Preface

The intimate knowledge of soils with regard to their nature, extent, spatial distribution, potential and limitations is a prerequisite for sustainable development of natural resources and environmental management. In the backdrop of global environmental change quantitative information on soil properties is required to comprehend the role soil plays in the biophysical and biogeochemical functioning of the planet. Soil surveys which were carried out using traditional methods until recently, provide such information. The soil scientists world over have graduated from traditional soil surveys to using aerial photographs during the period 1930s to 1960s, and ultimately to satellite data for deriving information on soil resources since early 1970s, and to study their potentials and limitations for intended usage for various purposes including agriculture, forestry, urban development, soil and water conservation, etc. Apart from generating information on soil resources, spectral measurements made from space platforms have also been found to be very effective in deriving information on soil degradation, soil fertility and soil moisture, and inputs for precision agriculture.

The availability of Landsat-MSS data with coarse spatial resolution in 1972 could afford generation of only reconnaissance level information on soils. With the increased availability of spatial data (satellite digital data with improved spatial and spectral resolution digital elevation model), the development of data-mining tools and GIS, on-site geophysical instrumentation, viz. electromagnetic induction (EMI), ground penetrating radar (GPR), portable X-ray fluorescence (PXRF), etc., the availability of computing power for processing data, and the development of statistical and geostatistical techniques have greatly enhanced our ability to collect, analyze, and predict spatial information on soils.

The book essentially aims at addressing the applications of remote sensing techniques in the studies on soils.

In pursuance of the objective, the book initially provides an introduction to various elements and concepts of remote sensing, and associated technologies, namely Geographic Information System (GIS), Global Positioning System (GPS) in Chap. 1. An overview of the sensors used to collect remote sensing data and important Earth observation missions is provided in Chap. 2. The processing of

satellite digital data (geometric and radiometric corrections, feature reduction, digital data fusion, image enhancements and analysis) are dealt with in Chap. 3. In the chapter to follow the interpretation of remote sensing data, very important and crucial step in deriving information on natural resources including soils resources, is discussed. An introduction to soils as a natural body with respect to their formation, physical and chemical properties used during inventory of soils, and soil classification is given in Chap. 5. The spectral response patterns of soils including hyperspectral characteristics—fundamental to deriving information on soils from spectral measurements, and the techniques of soil resources mapping are discussed in Chaps. 6 and 7, respectively. Furthermore, the creation of digital soil resources database and the development of soil information systems, a very important aspect of storage and dissemination of digital soil data to the end users are discussed in Chap. 8. Lastly, the applications of remote sensing techniques in soil moisture estimation and soil fertility evaluation are covered in Chaps. 9 and 10, respectively.

In order to make the soil survey and mapping techniques popular to the readers having not much exposure to pedology and soil surveys using remote sensing an attempt has been made by the author to provide (i) the basic concepts and techniques for interpreting/analyzing the remote sensing data, and (ii) the basic information on soils including soil classification. It is hoped that the soil survey practitioners, researchers and academicians may find the book quite helpful in pursuing their endeavour.

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