

Biodynamism by migratory and resident birds in the Sikkim Himalaya

Biodynamism is the holistic, ecological, and ethical approach to farming having incorporated ideas of the farm as an ecological unit. In fact, the birds play pivotal roles in the agro-forestry ecosystem and Sikkim is not an exception.

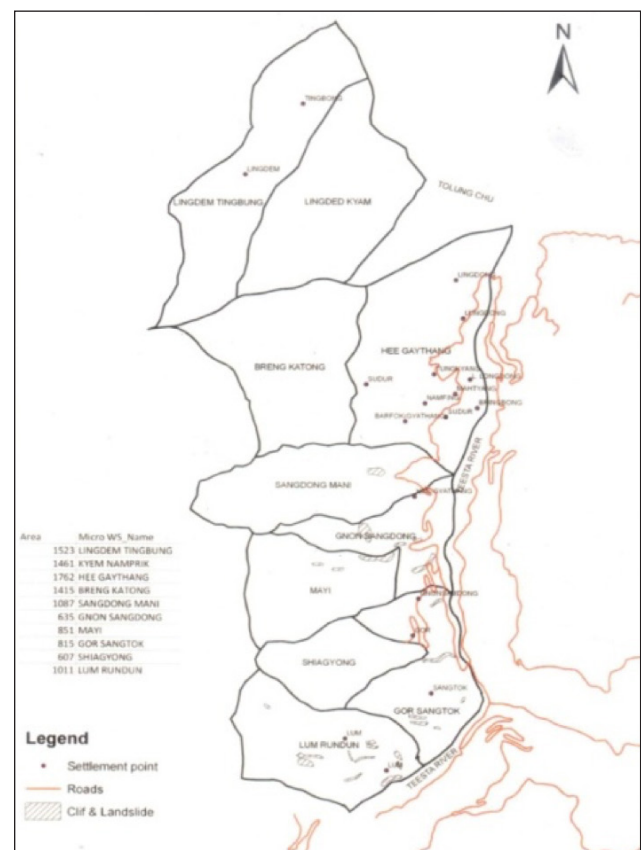
During the study, the farmers of tribal regions of Sikkim, Dzongu, were found practising farming using the signals produced by the birds. Similar studies were undertaken by several authors on biodynamic agriculture in the different parts of the world (Kirk et al. 2011, 2020; Power et al. 2013; Bavec & Bavec 2014).

In ecosystem, the migratory and resident birds are predominantly playing a role in biodynamic agriculture. This study found that the variety of bird species of the region is culturally linked with the Lepcha community of Dzongu for agriculture. Bird chirping sounds are used as the indicators for the agricultural practices, environmental change and threat.

The birds make a variety of calls, songs and sounds with a language as complex. Each type of bird's sound has different purposes such as alarm calls, begging calls, contact calls, flight call, songs, etc, which are exceptional. Besides, there are some non-vocal sounds also like bill drumming, buzzing, clapping or trilling sounds, bill snaps or clacks and scratching noises. Thus, this paper deals with the bird sounds which are used by the Lepcha tribal community for the biodynamic agriculture to determine the threat, conducive climate, sunny day, rainfall, snow, seasonal variation and so on.

The study area of Dzongu is located at 27.4666 –27.6333 & 88.3833 – 88.6333 having the altitudinal gradients of 700–6000 m. The geographical area of Dzongu is 78 km² includes the tropical to the alpine regions having the population of Lepcha community only.

In the study areas, the host plants of enumerated birds were noted, namely, *Bambusa sp.*, *Arundanaria sp.*, *Prunus sp.*, *Quercus sp.*, *Citrus sp.*, *Artemesia sp.*, *Musa sp.*, and *Arisaema sp.* Other host plants are *Prunus persica*, *Pyrus communis*, *Engelhardtia spicata*, *Alnus nepalensis*, *Juglans regia*, *Castanopsis indica*, *Castanopsis tribuloides*, *Berchemia floribunda*, *Maesa chisia*, *Ficus nemoralis*, *Rhus*



Map of Dzongu.

javanica, *Zizyphus jujuba*, *Quercus lamellosa*, *Cryptomeria japonica*, *Betula alnoides* and *Aconogonon molle*.

The Lepcha, one of the aboriginal tribes of Sikkim, practices biodynamism in agriculture. It is found that the Lepcha community utilizes the knowledge of bird sounds in agriculture, for instances, the bird chirping of *Apus melba* for rainfall in farmland, *Nisaetus nipalensis*, *Lophophorus impejanus*, *Gyps himalayensis*, *Tragopan satyra*, and *Trochaloxyeron affine* for snowfall in subalpine and alpine regions, *Psilopogon asiaticus* for sunny day in farmland, *Orthotomus sutorius* and *Myophonus caeruleus* for clear sky and sunny day in the region, *Ketupa zeylonensis* for favourable period or season in farmland, *Grus virgo* for sowing cucumber and pumpkin and *Cacomantis merulinus* for sowing bean, dal & legume plants.

Similarly, *Cuculus canorus* indicates spring season; *Psilopogon virens* signals probable rainfall in the farmland's and region and hints to prepare the land for farm activities; *Bubo bubo* indicates the threat in the farmland or region; *Parus monticolus* indicates the season or climate change in the farmland; *Cuculus saturates*, indicates the millet sowing period; *Eudynamis scolopaceus* indicates to prepare the farmland for sowing maize; *Strixaluco*, *Pericrocotus flammeus*, *Micropternus brachyurus*, *Psarisomus dalhousiae*, and *Garrulax leucolophus* indicate unfavourable environment condition; *Taccocuales chenaultii* indicates the recharging of the non-perennial

water sources of the region; *Cuculus poliocephalus* indicates the sowing period of buckwheat. The fundamental point is that Sikkim is the land of many migratory birds and resident birds which usually fly to these habitats for laying eggs, hatchling and growing chicks during the particular seasons (Grewal & Pfister 1998; Fleming et al. 2000). Moreover, the presence of these birds in the region is utilized for the biodynamic agriculture system by Lepcha in Sikkim Himalaya.

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