



Assessment of Decline in Forests of Indus Basin Using Landsat Imagery Data: A Case Study of Larkana, Dadu and Khair-Pur

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**Abstract:** Forests are life line of biodiversity, livestock, rural population, economic, environment and regional climate; nowadays modernization and economical loss; natural disaster has brought change of decline in a natural resource that is an eye opener. Many research studies and scientists focus on working solution and minimization of affect on natural cycle and economy. This scientific study work has been focused on calculation of forests cover and its impacts on living organisms such as animals, plants and environment such as increase in temperature and concentration of carbon dioxide and change in regional climate. Similarly modernization gives the powerful tool to monitor, assess physical impact on minimum cost, time saving and accurate assessment with Remote Sensing technologies. Larkana, Dadu and Khair-Pur Riverine forests are disappearing rapidly due to the construction of dams and barrages on higher flow to make hydroelectricity and utilization of irrigation installations which get smaller the release of fresh water into the downstream of Indus basin. In addition, anthropogenic behavior, illegal tree cutting, land used for agriculture purpose; with the results The Riverine forests have been turning into barren land and most of the land used for agriculture. These changes are not easy to monitor and control without using RS technology; the result finds temporal changes in the forests cover from April, 1979 to April, 2009, last 30 years period assesses deforestation in sub-tropical forests cover is 6.12%.

**Keywords:** Analysis Deforestation; Land Use/Cover Remote Sensing; Supervised Classification Maximum Likelihood Algorithm; Method; Landsat; Riverine Forest Sindh.

1. **INTRODUCTION**

Present a great consequence, of sub-tropical woodland and their rate of deforestation has many causes: like low precipitation, poverty, regional climatic changes and greenhouse gas contributions. The deforestation is one of the major contributions in precipitation, regional climatic changes and greenhouse gases emission and the forests in the sub-tropical have been recognized as the massive source of emission of greenhouse gases. Satellite remote sensing has been used in consideration of the deforestation rate and evaluated the land cover change and estimate of deforestation in Indus basin from 1972 to 2010 using Landsat data (Langner, *et al.* 2007). Investigation of satellite statistics, combined with local knowledge and field corroboration to assure accuracy (Skole, *et al.* 1997). This study has indicated major regions where sub-tropical deforestation has taken place in the previous few years (Lepers *et al.* 2005) and the numerous aspects and reasons of deforestation (Geist, *et al.* 2002). the process used for analyzing satellite data gives spatial clear approximation that can be confirmed by local specialists and field clarification (DeFries, *et al.* 2005). Further more to the experience

few countries that observe deforestation, from more few decades of studies has been produced various techniques and statistics that lay on groundwork for regular watching of deforestation (Mayaux, *et al.* 2005).

