and sugarcane can grow larger in these areas. The systems of rice intensification can be introduced. Among vegetables, onion is a suitable crop for the valley regions. Wheat along with mustard and barley can grow in both lower and middle elevations. The highlands provide ample agro-climatic conditions to grow millets, food grains, pulses, and oilseeds, high nutritional value crops. They maintain high air moisture throughout the year due to the nearness of the snow-clad mighty Himalaya. Citrus fruits, which have shifted to little higher elevation due to warming of the valleys, can grow in the new locations and similarly apple can grow in the little higher elevations. The Himalaya itself supports apple cultivation by providing chili winds. Potato along with numerous highlands vegetables and medicinal plants can grow with the changing climate. One of the practices is tea cultivation, which will restore the fragile landscape and will provide ample livelihoods. The farmers can be taught about climate change implications and climate-smart agriculture. Similarly, ample market facilities will assist farmers to sell their products. This model will be very useful to cope with the climate change phenomenon in the Himalayan region and other mountainous regions of the world, where similar geo-environmental and agro-ecological conditions exist.

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