Reprinted from

Eleventh International Symposium

Machine Processing of

Remotely Sensed Data

with special emphasis on

Quantifying Global Process:
Models, Sensor Systems, and Analytical Methods

June 25 - 27, 1985

Proceedings

Purdue University
The Laboratory for Applications of Remote Sensing
West Lafayette, Indiana 47907 USA

SPECTRAL DELINIATION OF SOILS DERIVED FROM ALLUVIUM BETWEEN BURHIGANGA AND MEGHNA RIVERS IN DHAKA DISTRICT, BANGLADESH

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ABSTRACT

In a tropical environment a study was conducted to determine the feasibility of using machine-processing of Landsat data to inventory soil units which correspond closely to existing soil association map at the scale 1:125,000 published 1965 and revised 1981.

The analysis was conducted on geometrically corrected Landsat data obtained on 3 January 1977 collected over northeastern part of Dhaka City in the area between the Burhiganga and Meghna rivers. MSS data for the test site, an agricultural area of 100,000 hectares, was used to divide the data into groups of sample points of similar spectral characterisitics. The statistics developed from these groupings wee input to a maximum likelihood algorithm. As a result, terrestrial features and aquatic environments were discriminated. The covariance matrix, mean vector statistics and ratios between bands were calculated, and as a final result a map of fourteen separable spectral classes was obtained. By summing the mean relative spectral values of all four bands to determine the magnitude of reflected energy, it was possible to detect soil boundaries with vegetated and non-vegetated cover.

Most of the soils of the study area azonal soils, derived from unconsolidated alluvial sediments and are classified as Entisols with little or no profile development. A few Ultisols and Inceptisols have been identified in the area.

In the soil association map, each map unit consists of a complex of different soil series which occur in a local landscape in association with each other. The variation in reflectance from different soils within a single association can be extreme. Some soils occur in several different combinations in different areas. Our results show that the soils vary widely with topography, as well as with differences between two forming geological ages (Miocene and Holocene). A computer-derived classification map based upon the separation of surface features with different spectral responses indicated that the soils on the relatively high terrace areas in the northeastern district (Madhupur tract) have much higher relative spectral response values than soils in the broad valleys. Also, the soils of the floodplains with almost level landscape and predominantly silty and clay soils are different compared to the soils of the old Brahmaputra meander floodplain which comprises a more undulating relief with soils ranging in texture from sands to clay. The results did show that the digital analysis of Landsat data can also be a valuable aid in soil surveying in tropical areas.

AUTHOR BIOGRAPHICAL DATA

Nurun N. Chaudhuri received her B.S. in 1975 from Eden Girls College at Dacca, Bangladesh and her M.S. in Zodlogy in 1978 from Dacca University.

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Stevan J. Kristof received his B.S. in Agronomy at Belgrad, M.S. in Horticulture at Purdue University, and his Ph.D. in Soil Science and Plant Nutrition from Belgrad. Dr. Kristof's interests lie in characterizing soils and other natural features by computer analysis of multispectral data, in particular with regard to the identification and assessment of soil degredation, potential soil productivity mapping and land use capability mapping. He developed important initial techniques for using digital analysis of multispectral data as a basic tool for soil survey and for assessing the quality and quantity of various earth resources. Dr. Kristof is a retired Research Agronomist from Purdue University.