Intro to Remote Sensing
Final Project:

Long-Term Land Cover Changes around Pasoh Forest Reserve in Peninsular Malaysia 1998-2010

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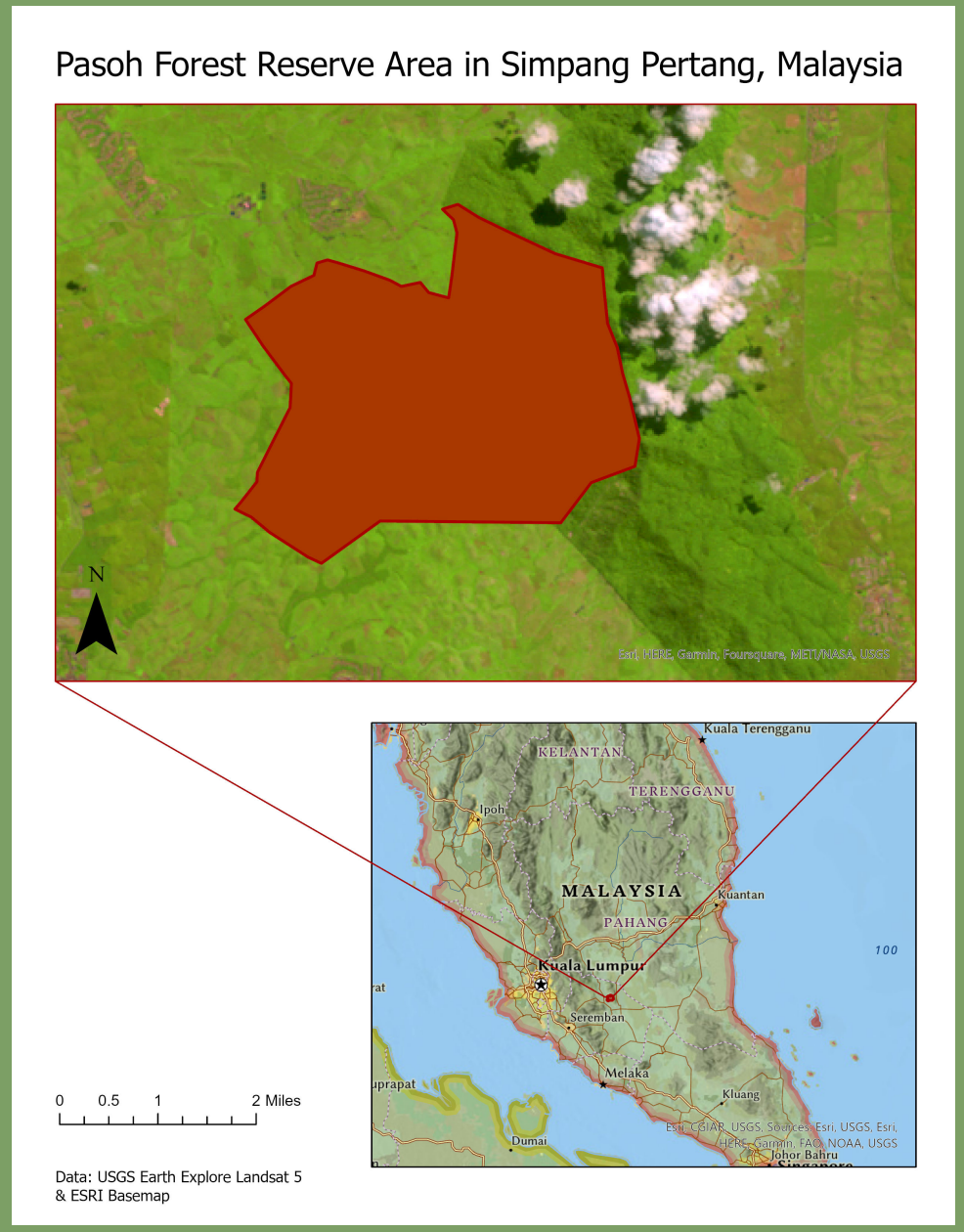
2022 Fall

Introduction – Study Area

- **Pasoh Forest Reserve,** a 50-ha lowland rain forest located in Peninsular Malaysia, was established in 1985. The reserve's core area is a residual unlogged (primary) forest that shows the typical structure and species composition of lowland dipterocarp forest, comprising 818 tree species. (Davies et al., 2003) This reserve has become an internationally recognized site for tropical forestry research.



Introduction – Impact of Land Change

Deforestation and Agriculture Development:

In the 1950s, large-scale deforestation occurred surrounding the forest reserve.

In the 1970s, **commercial crops** such as rubber and oil palm trees were planted in the area

Image Source : Google Earth taken in 2013

Impact on ecosystem:

The number of wild pigs (Sus scrofa) in the protected area has expanded dramatically as the surrounding agricultural area has grown. **The increased number of wild pigs may result in widespread plant community alterations as wild pigs dig up saplings to make their nests. (Ickes & Williamson ,2000)**

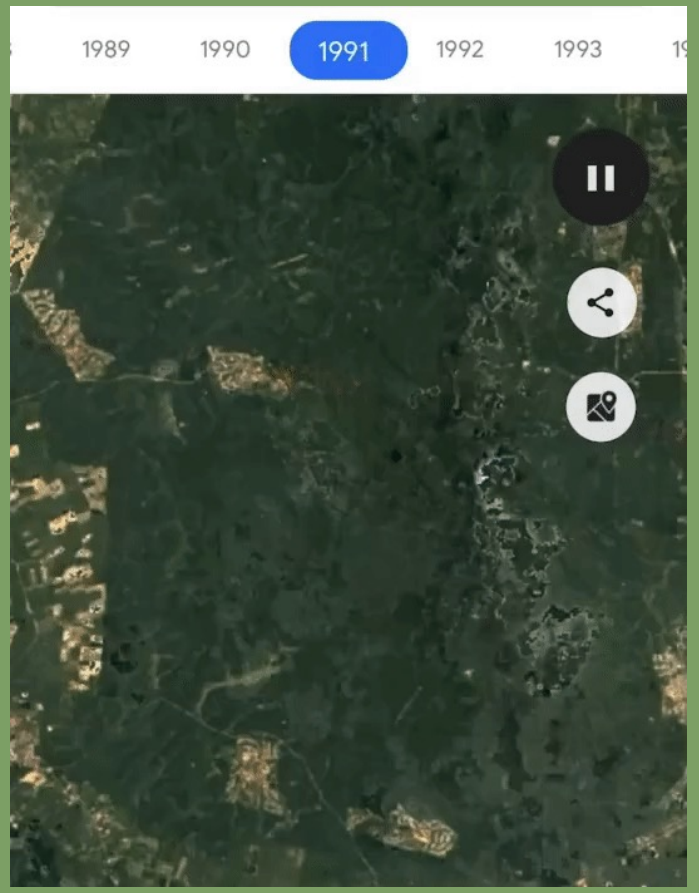
The ecology of forest reserve has impacted by changes to the surrounding land.

