Impact of Change in Depth to Groundwater on Vegetation Cover – A Case Study for Portion of Upper Thal Doab, Punjab-Pakistan

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Scheme of Presentation

- Research Introduction
- Project Area Description
- Research Methodology
- Research Outcomes
- Conclusions

Research Introduction

- To find out usefulness of Space Technology in investigating groundwater level
- To find a relationship between groundwater and vegetation cover
- To see whether NDVI and NDMI could ascertain groundwater fluctuations

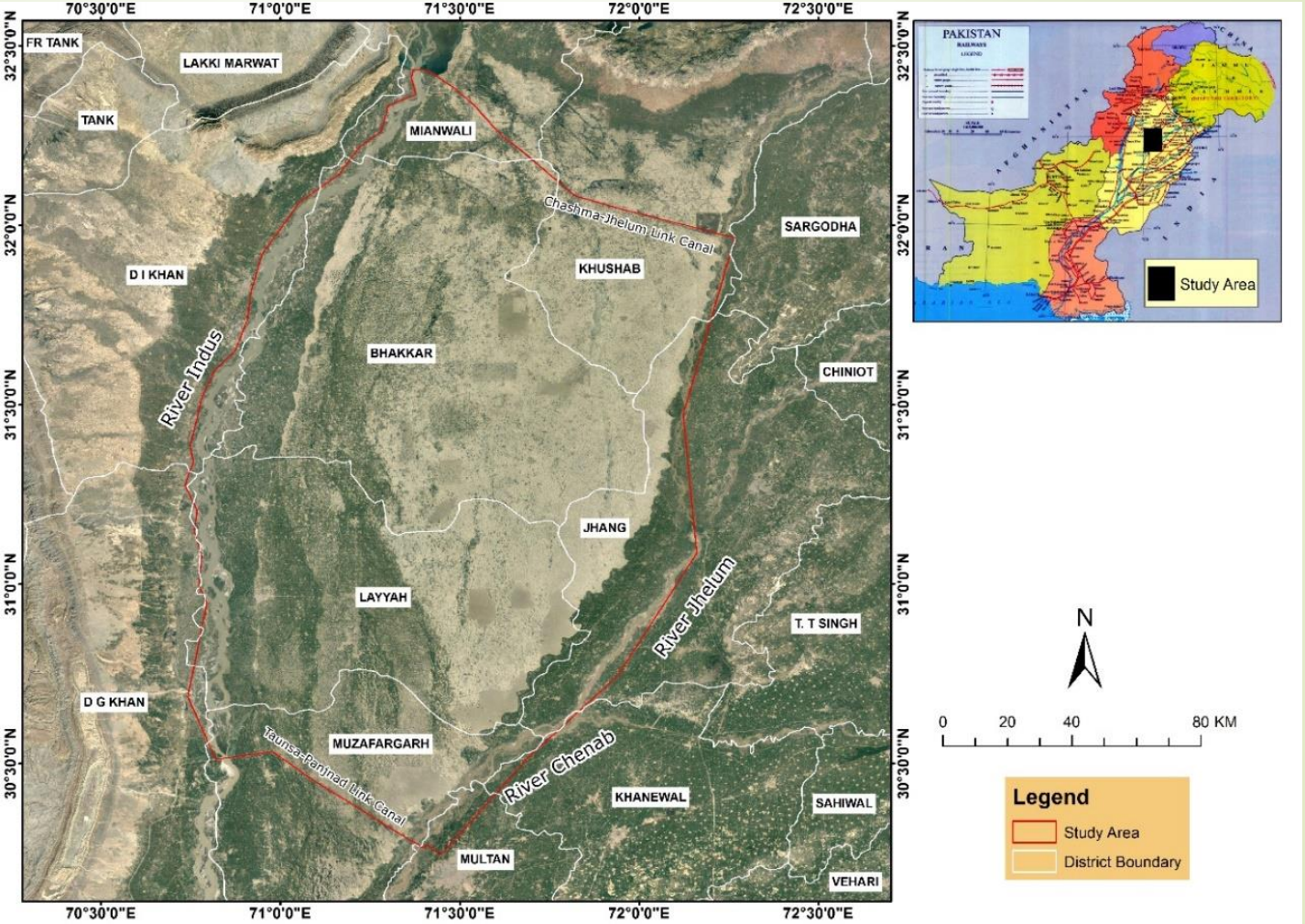
Research Introduction

- Groundwater emerged as an important natural resource in Indus basin, which is contributing about 40% in total water resources of Pakistan and play eminent role in sustainability of irrigated agriculture in the country.
- Groundwater exploitation for irrigation purposes has been tremendously increased in recent years in the Thal Doab, part of Indus basin.