2. **STUDY AREA**

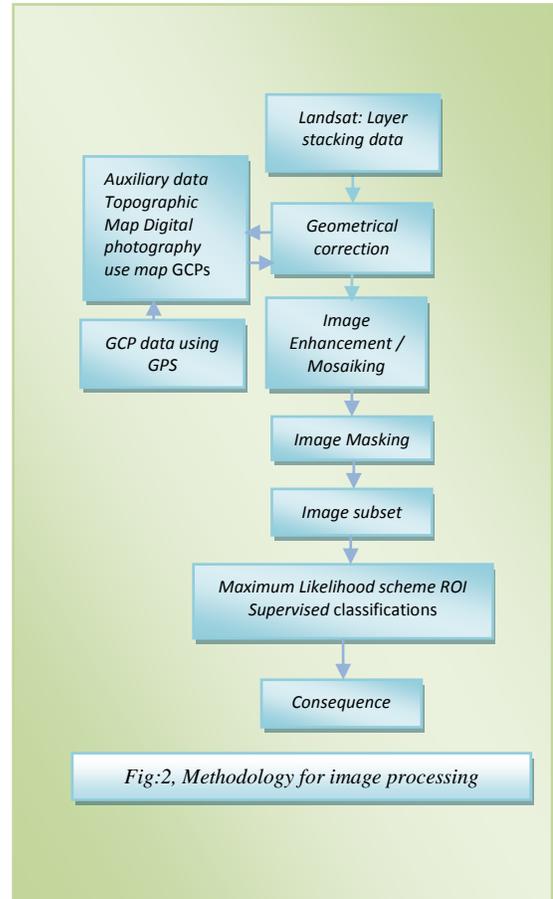
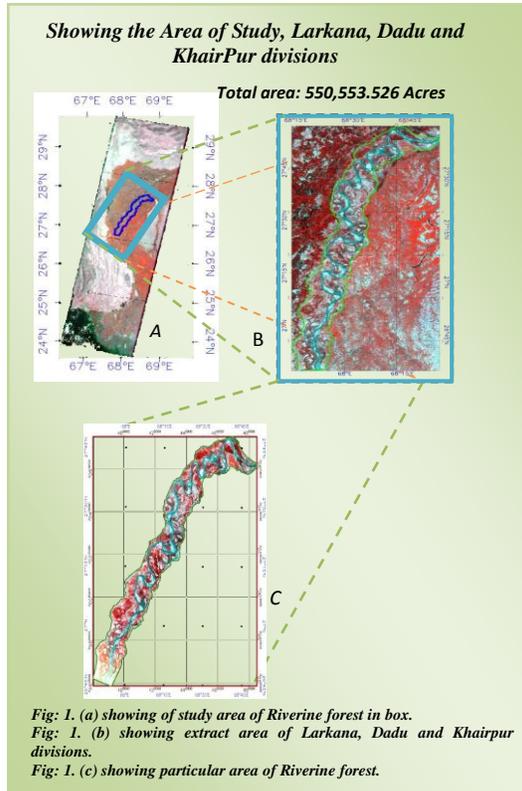
The Indus basin from Larkana, Dadu and Khair-Pur covers an area of 550,553.526 acres which fluctuate from 1 to 6 kilometer in thickness and both side banks cover from the flood in the country side. The climate of the vicinity is continental nature; contain warm summers and waterless winters enduring from December to February. The yearly significant precipitation in the northern part is about 100 millimeter, while in the south it is 175 millimeter and July & August are the months of rainwater. "Riverine basin has considerable sanctuary for a variety of mammals and reptiles mainly Hog deer and other animals like partridges, wild boars, jackals, sand grouse, wolves, porcupines" etc. The most important species of plants of Riverine forests are "Acacia nilotica Prosopis spicigera, Prosopis glandulosa, Tamarix dioica Desmastachya bipinnala Calotropis Procera", etc (Abbasi *et al.* 2011).