Objective/Research Questions

According to Google Earth Timelapse, a massive clearcutting occurred around the forest reserve during 2001 to 2002

- How has the landcover around the reserve changed before and after this clearcutting ?
- How the changes in area ratios of agriculture around the forest reserve?

This study's objective is to examine land cover changes, which might serve as a foundation for future analyses of ecological changes in forest reserves.

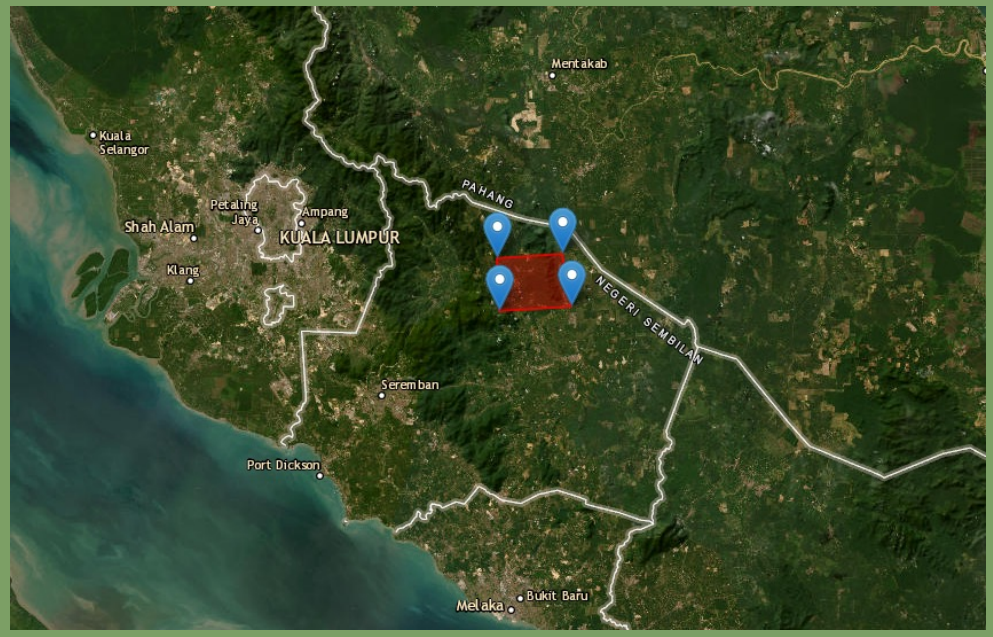


Source： Google Earth Timelapse

Data Resource

USGS Earth Explorer

- **Landsat 5 TM**
- **Coordinate system: UTM-48N**
- **Resolution: 30 meters**
- **Research Year: 1998, 2004, 2010**



Select Area on Earth Explorer

Method

- **Buffer Zone: 10 km**
- **Unsupervised Classification**
- **Supervised Classification**
- **Spectral Change Detect**

Data import from Earth Explorer (GEOTIFF/TIFF)

Digitize the reserve boundary on ArcGIS Pro

10 km Buffer around the reserve boundary (BUFFER)

Mask band1-6 of images (OVERLAY)

Covert DN Value for different years (REGRESSION)

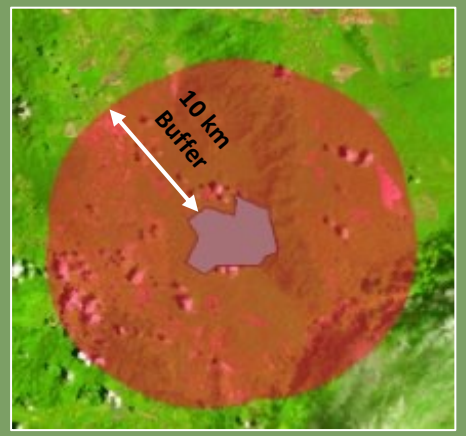
Spectral Change detect (IMAGEDIFF)

False Color Composite

Supervised Classification (Digitize, MAKSIG, PIPED, MAXLIKE)

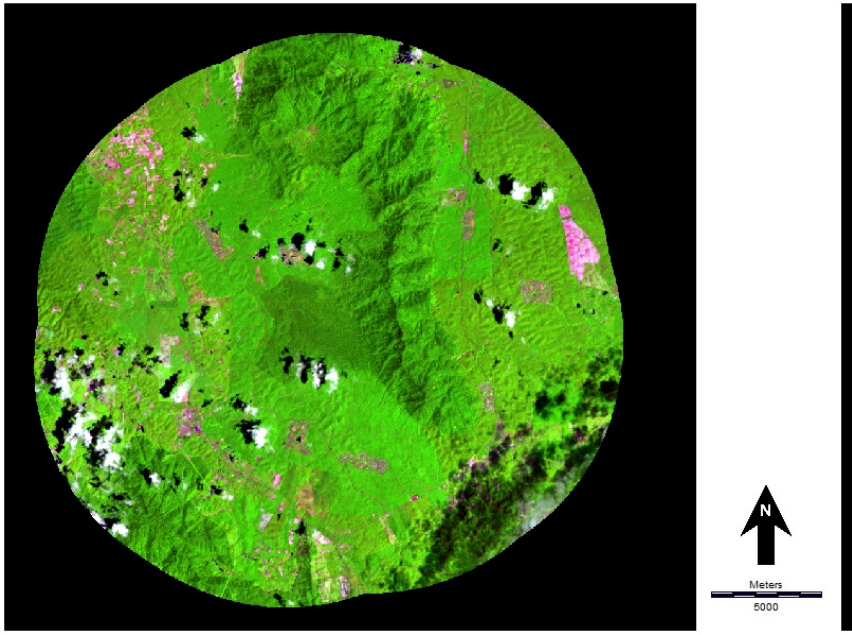
Change Detect (CROSSTAB)

Unsupervised Classification (CLUSTER)



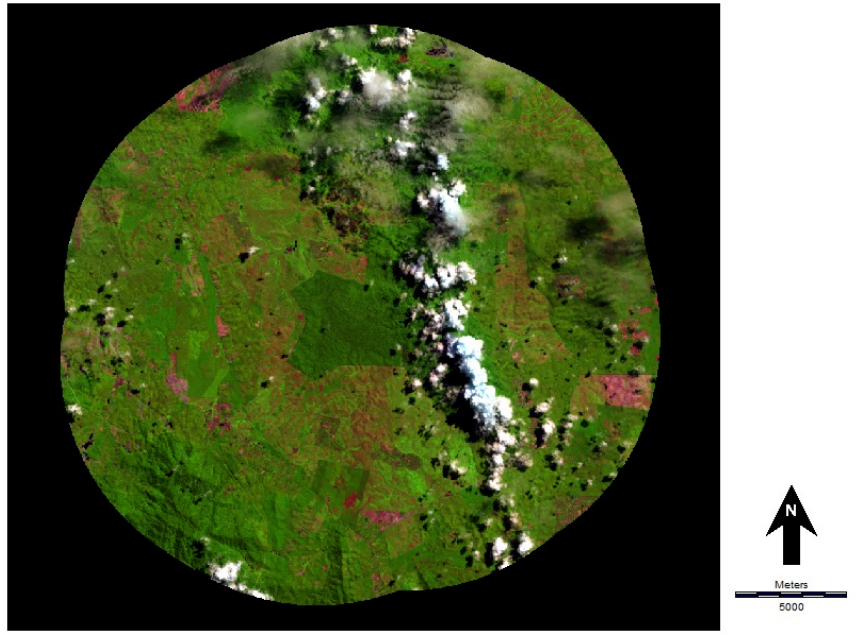
Results –False Color Composite (Band 3,4,5)