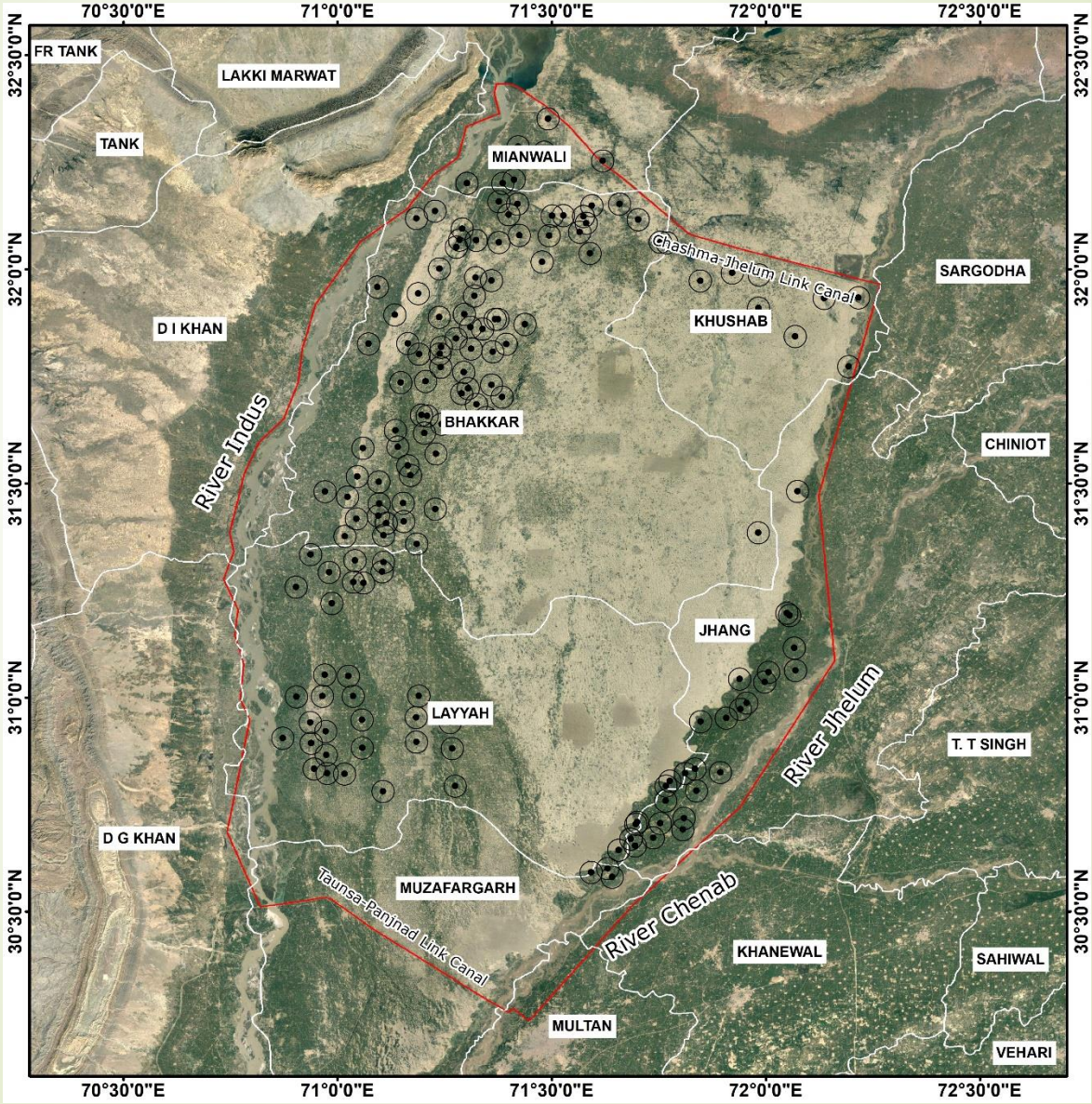
Research Introduction

- The Indus river basin represents an extensive groundwater aquifer, covering a gross command area of 16.2 million ha.

