Central Research Institute for Dryland Agriculture

CRIDA

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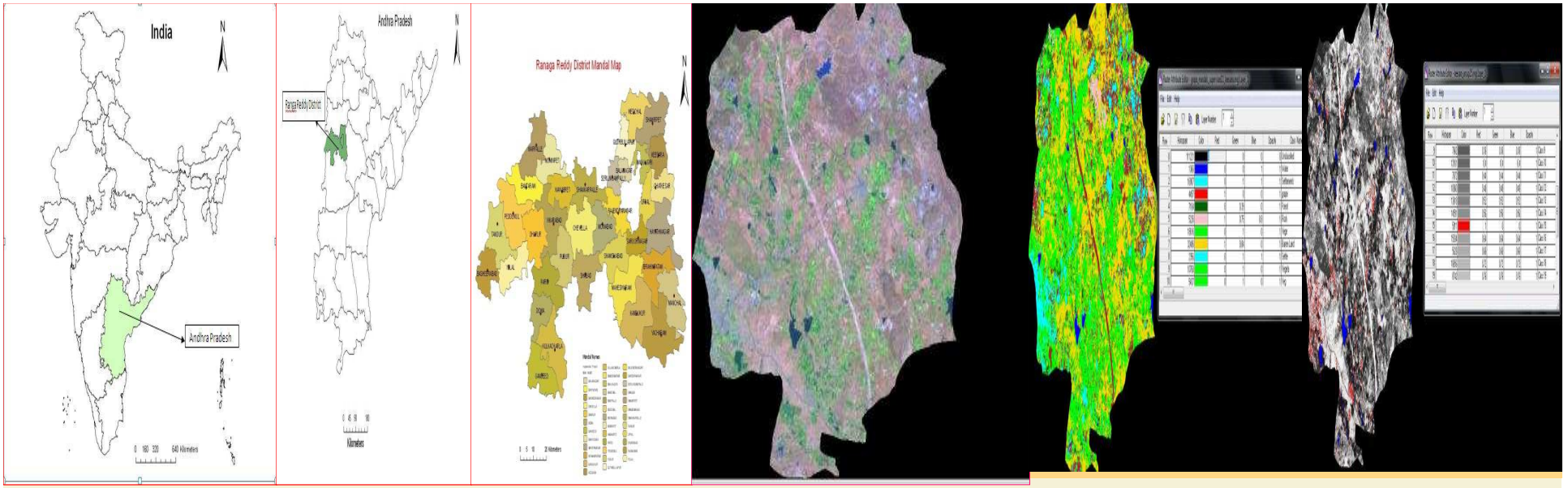

Grape Area Estimation using Spatial Technologies

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Overview of Presentation

- ✓ Introduction.
- ✓ objectives.
- ✓ Methodology .
- ✓ Results
- ✓ Conclusion .

Introduction

- ✓ Horticultural crops plays a unique role in India's economy and nutrition security.
- ✓ Over the years, horticulture has emerged as one of the potential agricultural enterprise in accelerating the growth of economy.
- ✓ These crops are grown in very vast regions in the country due to its adaptability to wider range of agro-climatic conditions
- ✓ At present, horticulture is contributing 24.5% of GDP from 8% land area.
- ✓ Grape, is most important fruit crops of India and grown for domestic and export purposes
- ✓ Reliable and timely estimates of area of horticultural crops provide valuable information in market planning and export.
- ✓ There is no systematic survey of grape orchard for area, and orchard status in the country,