Pasoh Forest Reserve False Color Composite 1998



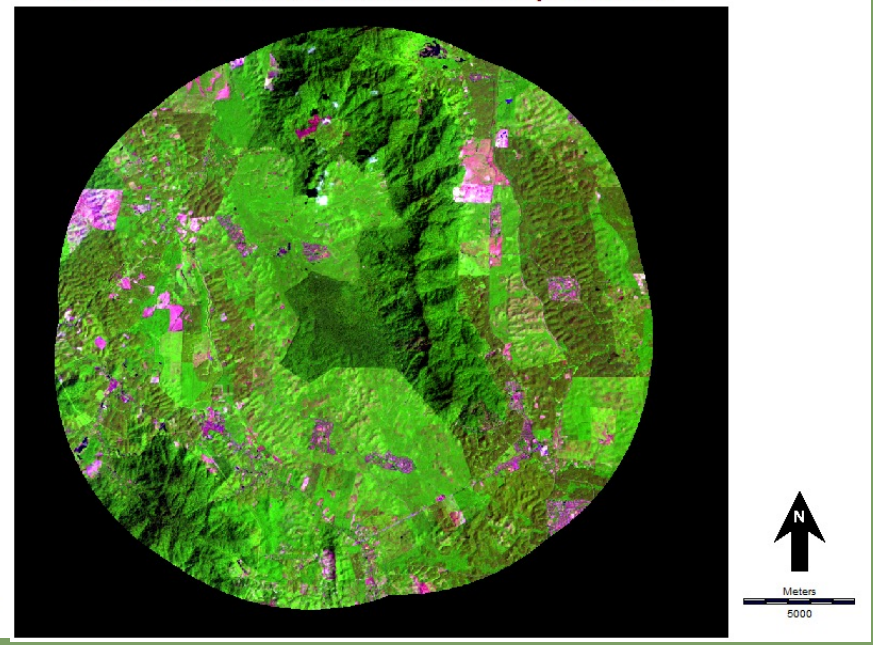
1998

Pasoh Forest Reserve False Color Composite in 2004



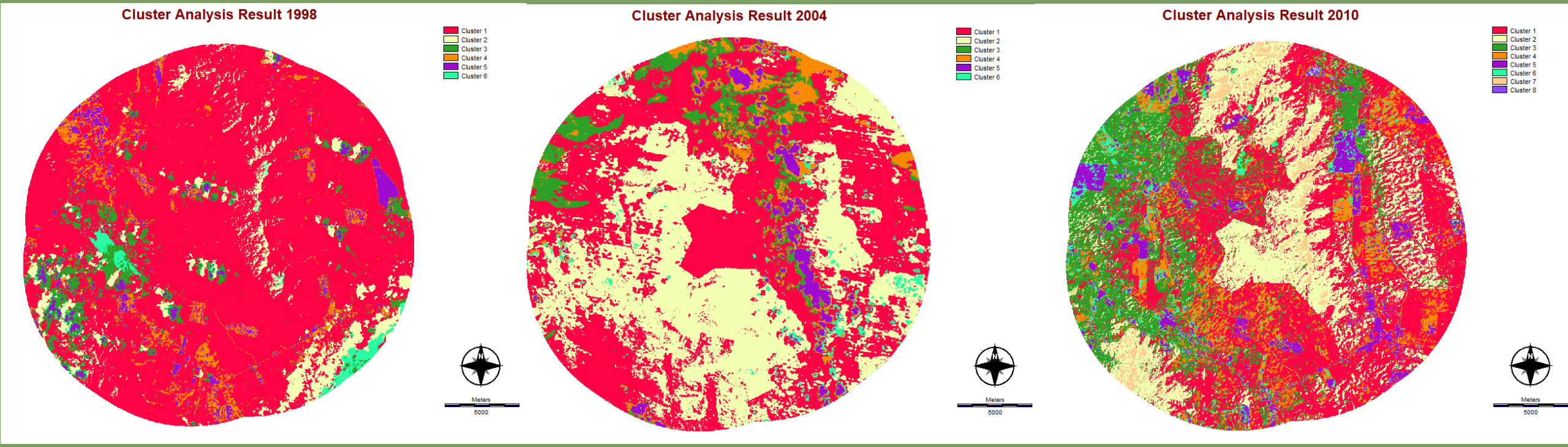
2004