Project Area Description



Wells Location



Research Methodology

Data

- Depth to groundwater levels – 1998 to 2016
- Landsat images – pre and post monsoon

NDVI:

NDVI:(NIR-Red) / (NIR+Red)

For Landsat – 7 NDVI:(B4-B3) / (B4+B3)

For Landsat – 8 NDVI:(B5-B4) / (B5+B4)

Research Methodology

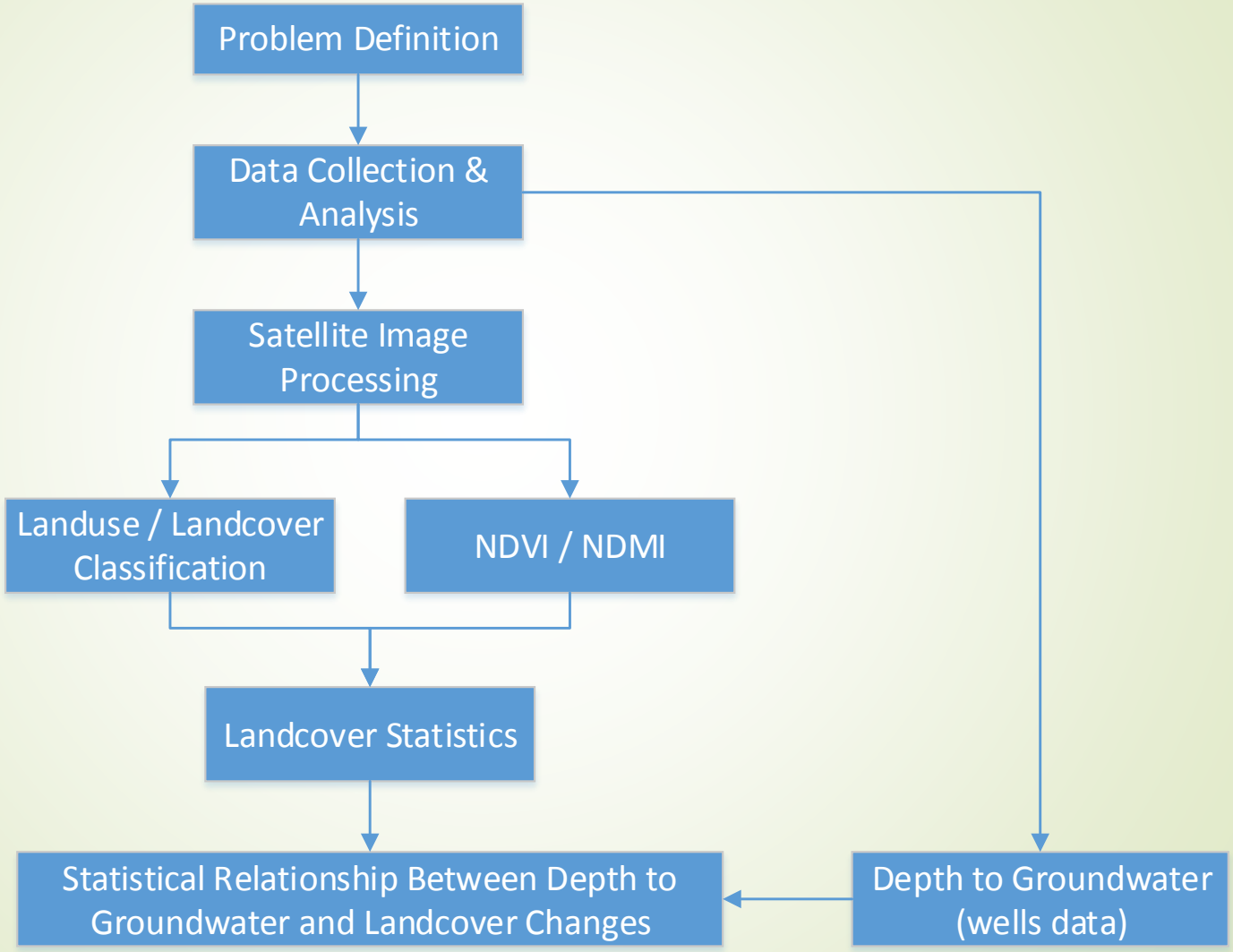
Data

NDMI: The Normalized Difference Moisture Index (NDMI) determines the different contents of humidity from landscape elements, specifically for soil and vegetation.