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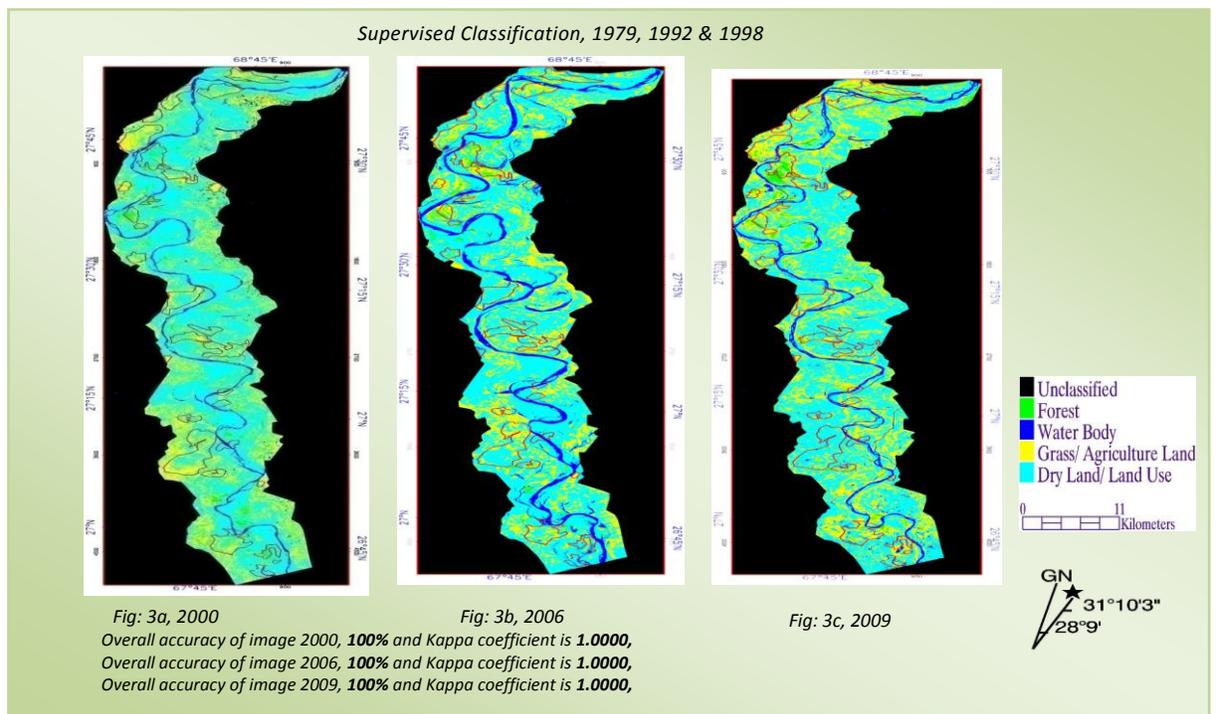
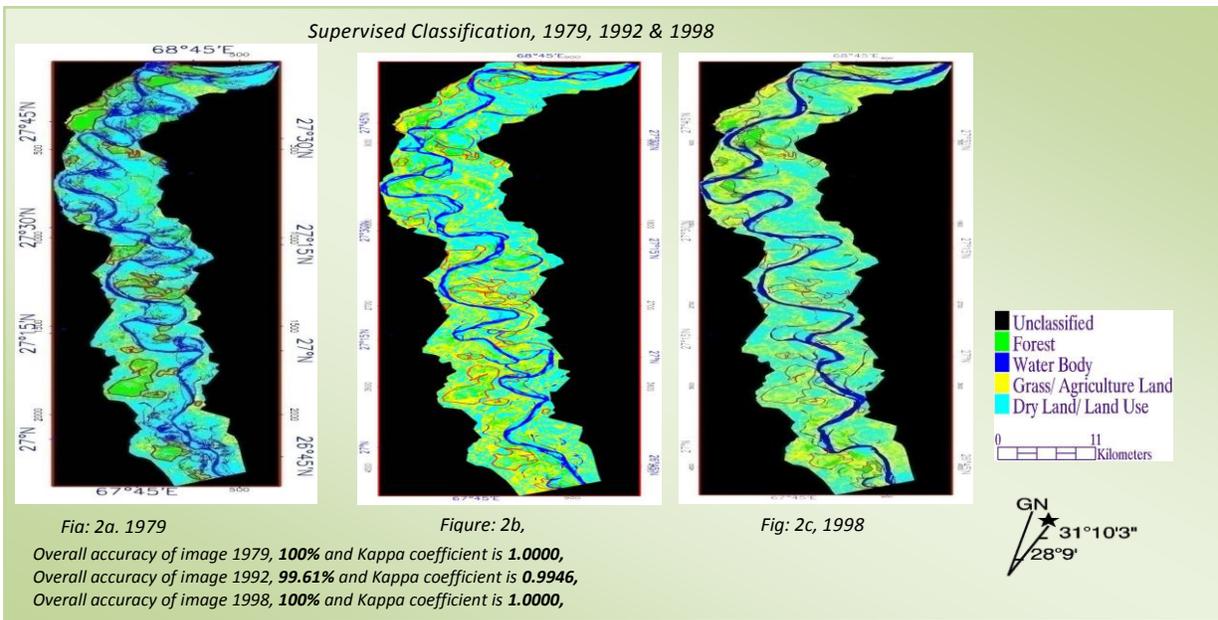