Pasoh Forest Reserve False Color Composite 2010



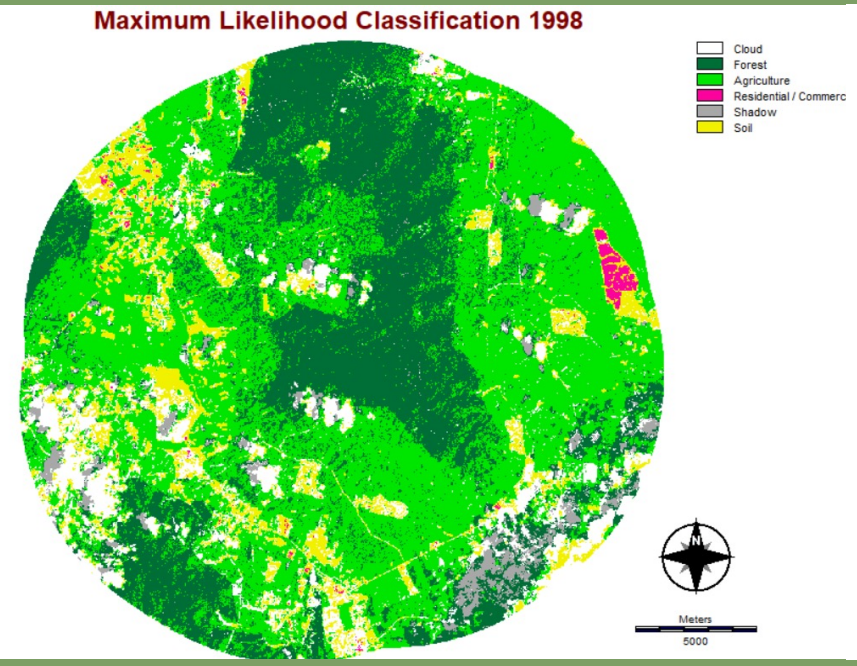
2010

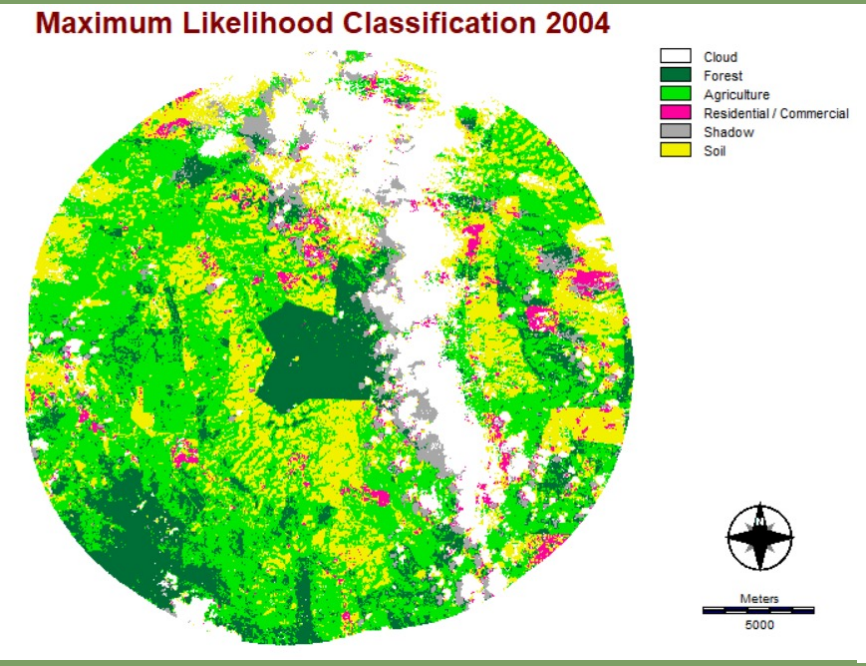
Results – Unsupervised Classification

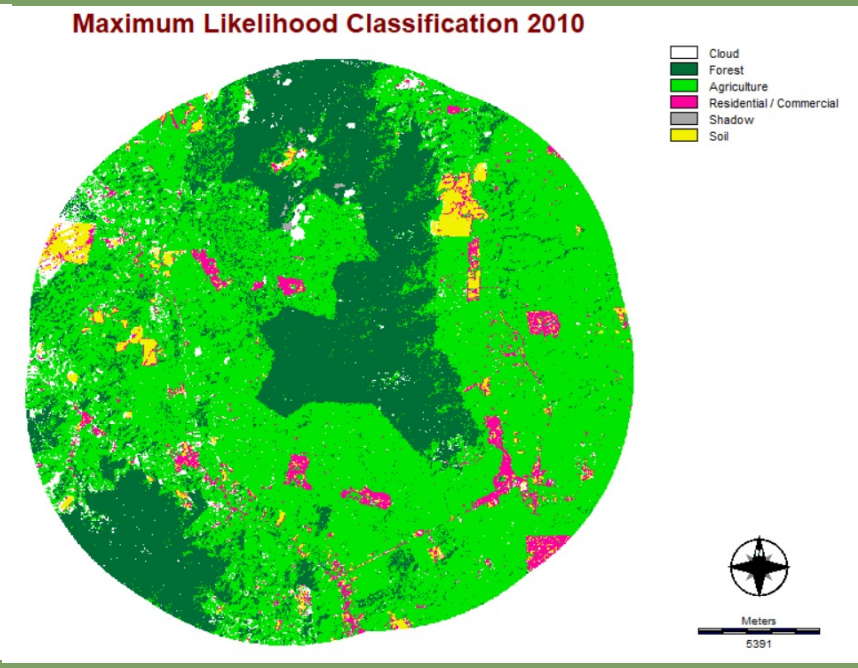


1998 2004 2010

