LAND USE /LAND COVER MAPPING USING DIGITAL IMAGE PROCESSING SYSTEM IN M.R.B.C COMMAND AREA NADIAD

Mahek aparnathi[1]Dr.M.B.Dholakia[2]

[2]Principal

[1, 2]L.D College of Engineering, Ahmedabad

Abstract—Spatial information technologies (Remote sensing, GIS and GPS) are helpful effectively managing the resources for sustainable development. The present papers deals with land use /land cover mapping in MRBC irrigation command area with the help of IRS P6/1D LISS-III data. The main objective of this study is that identification of crops wise area as per number of pixels of particular images.

Keywords:- Land use, digital image processing, Land Cover Classes

I. INTRODUCTION

Land Is The Stage On Which All Human Activity Is Being Conducted And The Source Of The Materials Needed For This Conduct. Human Use Of Land Resources Gives Rise To "Land Use" Which Varies With T He Purposes It Serves, Whether They Be Food Production, Provision Of Shelter, Recreation, Extraction And Processing Of Materials, And So On, As Well As The Bio-Physical Characteristics Of Land Itself.

Land Use/ Land Cover Mapping Helps In Identifying Land Use Monitoring Land Use Changes Like Changes In Cropping Pattern, Urbanization, Water Logging, Salinity Etc. Monitoring Is Done Over The Years To Identify Long-Term Impacts Of Irrigation. Mapping Of Land Use/ Land Cover Classes Was Done Using Multi-Season, Multi-Year Satellite Based Remote Sensing Data. Before Land Cover Classification Ground Truth Is Carried Out. Generally Around The Period Coinciding With Maximum Vegetative Cover Of The Crop Under Study And Coinciding With The Satellite Over Passes, The Ground Truth Sites Are Visited And Information On Crop Type, Growth Stage, Date Of Sowing, Ground Cover Etc. And Other Land Cover Classes Are Recorded. Global Positioning System (GPS) Can Also Be Used To Locate And Record GT Data.

Since Both Land Use And Land Cover Are Closely Related And Are Not Mutually Exclusive, They Are Interchangeable Terms. Also it's An Information on the Basic Prerequisite for the Conservation and Management of Land, Water and Vegetation Resources. Such Information Related To Spatial Distribution Of Various Classes Of LU/LC And Their Changes Is Desirable For Planning, Management And Monitoring Programmers At Local Regional And National Levels. Such Kind Of Information Doesn't Provides For Better Understanding Of Land Utilization Aspects But Play A Vital Role Against Formulation Of Policies And Problem Requires For Development Of Planning.

A. DATA USED

For Land Use and Land Cover Classification Two Dates of IRS P6 (Resource sat) and 1D LISS III Scenes Were Used. The Dates Were of 16 November 2012 and 4february 2013. These two dates cater to the khaki and rabbi season respectively. As Mentioned Earlier,LISS III Data of IRS P6 Is of 23.5 M Spatial Resolution Providing Data in Four Bands, Namely Green,Red,Near Infra-Red (NIR) And Short Wave Infra-Red (SWIR).Along With This Data, Survey of India Topo sheets At 1:50000 Scales Were Used. Mahi Right Bank Canal Command Is Mostly Covered By Four SOI Topo sheets 46B/10; 46B/11, 46B/14 and 46B/15.Command Area Boundary And Canal Network Maps Were Collected From The BISAG Gandhinagar. Various Statistics Collected For the Command Area Included Distributor Wise and Season Wise Crop Area, Land Use Statistics Etc.