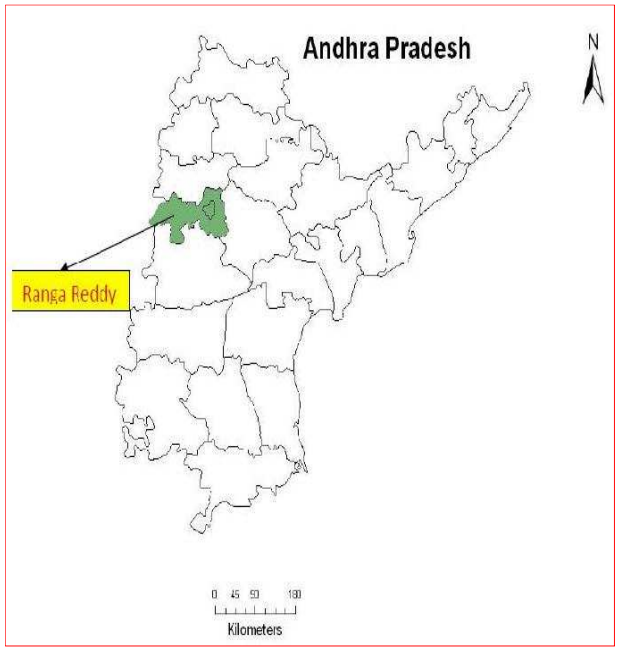
Introduction

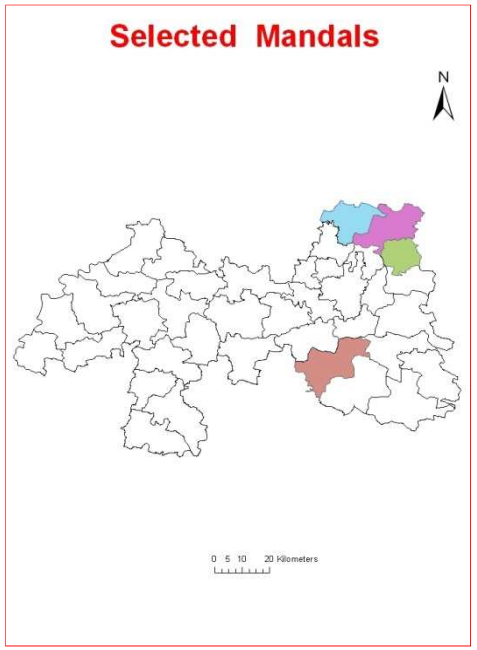
- ✓ In the traditional methods crop area estimation rely heavily on extensive ground truth data. Collection of this data is expensive and time consuming
- ✓ To overcome these problems the modern space technologies can appropriately be utilized to derive the required information in shorter time
- ✓ Remote sensing imagery and GIS can be used to identify different crop types, estimate crop area
- ✓ Keeping in view the importance of grape, in India, the space technology including remote sensing, Global Positioning System (GPS) and Geographical Information System (GIS) are used in delineating and estimate acreage of the grape..
- ✓ Processing of remote sensing data with minimal ground truth information can reduce both time and energy for crop area estimation

Objectives

- ✓To identify Grape orchard
- ✓To estimate area under grape
- ✓To validate area and with secondary data from Dept. of Horticulture.

Study Area





Ranga Reddy District is located in the Central Part of the Deccan Plateau and lies between 16^0 30' and 18^0 20' of North Latitude and 77^0 30' and 79^0 30' of East Longitudes