Results – Supervised Classification







1998

Agriculture Area: 262.7 km2
53.2 % of Total Area

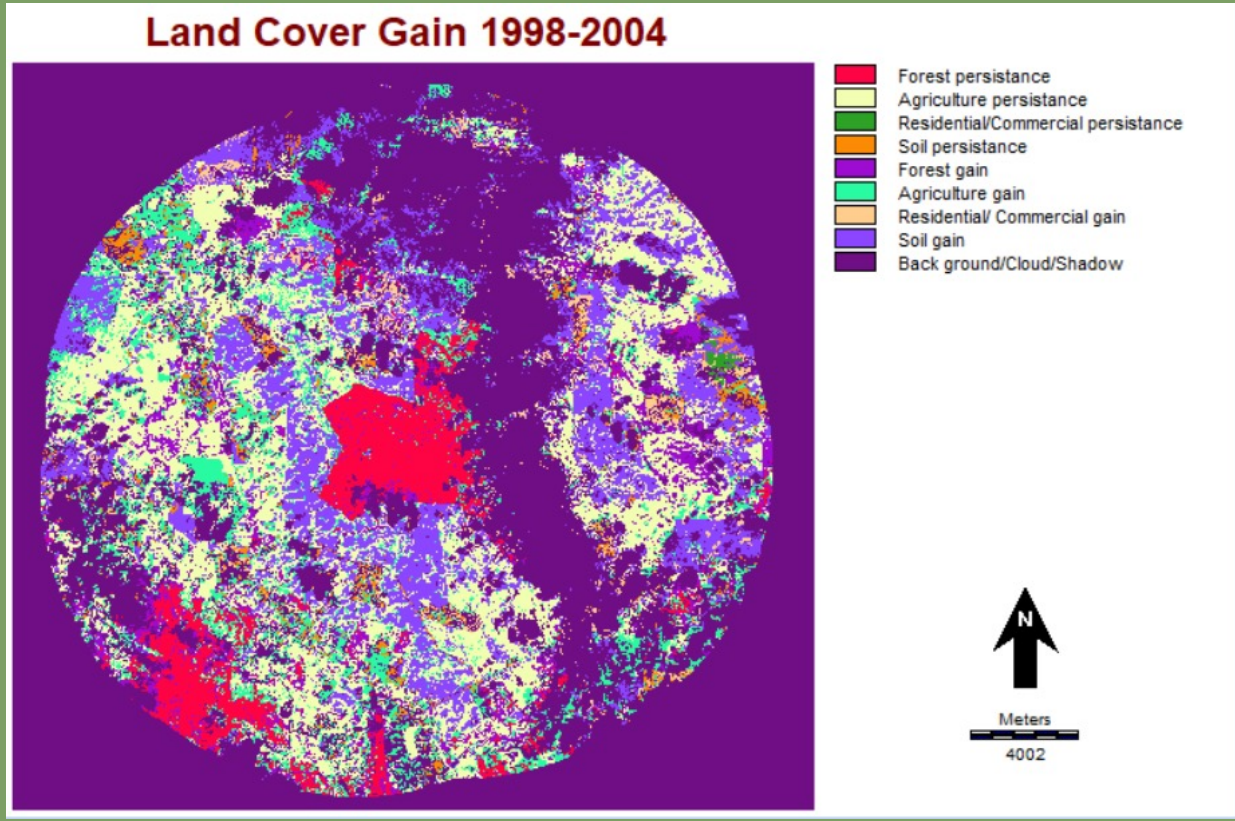
2004

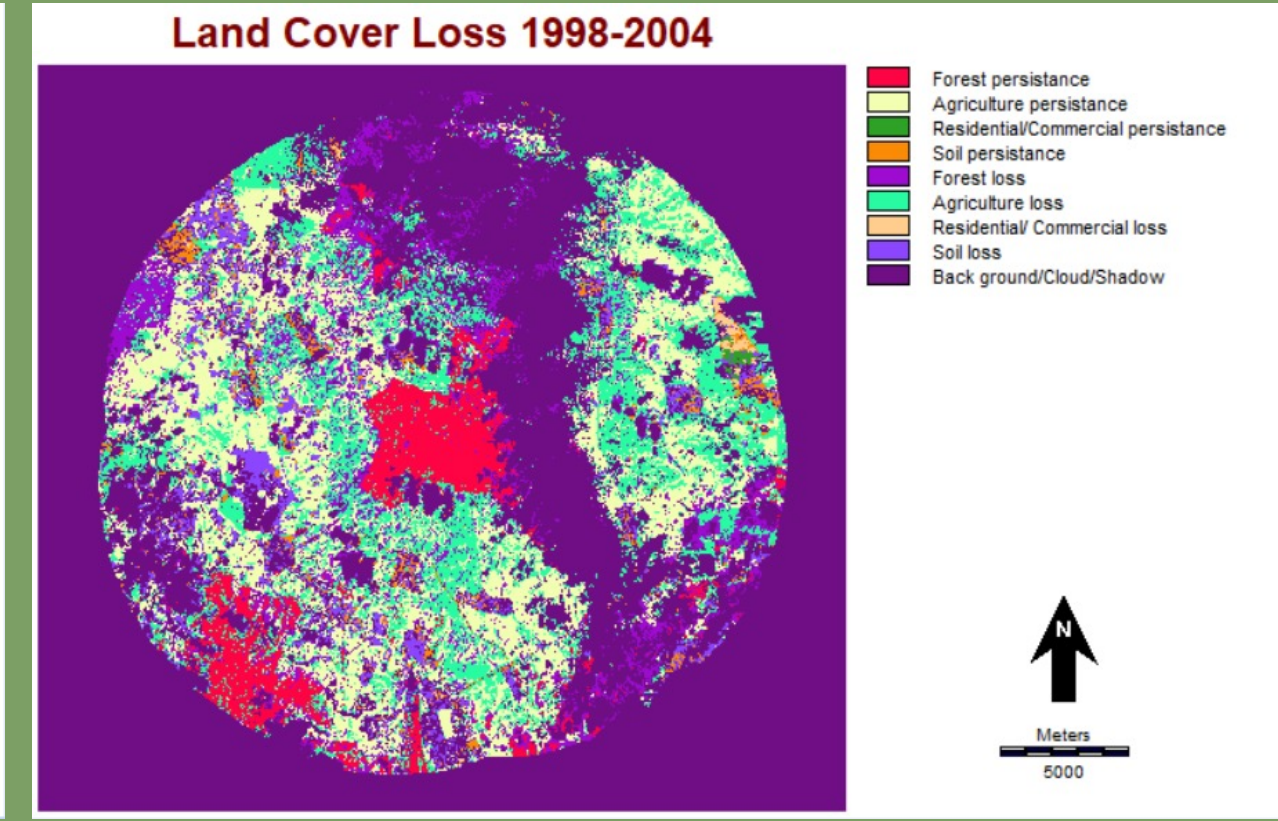
Agriculture Area: 203.5 km2
41.3 % of Total Area

