This paper presents the results of two studies on computer analysis of Landsat-derived and aircraft based multispectral scanner data towards hydrologic land use mapping, necessary for effective water resources planning and management. The analyses were performed on the interactive Multispectral Data Analysis System (MDAS) at the National Remote Sensing Agency (NRSA) headquarters in Hyderabad, India.

The first study involved automated generation of hydrologic land use information to support regional ground water exploration programmes in the Semiarid Southern parts of Tamil Nadu State in India. The accuracy of computer categorisation was estimated through stratified random sampling techniques to be around 70 percent. At 95 percent confidence level, the accuracy estimate ranged from 66 to 88 percent.

Computer analysis of airborne 11 channel scanner data, to be optimum, requires that minimum number of channels of data be used commensurate with information requirements. The results of a test study indicate that for a typical MDAS analysis involving 36 spectral groups (8 flood plain land use categories) there can be a reduction of about 130 minutes in CPU time when four channels of data are used instead of all the 11 bands. The disc memory space for 4 channel analysis is only about 50 percent of that needed for 11 channels of data. The categorisation accuracy was comparable even with four channels of data. Further the uncategorised area was 15.7 percent with 11 channels of data compared to 1.14 percent with 4 channels of data. Thus, in this regional level flood plain land use categorisation effort only 4 out of 11 channels needed to be used to obtain comparable results but at a significantly lower computer cost.
Rural areas are now receiving more attention from planners and natural resource researchers. As existing suburban areas and new towns (including boom towns) spread across the countryside it becomes important to conduct a survey of existing land conditions. The purpose of this research was to supply geographic and statistical data on USDA defined prime farmland in an area undergoing physical development pressures.

A county-wide land use and land cover, and prime farmland inventory was performed in Rappahannock County, Virginia to study agriculturally critical areas. Individual prime farmland soil series were delineated and mapped. The objectives were to measure six characteristics of prime farmland.

The procedure devised to meet the objectives was twofold. NASA Black & White medium scale flight photography was manually classified into 18 prime farmland related land use and land cover categories. Farm plans provided additional information to complete the land use and land cover data base. Soil survey information was manually transferred and combined with the land use and land cover base to complete the prime farmland data base.

The research provided a geographic baseline (1977) distributed and measurement of land use and land cover, and prime farmland soils. Results were two thematic maps showing the location of landuse/land cover categories and prime farmland soil series, and area measurements for each. For rural counties with limited planning capabilities this technique requires minimal equipment and training, and could provide needed information on farmland resources.
LAND SURFACE FEATURE DELINEATION OF RURAL CENTRAL JAVA REGION USING DATA ENHANCEMENT TECHNIQUES APPLIED TO DIGITIZED LANDSAT MSS DATA

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The use of rotated and non-rotated principal component and vegetation (green biomass) indices to enhance original four band Landsat MSS data has a potential to improve delineation of surface features particularly in underdeveloped regions of the world which have a paucity of organized ground truth. It is vital to analyze and display Landsat data in forms which highlight features of interest most effectively especially in areas with limited or outdated surface data. Principal component and biomass ratio forms of Landsat data have proven to have the ability to identify selected land surface features better than using original Landsat data, consequently improving the potential for accurate surveying, mapping, or resource inventories of large area ecosystems of underdeveloped parts of the world.

Research at the Indiana State University Remote Sensing Laboratory (ISURSL) has been conducted which applies transformed Landsat MSS data in principal component and biomass ratio formats for a synoptic rural survey in a central Java study area. The study area is comprised of a variety of features including complex lowland and upland crop ecosystems, dry crop ecosystems, numerous agricultural rural settlements, forest and grass cover of various types differentiated vertically along volcanic mountain slopes, edaphic zones, and water. The micro-level complexity of this environment coupled with very limited ground information makes Landsat analysis of this region very difficult particularly using the raw data.

Utilizing Landsat data (Scene 106702145, 28 September 1972) in principal component and biomass ratio forms for supervised and unsupervised classification resulted in better delineation of agricultural soil features which were not clearly identified using original four channel data. It was also found that the vegetation indices led to better identification of vegetation cover when compared to original data. Also, the use of vegetation indices in combination with the principal component data is found useful in the overall land surface identification process. The utility of principal component and vegetation indices for data enhancement is thus, recommended for land surface feature identification and delineation in the underdeveloped regions of the world.

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A REMOTE SENSING AND GEO-BASED INFORMATION SYSTEM APPROACH TO THE ASSESSMENT OF IRRIGATION DEVELOPMENT POTENTIAL

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The Earth Resources Observation Systems (EROS) Data Center is engaged in a cooperative demonstration project with the Portland District of the U.S. Army Corps of Engineers. This study is using remotely sensed data and a geo-based information system to evaluate present and future effects of irrigation development on the flow of the Columbia River.

The Stanfield, S.E., Oregon, 7.5 minute quadrangle was chosen as a test area. Land cover shown on a 1972 Landsat scene was classified as irrigated land, dryland agriculture, rangeland, and wetland. Soils maps of the area were interpreted to determine the potential of the soils to support irrigation development. The resultant potential irrigation map was digitized and entered into a geo-based information system along with slope derived from digital terrain data. A map of the potential for irrigation was then derived based on 1972 land cover, soils, and slope. The composite map revealed that the most favorable terrain for irrigation development was in the southeast part of the quadrangle.

Economic factors involved in irrigation—distance and elevation from the source of water (the nearest point on the Columbia River)—were also entered into the geo-based information system. It was assumed that irrigation pumping costs increase in proportion to distance and elevation from the source of water. When qualitative economic data were included in the geo-based model, it was noted that areas with the greatest probability for irrigation development were in the northwest quadrant of the study area (nearer the source of water than the southeast part). Landsat imagery from 1977 shows that irrigation development occurred as predicted when distance and elevation from water source

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DETERMINATION OF POTENTIALLY ARABLE LAND
AND MEASUREMENTS OF NON-AGRICULTURAL USES
FOR NINE SELECTED AREAS IN AFRICA

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The purpose of this study was to
determine the percentage of total po-
tentially arable land currently committed
to non-agricultural human settlement uses
in selected African agro-climatic zones.

Nine study areas equal in size to
Landsat scenes, were selected by climatic
zones as specified by the Food and
Agriculture Organization, Rome, Italy.
Soils information were fundamental to this
project and were combined with climatic
and crop suitability information for each
study area. This information was manually
converted to digital form for input to a
computer-aided geographic information
system, thereby creating nine independent
data bases.

Landsat CCT data for these study
areas were processed by computer to
identify and map the extent of human
settlement. These data were automatically
input as files into the appropriate data
bases using the registration and aggrega-
tion program LEVT, developed at the
Holcomb Research Institute.

Potentially arable lands were
identified within each Landsat scene,
using FAO criteria, based upon soil and
crop suitability within each climatic
zone. Landsat digital data identified
the extent and location of human settle-
ment, and file manipulation techniques
identified settlements occurring upon
these potentially arable lands. The
results of this study indicate that the
amount of potentially arable land varied
dramatically between the nine study areas,
ranging from 778 km² in South Africa (.19%
committed to human settlements) to 29,017
km² in Nigeria (2.1% committed to human
settlement).

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