Four Mandals Shamerpet,Kesra, Medchal,Maheswaram mandals selected for study

Methodology-Data Sets Used

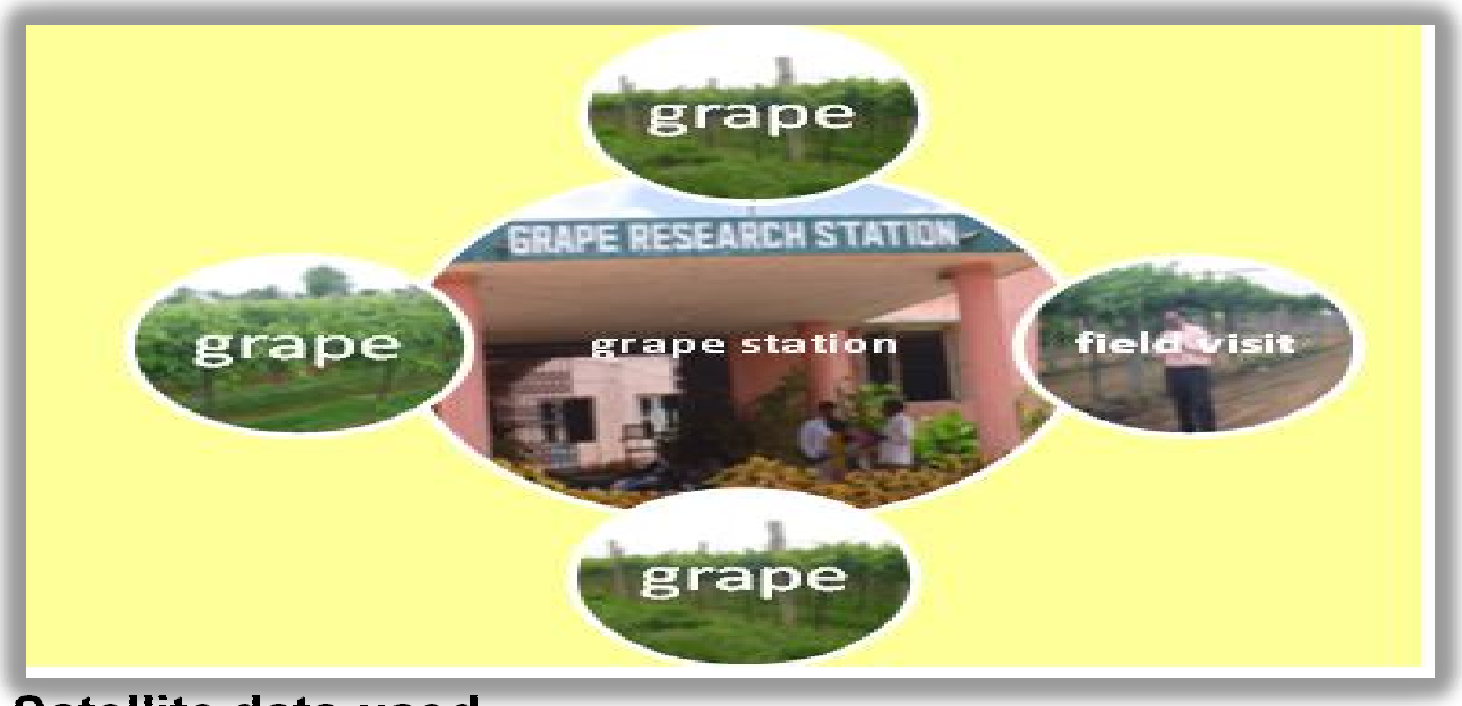
Data used

- Ancillary information collected from Departments of Horticulture, Agriculture and Institutes of Indian Council of Agricultural Research.

Field data/ground truth data collection

- Ground truth information, which involves gathering information on land cover types, their spatial extent, condition and geographical coordinates of the location was collected to determine the signature of grape orchards.
- The latitude, longitude and altitude were recorded with the help of global positioning system (GPS)