NDMI: (NIR-IR)/(NIR+IR)

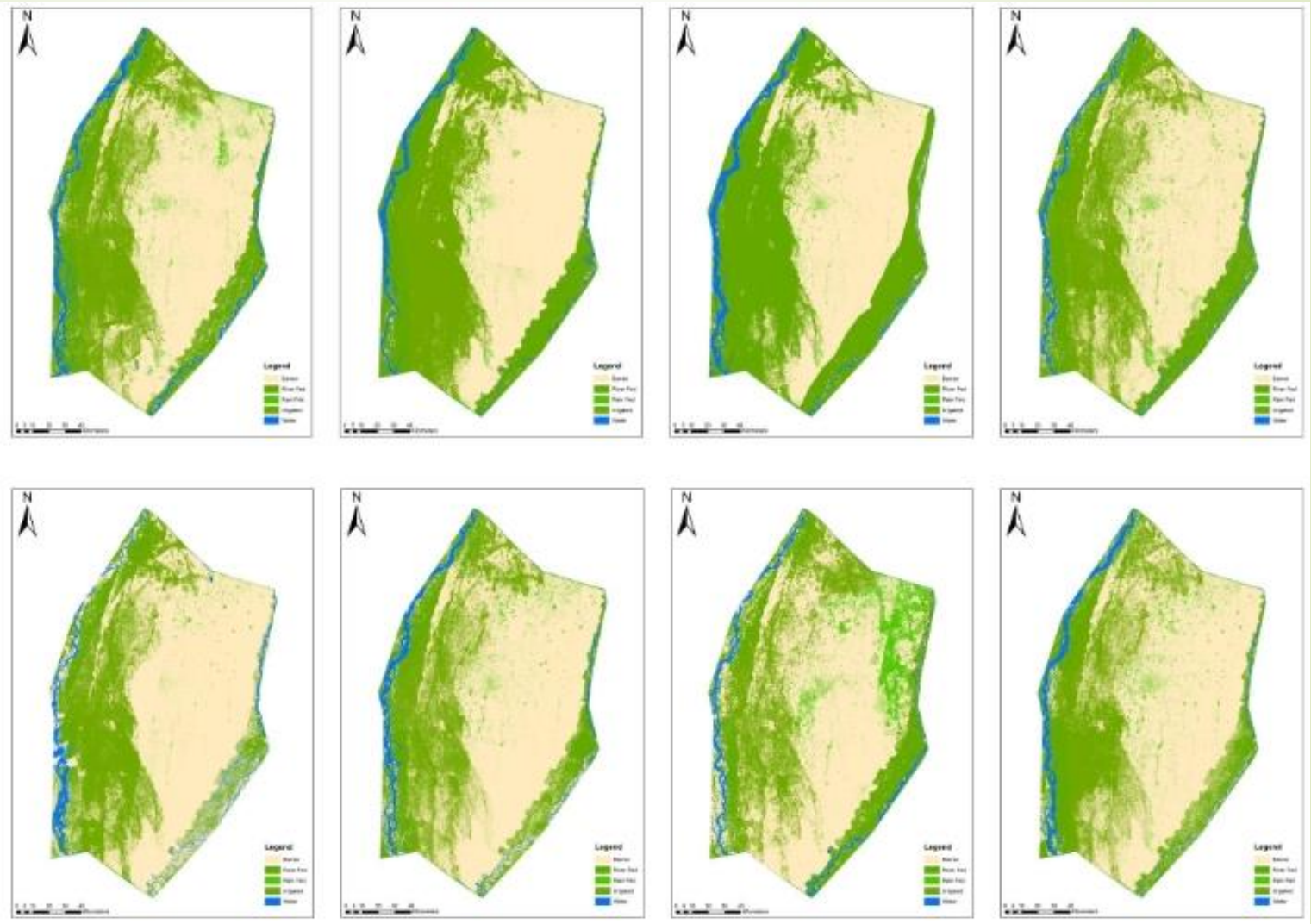
Landcover Classification: Supervised classification techniques were used for landcover classification.