2010

Agriculture Area: 332.13 km2
63.22% of Total Area

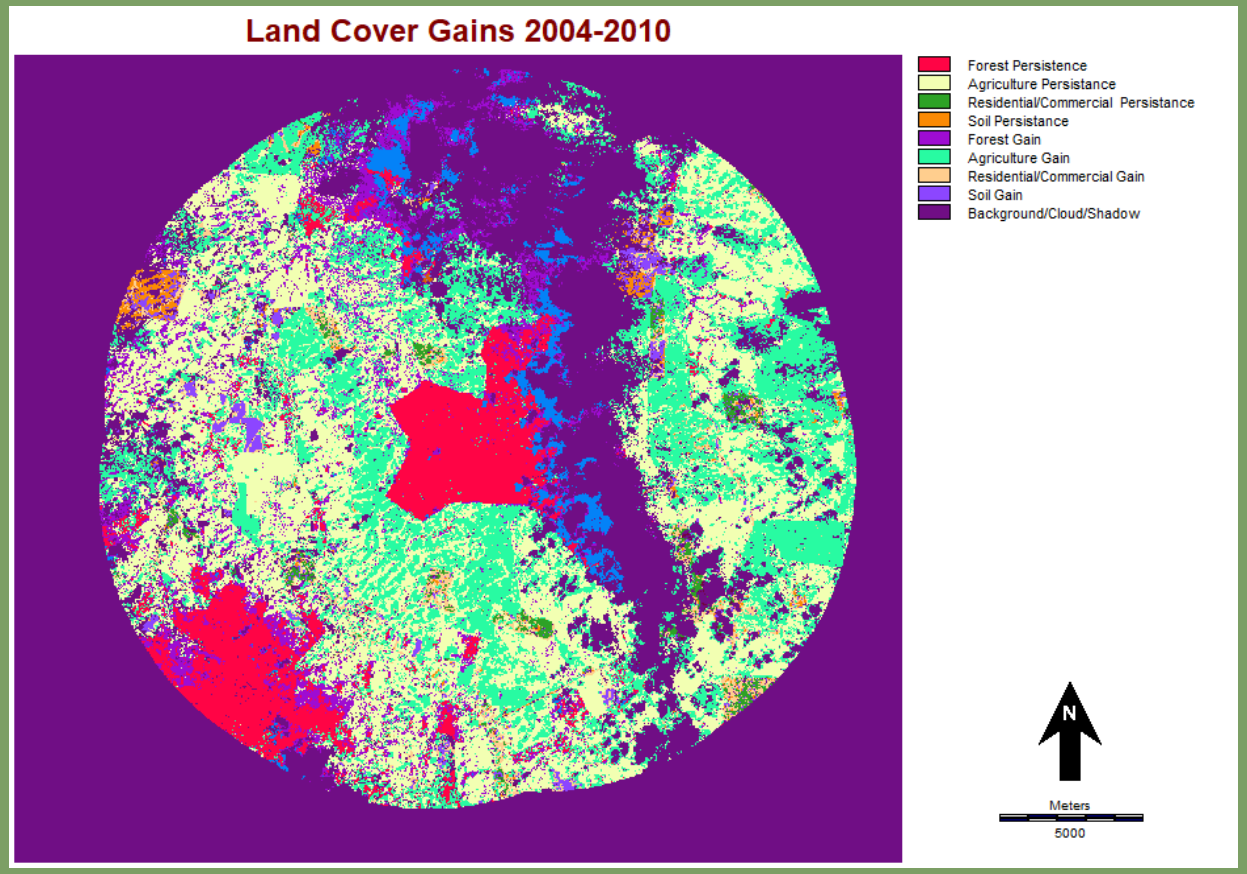
Result – Land Cover Changes 1998 –2004

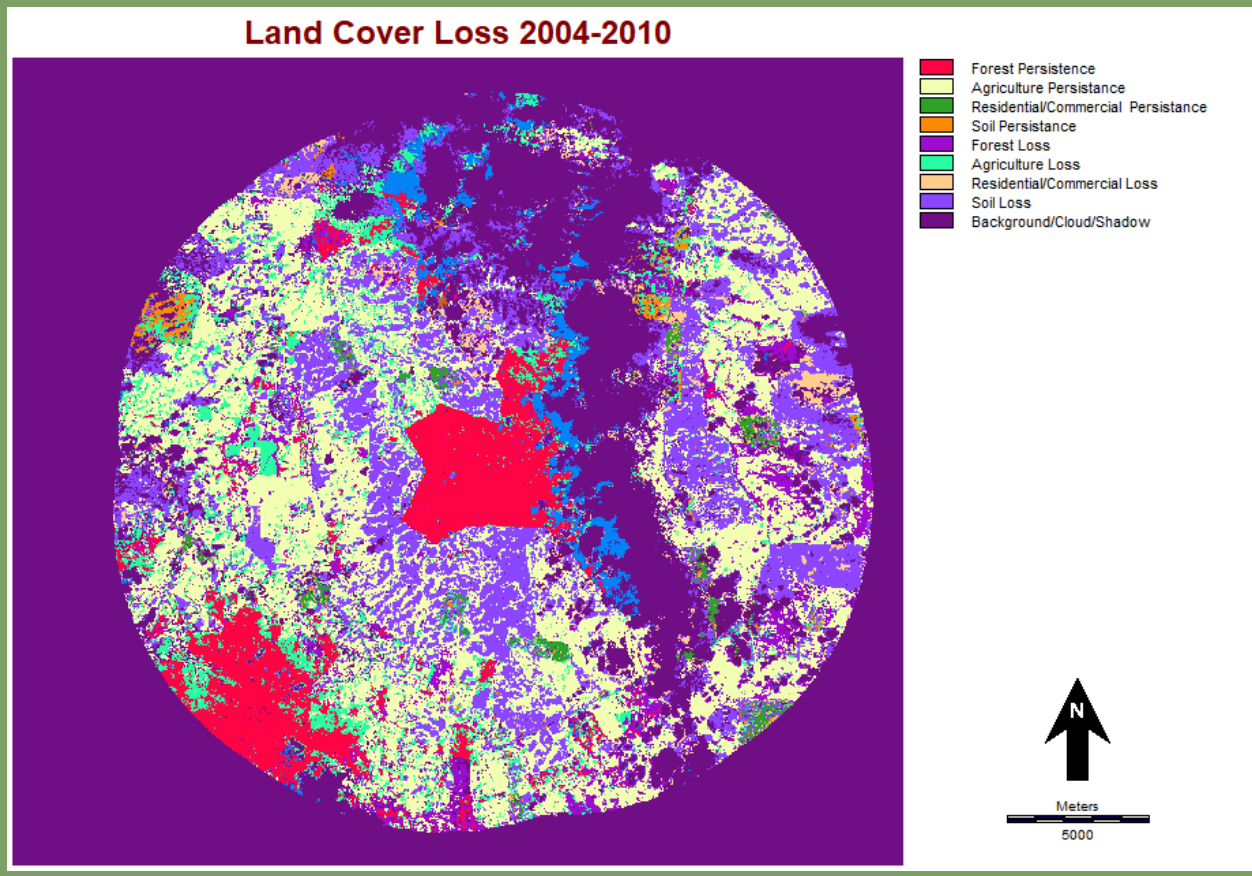




Soil had the most gain in area during this period, with a total increase of 88.84 square kilometers, while agriculture had the greatest decline in area, with a total area of 97.17 square kilometers.