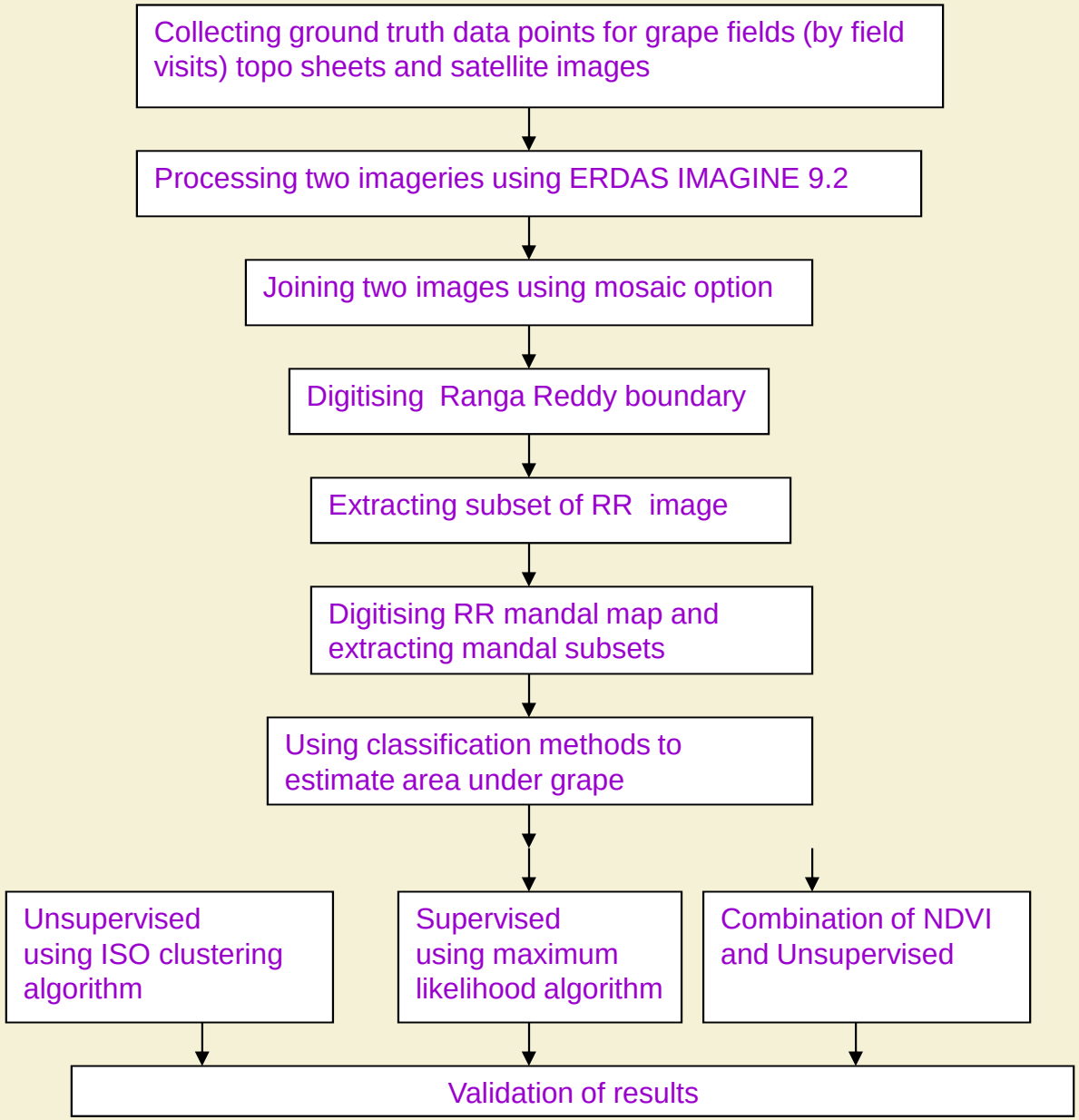
Methodology-Data Sets Used



Satellite data used

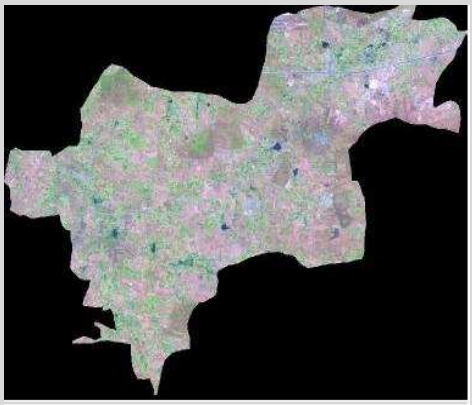
- IRS -1D digital data from LISS – III (path 99/60, of 21st March 2011 and 100/60 of 2nd March 2011), LISS – III (path 99/60, path 100/60 14 November 2008) and LIS IV were used.

Flow Chart

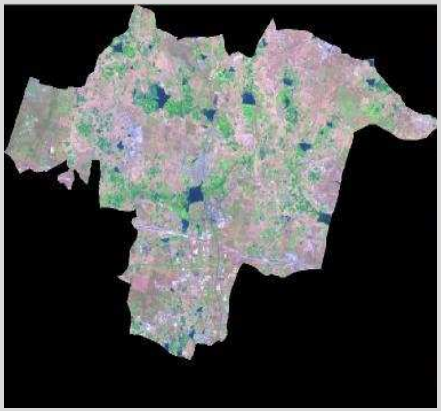

Collecting ground truth data points for grape fields (by field visits) topo sheets and satellite images
Processing two imageries using ERDAS IMAGINE 9.2
Joining two images using mosaic option
Digitising Ranga Reddy boundary
Extracting subset of RR image
Digitising RR mandal map and extracting mandal subsets
Using classification methods to estimate area under grape
Unsupervised using ISO clustering algorithm
Supervised using maximum likelihood algorithm
Combination of NDVI and Unsupervised
Validation of results

Selected Mandals

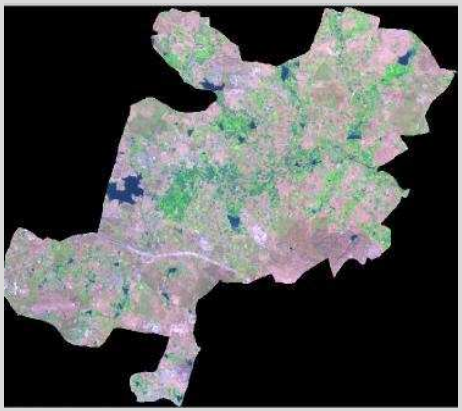
Keesra



Maheswaram



Medchal



Shamerpet

Supervised Classification(Method 1)

- User
  - ➢ specifies classes
  - ➢ create signatures for classes
  - ➢ required priory knowledge

- Using this method

✓ Signatures were created by Area of Interests(AOIs) using a tool SEED values

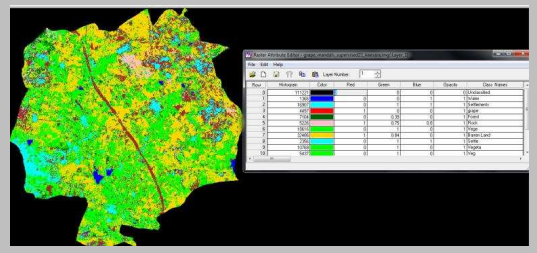
✓ Maximum likely hood rule was used .

