

## Indigenous knowledge and practices for climate resilience in traditional agriculture systems of the Sikkim Himalayas

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The farming systems in Sikkim is complex and unique of its own as the land use system in this region is dominated by traditional agriculture and adjoining forests along the altitudinal gradients from 300 to 5000 m elevations. The traditional agroforestry maintenance, soil and water management, biodiversity conservation and pest management are key traditional and local practices for climate resilience. A study was carried out to document the traditional knowledge and practices concerning



farming practices, agrobiodiversity, local soil and water management in agriculture systems in four districts of Sikkim during 2016-17.

Sikkim is predominantly dependent of animal power for tillage that uses typical traditional farm implements such as *Halo*, *Juwa*, *Dandee*, etc. prepared from the local plant species. The traditional soil fertility practices are dependent of production of farmyard manure, *in situ* manuring by keeping animals in the farms, use of grain legumes, mulching with forest litter and crop residues, application of green manure, application of ash, burning of biomass, land fallowing etc. Thus, soil fertility maintenance practices based on the use of animal manures still dominate; the ability to maintain and sustain these indigenous systems is being undermined by socio-economic factors.

The traditional farming is housed by a diversity of agroforestry practices such as farm-based, forest-based, *Alnus*-cardamom based, forest-cardamom based, and *Albizia*-mixed tree-mandarin based systems. These agri-horti-pastoral system, agri-silvi-pastoral system, horti-silviculture system, agri-horti-silvipastoral system, livestock-based mixed farming, sericulture-based farming are designed and



redesigned on a rotating basis according to conditions, requirements, and time. The agroforestry systems in Sikkim Himalaya in general include home gardens, alley cropping, growing multipurpose trees and shrubs on farmland, boundary planting, farm woodlots, orchards or tree gardens, plantation/crop combinations, shelterbelts, windbreaks, conservation hedges, fodder banks, live fences, trees on pasture, livestock and beekeeping.

Majority of rural population living in the dry areas of East, South and West Districts of Sikkim are lacking minimal access to water for drinking, other domestic purpose and irrigation, and whose livelihoods depend on agriculture, wage labour, ecosystem services, rain-fed agriculture, fragile dwellings and those without social support networks are most likely to be affected by changing climatic variations as perceived by them.

Climate variation in the region has contributed to unpredictable or erratic rainfall patterns, drying up of local springs and streams, species migration to higher elevations, shift of sowing and harvesting periods of crops, emergence of invasive species, and rising incidence of diseases/pests in crops as well as in fodder species. Under such circumstances,



promotion of home garden agroforestry systems through community innovations and investments would be an adaptive strategy for adaptation, mitigation, and livelihood security. In the wake of climate scenarios and the pressures of globalization, revitalizing small and marginal farms and production systems that emphasize diversity and integration, and social processes that value community participation and empowerment, may prove to be perhaps one of the best options to meet present and future food needs and adaptation to climate change.