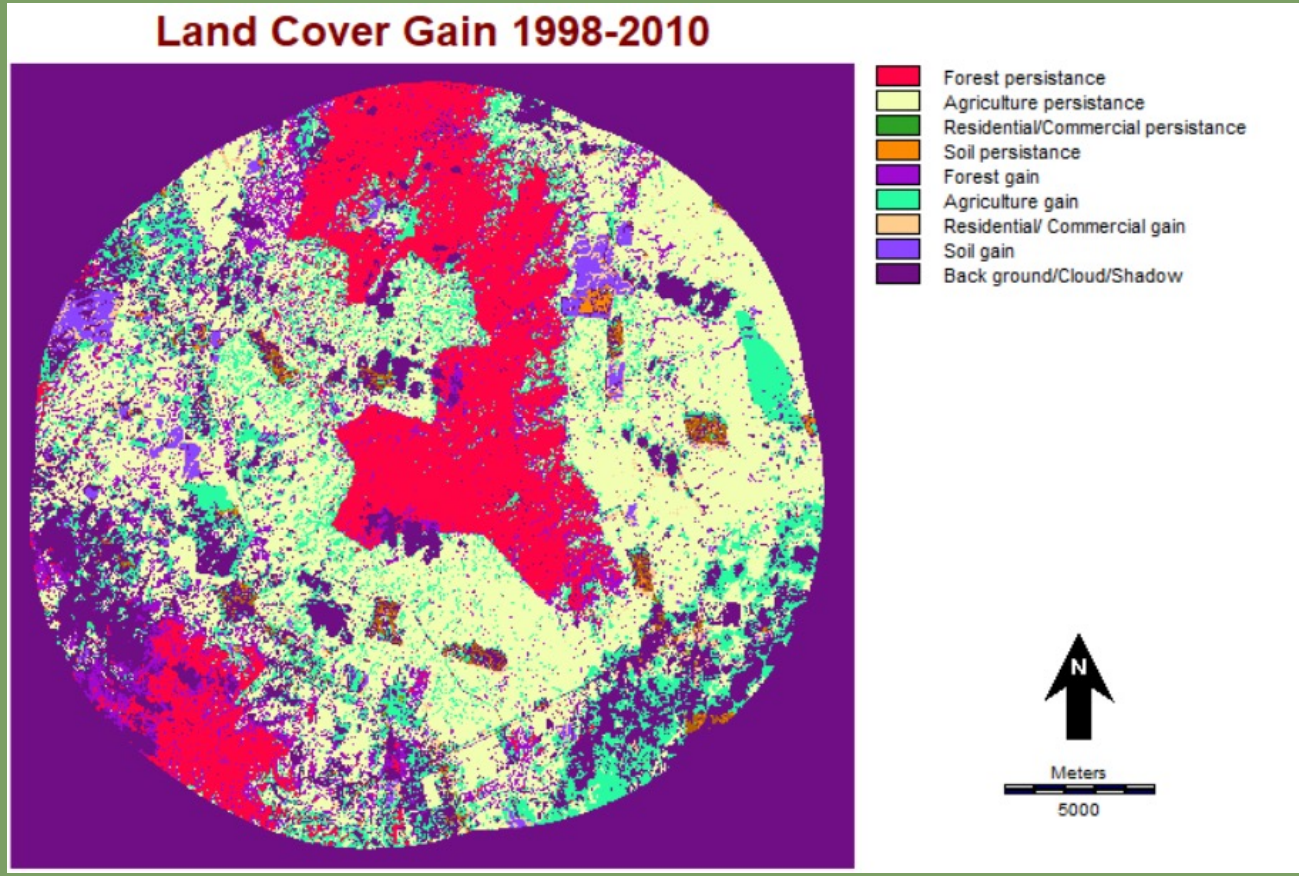
Result – Land Cover Changes 2004 -2010

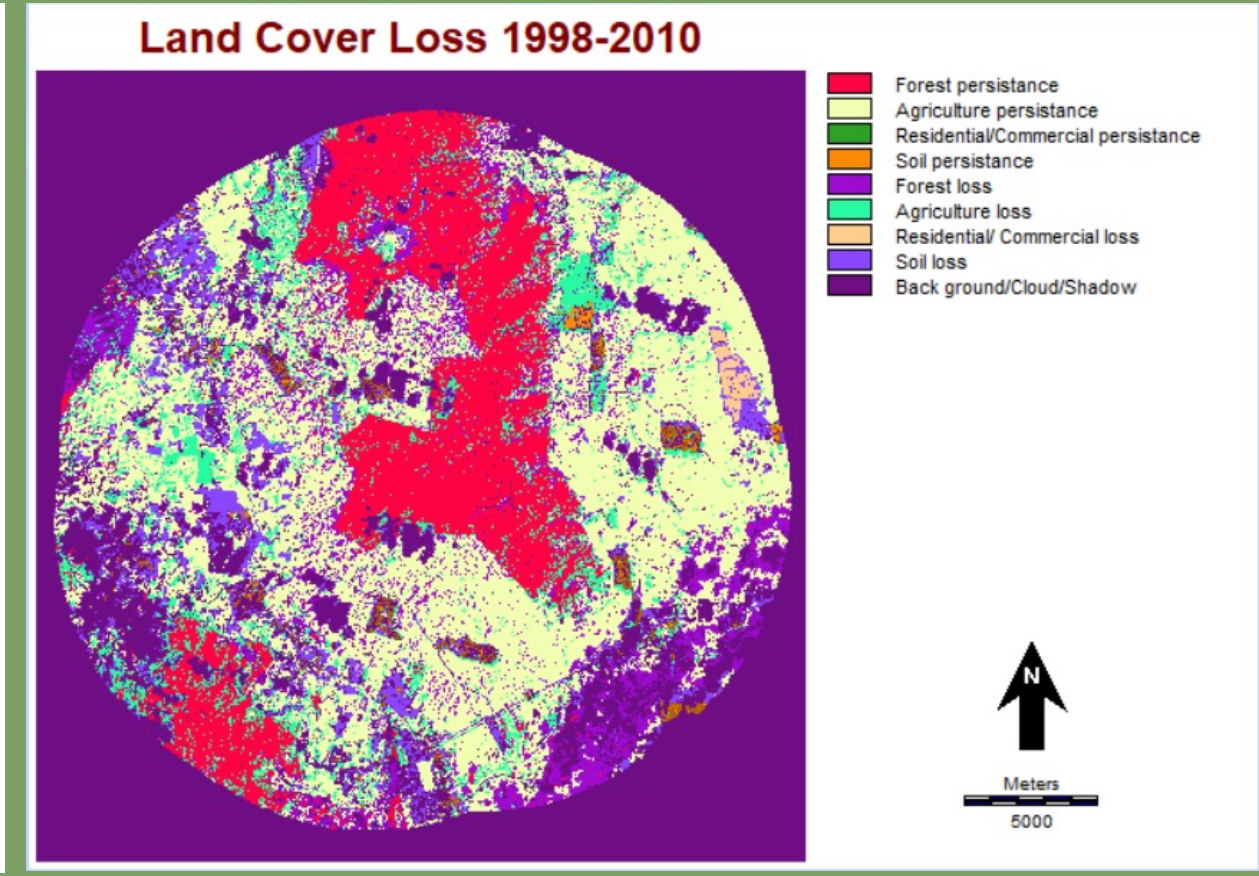




Agriculture had the most gain in area during this period, with a total increase of 121.45 square kilometers, while soil had the greatest decline in area, with a total area of 105.96 square kilometers.

