Reprinted from

Ninth International Symposium

Machine Processing of

Remotely Sensed Data

with special emphasis on

Natural Resources Evaluation

June 21-23, 1983

Proceedings

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

UTILITY OF SOME IMAGE ENHANCEMENT TECHNIQUES FOR RECONNAISSANCE SOIL MAPPING - A CASE STUDY FROM INDIA

R.S. DWIVEDI

National Remote Sensing Agency
Secunderabad, India

I. SUMMARY

While interpreting Landsat MSS data - either visually or by digital processing, we often come across with the data having poor tonal contrast which may be due to a variety of factors including highly reflective/absorptive terrain, presence of thick vegetation cover, etc. The poor tonal contrast obscures subtle tonal variations related to various features of interest thereby making them indiscernible. Various image enhancement techniques including density slicing, ratioing, contrast stretching - both linear and non linear, and edge enhancement, etc. have been developed to bring out these subtle tonal variations which are otherwise obscured.

In the present study Landsat MSS digital data with path-row numbers 155-050 covering part of Anantapur district of Andhra Pradesh (southern India) has been subjected to density slicing, band ratioing, contrast stretching-linear and non-linear and ratio-stretching in order to see whether these techniques are useful for soil-scape boundary delineation. If so, to what extent over original data. The results have been compared with the reconnaissance soil maps prepared by visual interpretation of Landsat false colour enlargement (FCC) and ground conventional method.

The results show that on density-sliced data the boundary between red and black soils is distinct. Furthermore, within black soils, slightly eroded, Typic Chromusterts could be differentiated from moderately eroded, Vertic Ustochrepts which is not possible on original (unenhanced) data. Within red soils, cultivated, Typic Ustorthents and Typic Ustochrepts with occasional basic rock outcrops, and bare rocks with occasional Lithic Ustorthents have come out very clearly.

The ratioed data, however, could not afford additional information over original data. Instead, cropland, water-bodies and rock outcrops look almost alike. After linear stretching the ratioed data permits delineation of two categories of water i.e. shallow and deep, cropland, scrub/grassland and residual hills associated with different soil associations (sub groups). In addition, the drainage pattern has also been brought out very clearly.

On non-linear stretched data, very severely eroded land having Lithic Ustorthents with occasional rock outcrops and rock outcrops in the pediplain (on granite-gneiss complex) have come out very distinctly. These units are inseparable on original data. Like ratioed data, on this data also cropland in valleys, black soils, water bodies and residual hill complexes on basic formation are exhibited in the same colour thereby making their delineation difficult. The drainage pattern has almost disappeared which is partially clear on the original data.

The linear-stretched data, on the other hand, has been found to be the best amongst all the enhanced data as the soilscape units which were mixing in other data have been brought out very clearly thereby making their discrimination easier and more accurate.