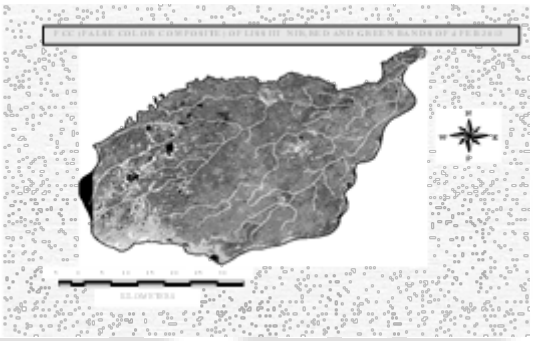

Fig. 1: Plate-1 FCC Of Nir,Red And Green Bands Of 4 Feb 2013

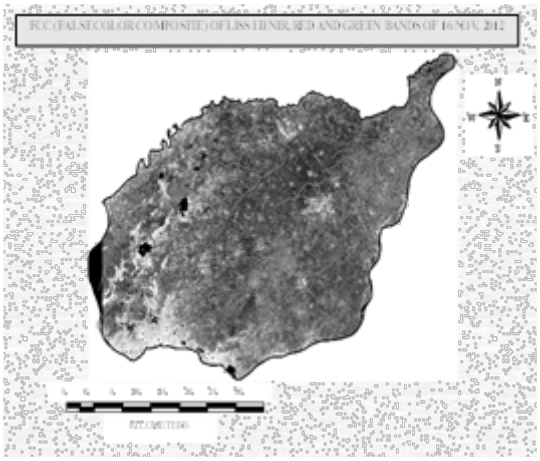

Fig. 2: Plate-2 Fcc Of Nir, Red And Green Bands Of 16 Nov 2012

II. METHODOLOGY

The Digital Analysis For Land Cover Classification Can Be Divided Into Following Steps.

1) Image Georeferencing Using (SOI Map) Survey of India Toposheet.

2) Image To Image Registration For Creating Multi-Date Database
3) Marking Training Sites Using Ground Truth Information
4) Generation Of Various Statistics For Each Training Site
5) Image Classification Using A Supervised Maximum Likelihood Classifier
6) Area Estimation For Each Land Cover Class
7) Accuracy Estimation
8) Comparison of Land Use for Different Time Period for Land Use Monitoring.

Thus, The First Step In Digital Analysis Is The Georeferencing Of The Master Image. This Involves The Development Of A Transformation Equation Between Known Geographical Co-Ordinates On A Map And Corresponding Co-Ordinates On The Satellite Image In Terms Of Scan line And Pixel Number. The Points Used For Developing Such An Equation, Called Ground Control Points (GCP) Need To Be Well Distributed Over The Entire Image In Order To Get An Accurate Transform Equation. This Procedure Is Reappeared For Images Of Other Dates, Where The Source Of Georeferenced GCP Is The Above Master Image.

Using Topographical Maps And Ground Truth Information Collected, Sites Of Various Crops And Other Major Land Cover Classes Are Identified And Demarcated Within The Segment Image. All Information Is Stored As A Ground Truth Mask Image And Used For Generating The Training Sites Statistics, Like, Mean, Standard Deviation, Variance And Covariance Matrix And Correlation Matrix, Which Are Used For Classification. Using Confusion Matrix And Divergence Matrix Of Training Site Pixels, Separability Between Classes Are Checked. A Supervised Classification Approach Is Followed Using A Gaussian Maximum Likelihood Classifier. In This Using Mean Vector And Covariance Matrix Of Training Data It Computes The Statistical Probability Of A Given Pixel Value Being A Member Of A Particular Land cover Class. The Pixel Is Assigned To The Most Likely Class, Or Labelled Unknown If The Probability Values Are All Below A Threshold.

III. RESULTS

In An FCC (false color composite) image given in plate 2 is that of 16 November 2012 in this FCC crop and other vegetation look red because of high reflectance in NIR band. In an FCC NIR Assigned Red Color, Red-Green Color And Green-Blue Color. The Dark Red To Greenish Tone Is Seen In The Images Due To Matured Crops In November. Two major urban area, nadiad and anand city are seen in the image. Towards the tail end of the images salt affected area and mudflats are also seen as white-cyan color. Toward the western end of the images black color is seen because of no data. However, in the February data due to peak vegetation season the images is looking reddish. The difference in red tone is due to difference in vegetation condition. Due to contrast the urban area and wastelands are clearly demarcable.

An analysis of digital numbers of different land cover/land use classes in different bands during two dates, November 16 and February 6 figure 1. Showed that water has low digital number in all the bands. This is because water absorbs radiation in all bands. However among all the bands NIR and SWIR had lowest DN value for water. Urban, salt affected land and sand had high DN values in all the bands and in both the dates. That creates difficulty in separating these three classes and them always overlap in the classification. Among these three classes sand had highest DN value in all the bands. Crop had high DN value in NIR band and low DN value in red and SWIR bands. This is because of high chlorophyll and water absorption in these two bands, respectively. Fallow land produced low DN values in all the bands and all the dates; however those were not as low as water body.