### 3. RESEARCH METHODOLOGY

The study areas of Larkana, Dadu and Khair-Pur divisions are covered in one Landsat satellite image (USGS). The land cover classification of image in ENVI 4.0 (Environment for Visualizing Images) based image processing scheme. The raster images were enhanced by contrast stretching and displayed in false color composite images and subset. Geo-referencing was then carried out to remove geometric errors using the survey of Pakistan maps and field survey ground control points (GCP) to project the images to real world coordinate systems. Rectified images were mosaiced by image mosaicing method and color balancing was applied on mosaiced images (Richards *et al.* (1999). In order to use the required area of the mosaic, the outside area, i.e., the borderline of the river plain were digitized and masked. The Indus basin was classified into four main landuse/landcover classes, which are, forests, water body, grass/ agriculture land and dry/barren land and then supervised classifications were conducted, The regions of interest were used for classification and determined the different zones (or classes) based on the spectral response (Hesbon. *et al.*, 2003). These classified maps from year 1979 April to 2010-April it contained information about the Larkana, Dadu and Khair-Pur division forests, respectively the methodology flowchart of satellite data classification has been shown in (Fig. 1 2 and 3).

### 4. RESULTS

The remotely sensed data for land deforestation assessment was used. The selected midsummer month of May for temperature assessment, on this day mostly cloud covers 0% to 5% and it is a non-crop season. For deforestation, the month of April was chosen, when there was no seasonal crop in that area, only some permanent vegetable crops were present in the Indus basin, Landsat imagery has wide range of electromagnetic wavelength band, including visible, infrared and thermal bands. Thermal band (band 6) used in ERDAS model as input finally interpreted desired area temperature converted from kelvin to Celsius. Step two, the enhanced false colour composite of images, the grass/ agriculture land appear in bright red and forests patches appear in dark red tone and can easily be distinguished from other ground features. In Landsat image of 1992, it was observed that there were large number of dense and healthy forests in the upper Indus river basin, Nawabshah division. These satellite imageries from 1992 to 2009 are classified into four classes, Green legend for the forests cover, yellow for Grassland/agriculture cover, aqua dry land/land use and black legend for unclassified area in image.



**Statistically Analysis of Larkana, Dadu and Khairpur Divisions**

<b>Year</b>	<b>landsat MSS Data sat1979</b>	<b>landsat TM data sat 1992</b>	<b>landsat TM Data sat1998</b>	<b>landsat TM Data sat 2000</b>	<b>landsat TM Data sat 2006</b>	<b>landsat TM Data sat 2009</b>	<b>landsat TM Data sat 2009-12</b>	<b>landsat TM Data sat 2010 - January</b>	<b>Average</b>
<b>Forest cover</b>	15.02%	11.06%	6.27%	4.52%	2.13%	2.93%	4.96%	2.04%	6.12%
<b>Water body</b>	20.28%	9.53%	12.18%	4.30%	8.62%	5.87%	4.98%	4.75%	8.81%
<b>Glagriculture land</b>	12.49%	34.16%	37.64%	25.45%	23.02%	31.17%	13.21%	19.05%	24.52%
<b>Dry/ barren land</b>	52.20%	45.25%	43.89%	65.7%	66.22%	60.0%	76.83%	74.15%	60.53%

*estimate of Riverine forests and vicinity base maximum likelihood algorithm on landsat Imagery and eight dissimilar years and other objects in (%) from 1979 to 2010- January*

## 5. CONCLUSION

Remotely sensed data has been processed and interpreted to extract deforestation pattern and build up digital imagery documentation of deforestation from 1992 to 2010 were collected and analyzed systematically. This technical study will support environmentalists and forest department of Sindh to improve forests.

## 6. ACKNOWLEDGEMENT

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