Research Methodology



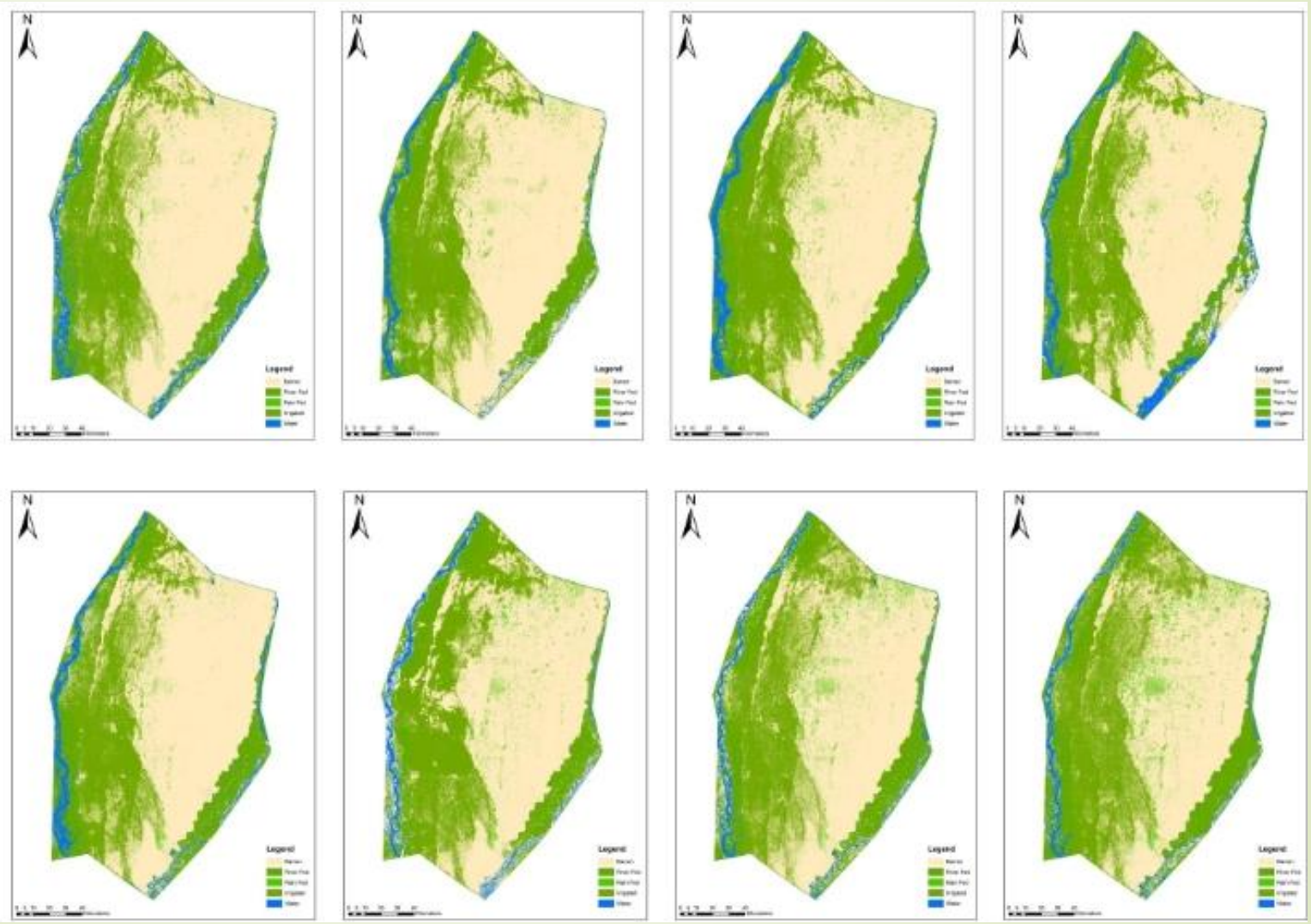
Research Outcomes

Pre Monsoon



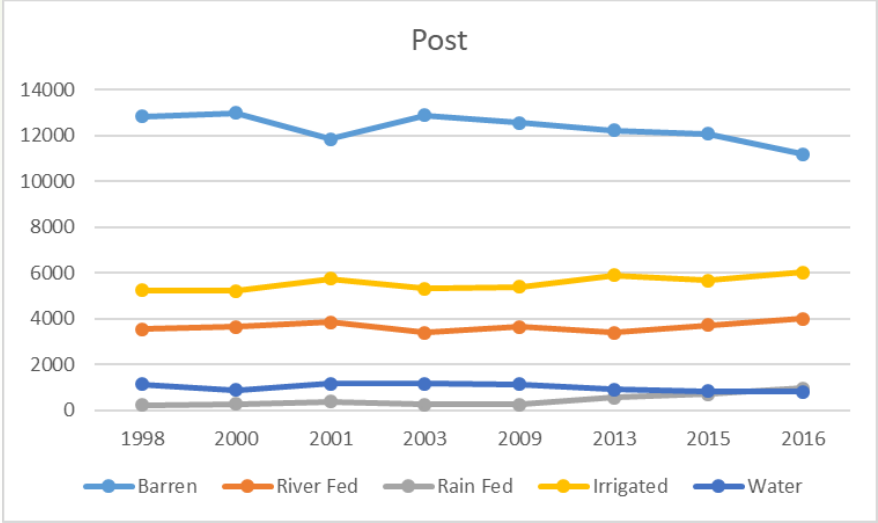
Research Outcomes

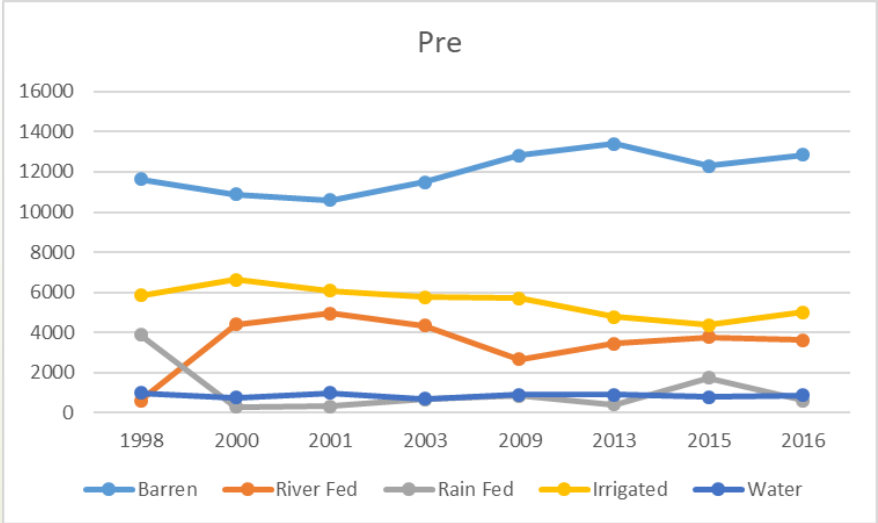
Post Monsoon



Research Outcomes

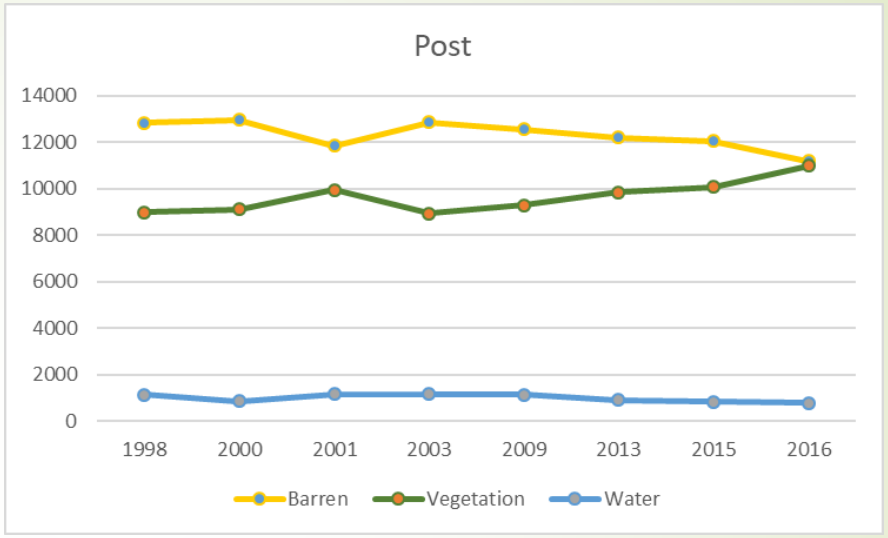
Landcover Classification Statistics

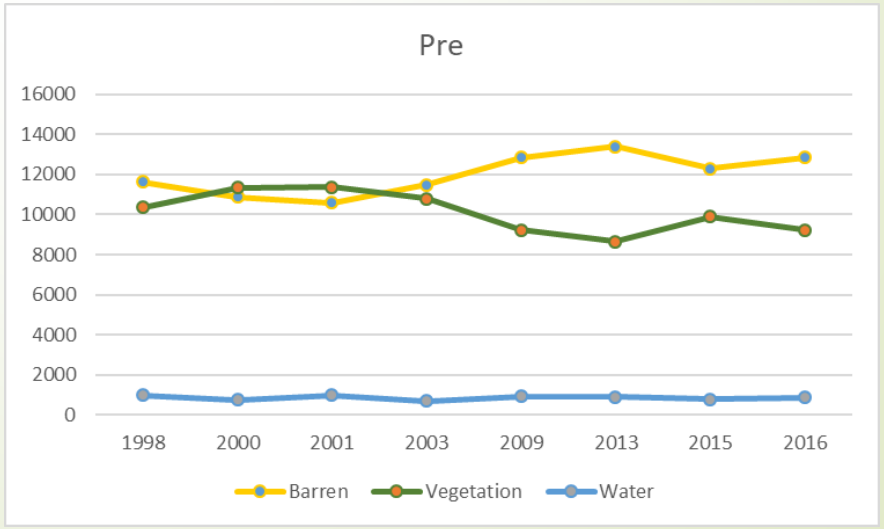


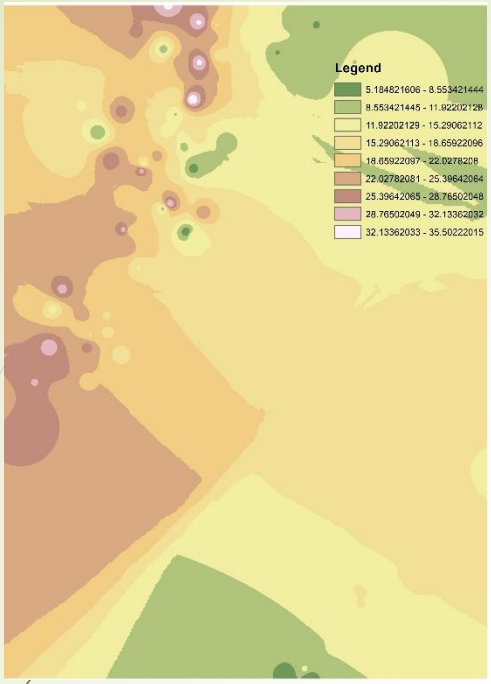


Research Outcomes

Landcover Classification Statistics



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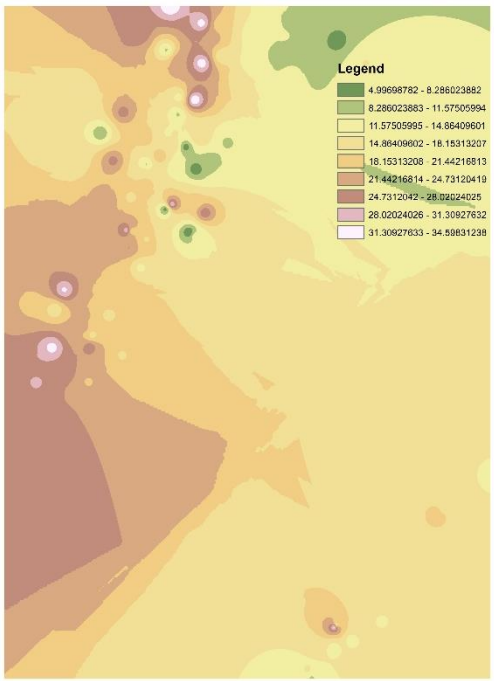
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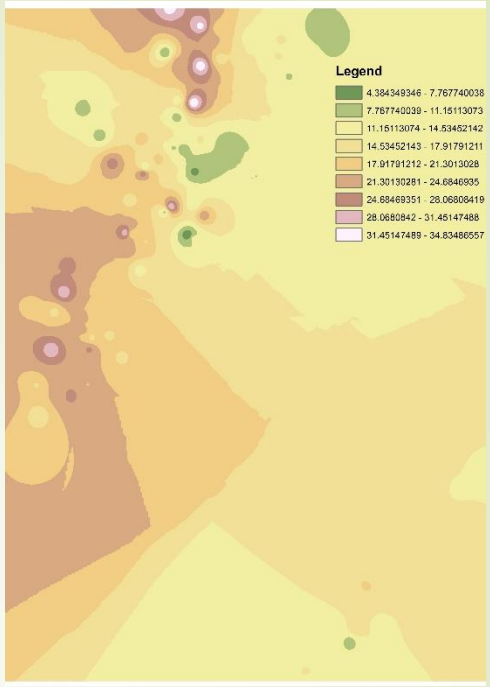