Plates 3 show that vegetation and non-vegetation classes differentiate using NDVI thresholding technique, for kharif and Rabi season respectively. In each of the plates, there are three images. First images (a) show the vegetation mask (yellow color) on the LISS III FCC. Since all the classes are hidden behind the mask only water bodies, urban area, wasteland and salt affected land are seen. Similarly when the non-vegetation mask (cyan) overlaid on images (b) only vegetation classes are seen. That is why the images look red, and the tone of the images varies depending upon the vegetation condition. In the images (c) both the mask are combined images and overlaid on the images. No portion of images is seen only 2 classes of vegetation (yellow) and non-vegetation (blue) is found. Furthers k-means classification was carried out within in each mask to get different land cover classes.

Sr.No	Classes	No. of pixels	Area(ha)
1	Rabi crops	669156	36954
2	Kharif crops	1688056	93223
3	Double season crops	2682553	148143
4	Water body &waterlogged	84177	4649
5	Urban, wasteland & saline area	435590	24056
6	Scrubland & fallow land	712610	39353

Table. 1: Land Use/Land Cover Statistics For Mrbc Generated From Remote Sensing Data.

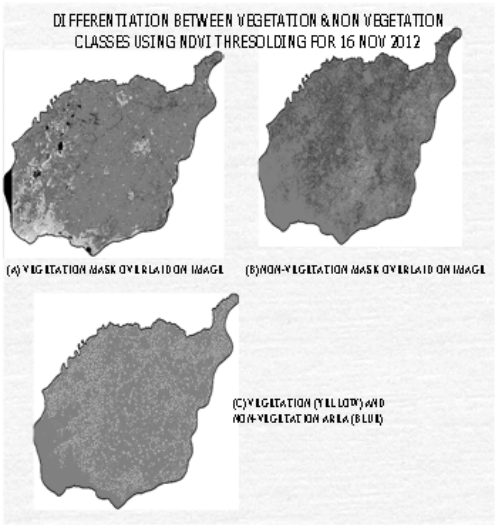

Fig. 3: Plate-3: Differentiationbetween Vegetation & Non-Vegetation Classes Using Ndvi Thresholdingfor 16 Nov 2012

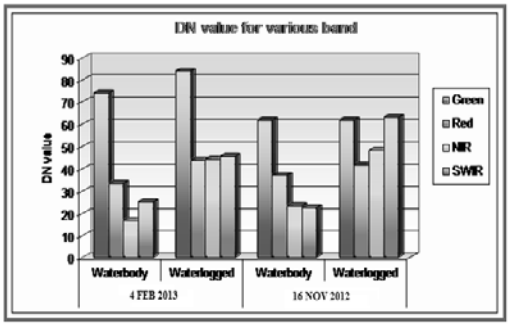

Fig. 4: Digital Number Values of Various Land Cover Classes in Different Bands.

IV. CONCLUSION

Mapping Of Land Use/Land Cover For Micro, Meso And Macro Level Planning A Such Morden Tool Remote Sensing Data Are Used. Remote Sensing Have The Capability For Repetitive Coverage, Which Is Required For Change Detection Studies. Land Use/Land Cover Map Is Necessary While We Ensuring Planned Development And Monitoring The Land Utilization Pattern. The Present Study Demonstrates The Usefulness Of Satellite Data For The Preparation Of Land Use/Land Cover Maps Depicting Existing Land Classes For MRBC Command By Utilizing Digital Image Processing Techniques.

BIBLIOGRAPHY

[1] Dadhwal, V.K and J.S Parihar (1985). Estimation of 1983-1984 wheat acreage of karnal district (Haryana) using Landsat MSS digital data. Technical note,IRSUP/SAC/CAPE/SR25/90, Space Applications center Ahmedabad, India pp.51-76.

[2] Dadhwal, V.K and Ray, S.S (1998). Crop assessment using remote sensing-part II: crop condition assessment and yield forecasting. In the proceedings of workshop on remote sensing and Agricultural statistics: Rationale, scope and aims, April 21-22.1998 at space Applications centre, ahmedabad-380053.

[3] De wit, A.J.W., &Boogaard, H.L (2001). Monitoring of crop development and crop model optimization using NOAA-AVHRR: Towards in integrated satellite and model-based crop monitoring system in the European context (Vol.BCRS Report 2000: USP-2 Report 2000:00-12). Delft:Beleids commission Remote Sensing (BCR).

[4] Janssen, L.L.F & Huurneman, G.C (Eds.) (2001), principles of remote sensing: an introductory textbook (2 Ed). Enschede:ITC.

[5] Navalgund,R.R (1991). Remote sensing applications in agriculture: Indian experience. In proceedings of special current event session international Astronautical federation, 42th IAF Congress. Montreal, quebec.pp 31-50.