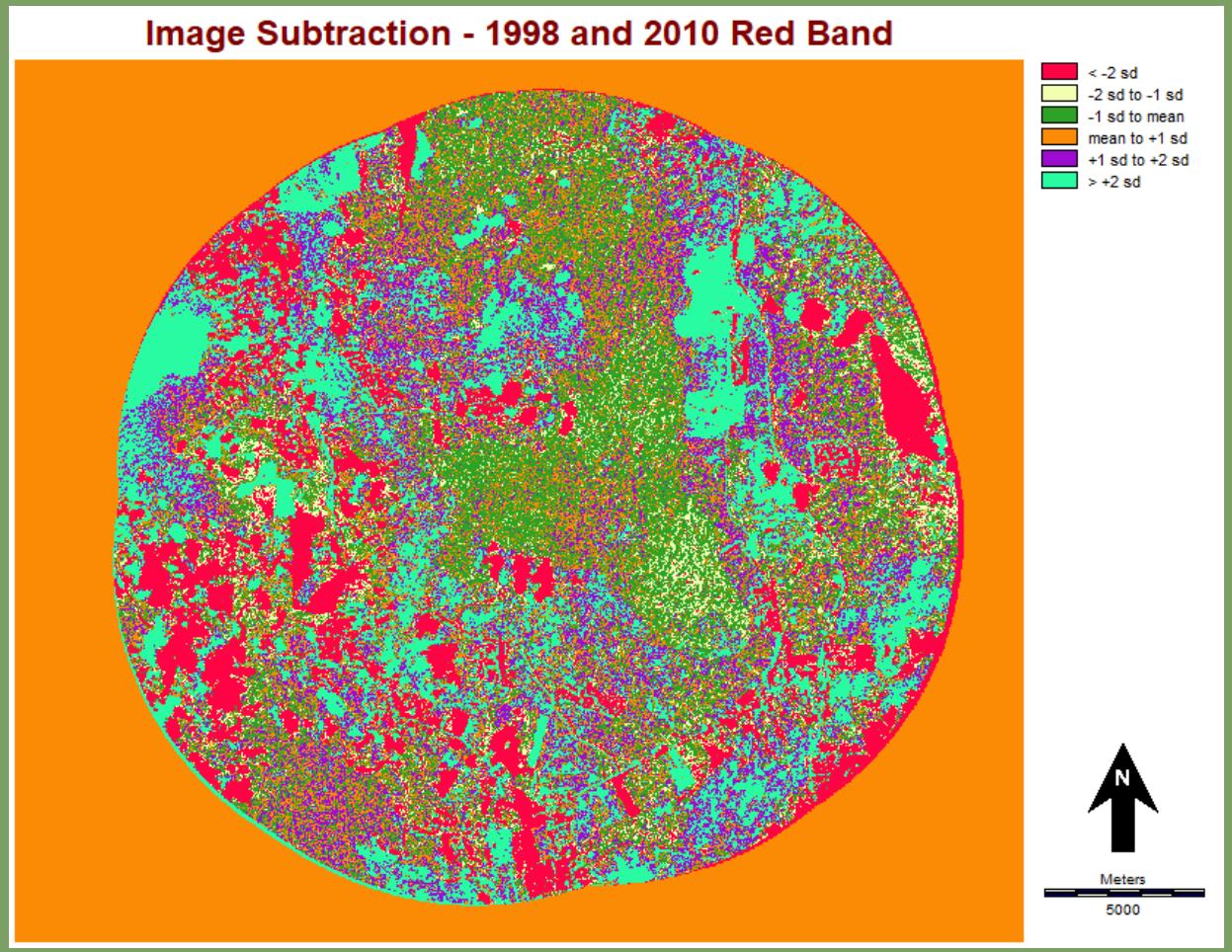
Result – Land Cover Changes 1998 -2010

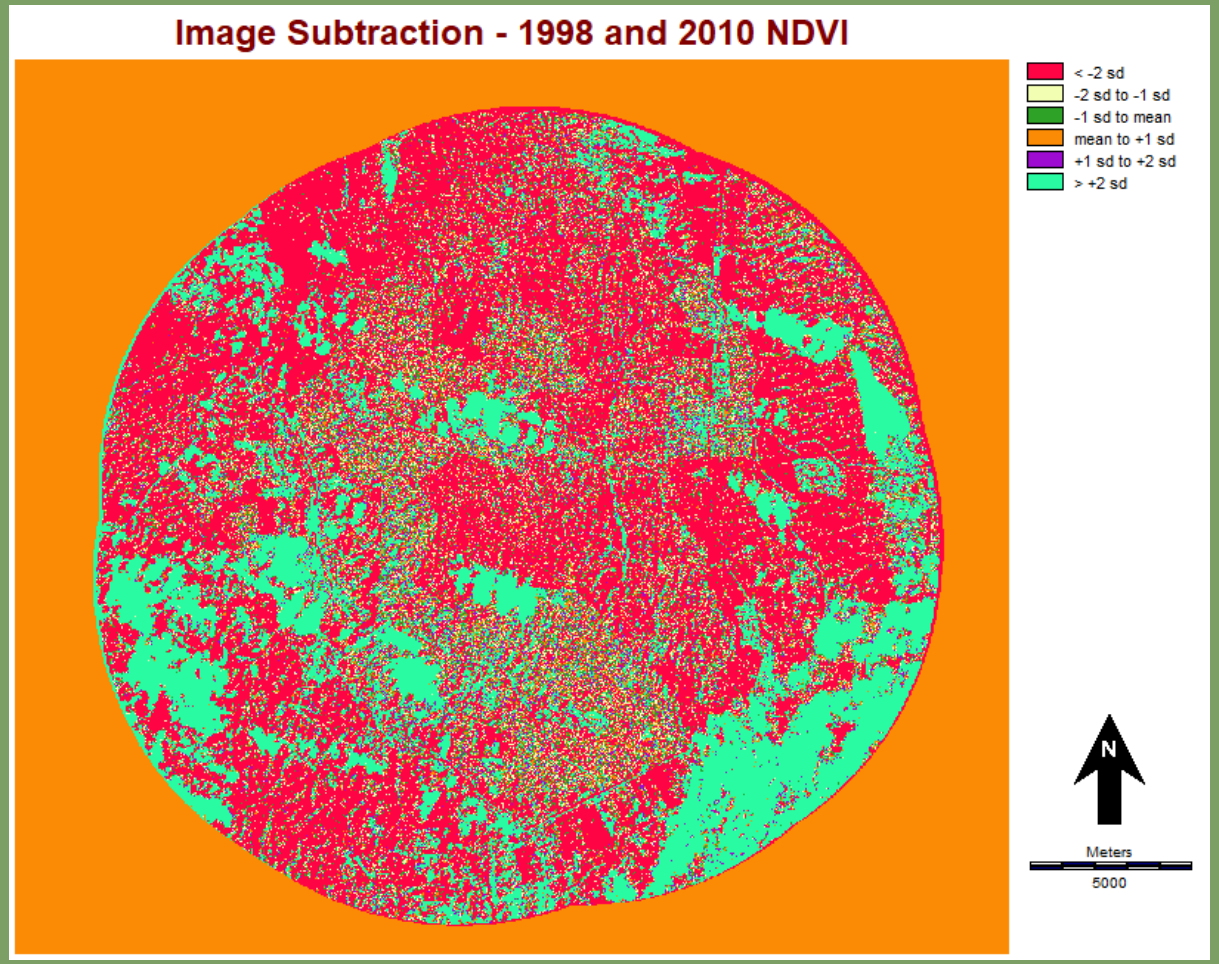




Agriculture had the most gain in area during this period, with a total increase of 77.68 square kilometers, while forest had the greatest decline in area, with a total area of 51.03 square kilometers.

Result – Image Subtraction Red Band and NDVI 1998 - 2010





Conclusion / Discussion

- The area of agriculture and soil changed the most significant between 1998 - 2004 and 2004 - 2010, and the distribution of agricultural and soil changes is almost overlapping. This is largely due to the replanting of the agricultural region following clearcutting in 2001.

- According to a comparison of the changes in 1998-2010, the most notable area loss was in the forest.

- According to the supervised classified agricultural area calculation, the area and proportion of agriculture have risen over time.

Limitation and Future Work

Data Issues

- Boundary
- Missing 2002 Data
- 2004 Image (Cloud)

Future Work

- Negative standard deviation in Forest Reserve
- Relationship between land cover changes on ecological environment
- Compare different period

Reference

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- Landsat-5 image courtesy of the U.S. Geological Survey


Thank you !!!