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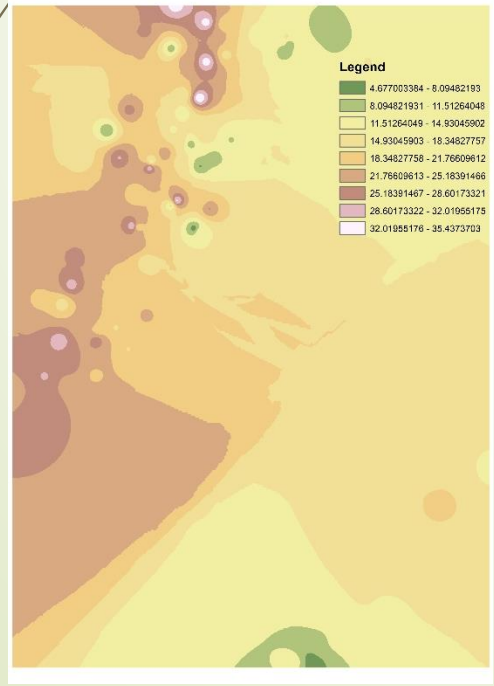
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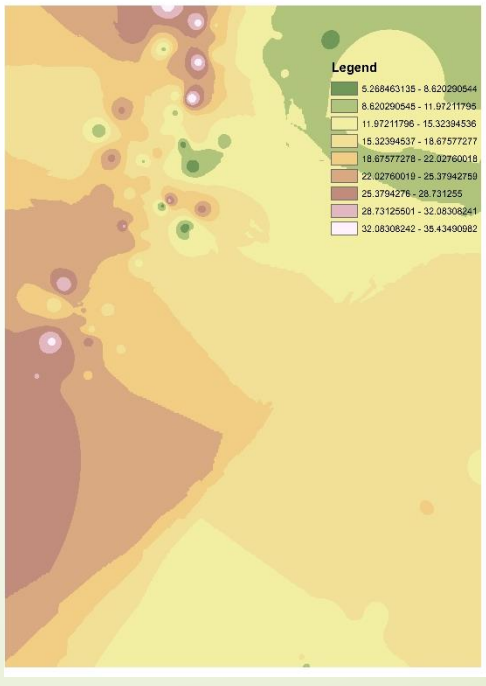
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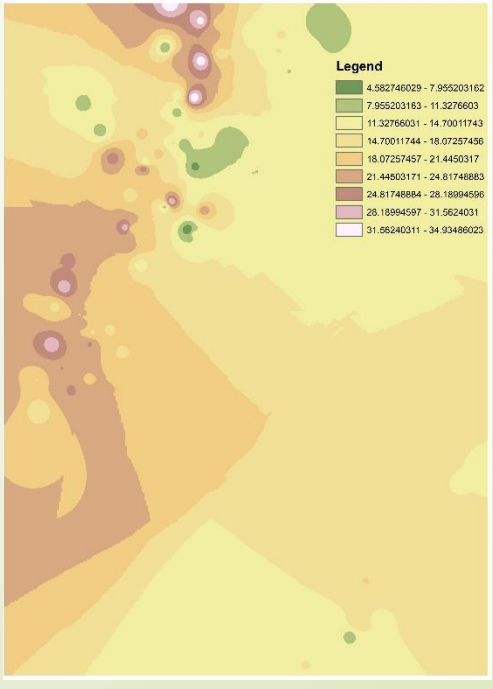
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Results

- The landcover classification shows the increase trend in biomass from 1998 onward. There is an increase of about 22 % in vegetation cover and 13 % and 7 % decrease in Barren and Water area respectively.
- Positive relationship was observed between increase in vegetation cover (from 9000.48 – 10984.64 sq km) and decrease in depth to groundwater (35.44 – 34.83 m) from 1998 to 2016.

Results

- The analysis shows that the decrease in depth to groundwater results an increase in biomass in general.
- Both the NDVI and NDMI results support the landcover classification results.
- Since the NDVI area indicates the biomass area, thus there is a direct relationship between vegetation cover, NDVI and depth to groundwater.

Results

- The results concluded that change in vegetation is linked with the change in groundwater depth.

Conclusions

- This study depicts that satellite remote sensing technology can be effectively utilized for investigating fluctuation in depth to groundwater and change in biomass covered area.
- Future scenarios on vegetation cover can be derived based on hydrological model results.

Conclusions

- Hence, remote sensing technology in conjunction with groundwater level data provides a better tool for management of groundwater resources and prediction on cropland area.
- This type of studies may provide a base for identification of depletion of groundwater resources.

Acknowledgements

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- Thanks