PART I

Characterisation of Some Soils of the Eastern Himalayan Region

Chapter 1

Review of Previous Work

Soils of the hill areas of North Bengal and Sikkim have received attention of few workers only. It has been reported that the soils are acidic in nature (pH 4.4 to 5.8). Dhamija et al (1) studied the soils of the cinchona plantation area in the district of Darjeeling which records pH as low as 4.5 to 5.0. The acidic nature of the soils has been reported by other investigators also. Chakraborty and Chakravarti (2) studied the physicochemical characteristics of the organic components of twelve soils collected from foot hills to an altitude of 3400m (Sandhakphu) above the sea level. Decrease in the clay content, increase in organic matter and increase in the proportion of easily extractable fraction of humus are some of the significant

observations in the samples from regions of gradual increase in altitude. The increase of organic matter content with increase in altitude of the site of this region has also been reported by Mukhopadhyay and Banerjee (3). Banerjee and Chakraborty (4) reported that on passing from hill to foot hill the humic acids/ fulvic acids ratio alters. This ratio for the hill soil (Kalimpong) is less than unity but in terai soils (Rohitnagar and Phansidewa) it is greater than unity. Similar results are also reported by Chakraborty and Chakravarti (2). The latter workers also reported that cation exchange capacity of humic acids and fulvic acids are, in general, higher in the hill soils of Darjeeling district.

Gupta and Prasad (5) extracted humic acid from forest soils of Sikkim and reported the presence of functional groups to the extent of 293, 171 and 227 C mol (P^+) kg^{-1} for COOH, OH and C = O groups, respectively. Gupta (6) reported that the content of exchangeable Al in C mol (P^+) kg^{-1} of Sikkim soils varies from 0.0 to 4.1 and the percent aluminium saturation of effective cation exchange capacity varies from 0 to 75. The soil of higher altitude contains higher percentage of Al^{3+} than that of lower elevation. Exchangeable Al^{3+} has been found to be negatively correlated with pH ($r = -0.75$).

Khera and Pradhan (7) reported that the acid soils of Sikkim fixed very high proportion of applied phosphorus. The average fixation as measured against extraction by Bray's P_1

test was about 90 percent of the phosphorus applied at the rate of 12.5 ppm P. They explained the variation in phosphorus fixation by the amount of exchangeable Fe and Al present in these soils. They recommended band replacement of phosphatic fertilizers in crop production.

Pradhan and Khera (8) studied the lime requirement of soils of Sikkim based on exchangeable aluminium test. They have reported that lime rates equivalent to the amount of exchangeable aluminium reacted primarily with exchangeable aluminium, and the aluminium saturation of the effective cation exchange capacity was reduced to less than 23 percent. At greater than equivalent rates, lime neutralised also an appreciable proportion of non-exchangeable acidity. With 80 percent neutralisation of exchangeable Al the soils attained pH around 5.3.

Adhikari et al. (9,11) have studied the mineralogical properties of some hill soils of North Bengal by petrographic, X-ray, DTA and electrometric titration methods. They have reported that the sand and silt fractions were dominated by quartz, feldspar and mica (biotite), other primary minerals were tourmaline, garnet, epidote, zircon and hornblende. They reported illite as the dominant clay mineral. Shukla et al. (10) studied the morphological, physical, chemical and mineralogical properties of two profiles at the foot hill soils of the Himalayas and found that illite associated with chlorite was the dominant mineral.