✓ It uses seed statistics to define ellipses for each class.

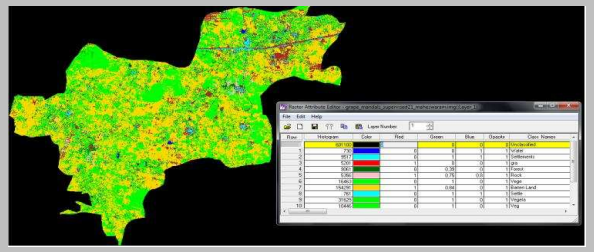
✓ Ellipses make it easier to separate similar classes.

✓ Five signature classes were selected to estimate grape crop in this classification.

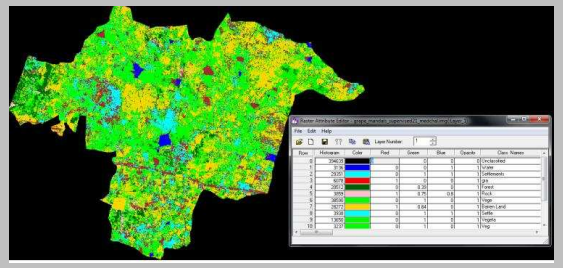
Results of Supervised Classification



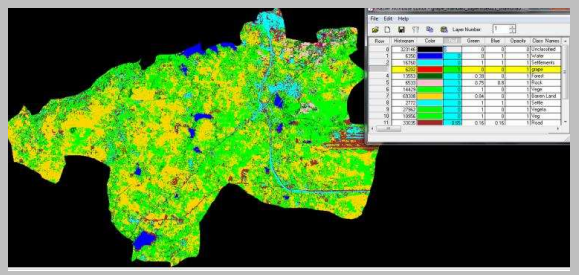
Keesara



Maheswaram



Medchal



Shamerpet

Un Supervised Classification(Method 2)

- Grape crop was identified among 30 total classes.
- Unsupervised classification avoids problems with the user biasing the classification with improper or poorly represented training data.
- As classes are generated by the ISODATA algorithm with the inquire cursor option features were wisely identified and assigned to different land cover types.

Un Supervised Classification(Method 2)

- ✓ The computer selects classes based on clustering of brightness values.
- ✓ This classification uses the Iterative Self-Organizing Data Analysis
- ✓ Technique (ISODATA) algorithm to execute the clustering of the image
- These clusters of pixels will correspond to different land cover classes.
- no *a priori* (before the fact) knowledge is needed.

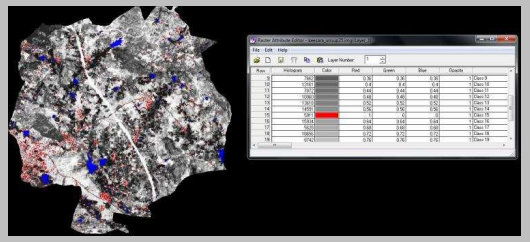
Using this method

with 30 classes or clusters (N)

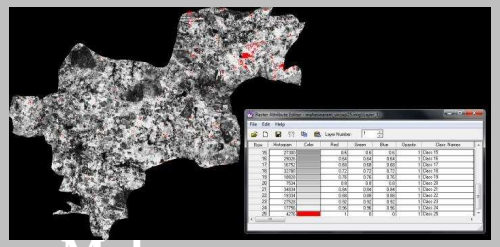
with 60 iterations (M)

at the convergence threshold 0.950 (T).

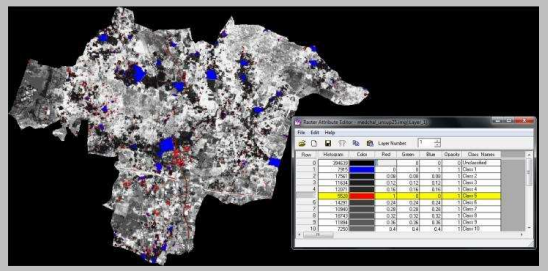
Unsupervised Classification



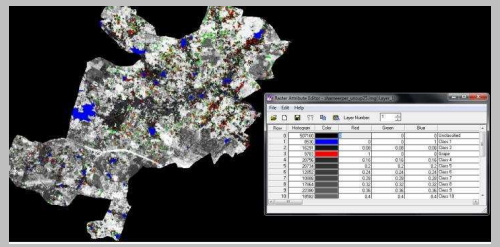
Keesara



Maheswaram



Medchal



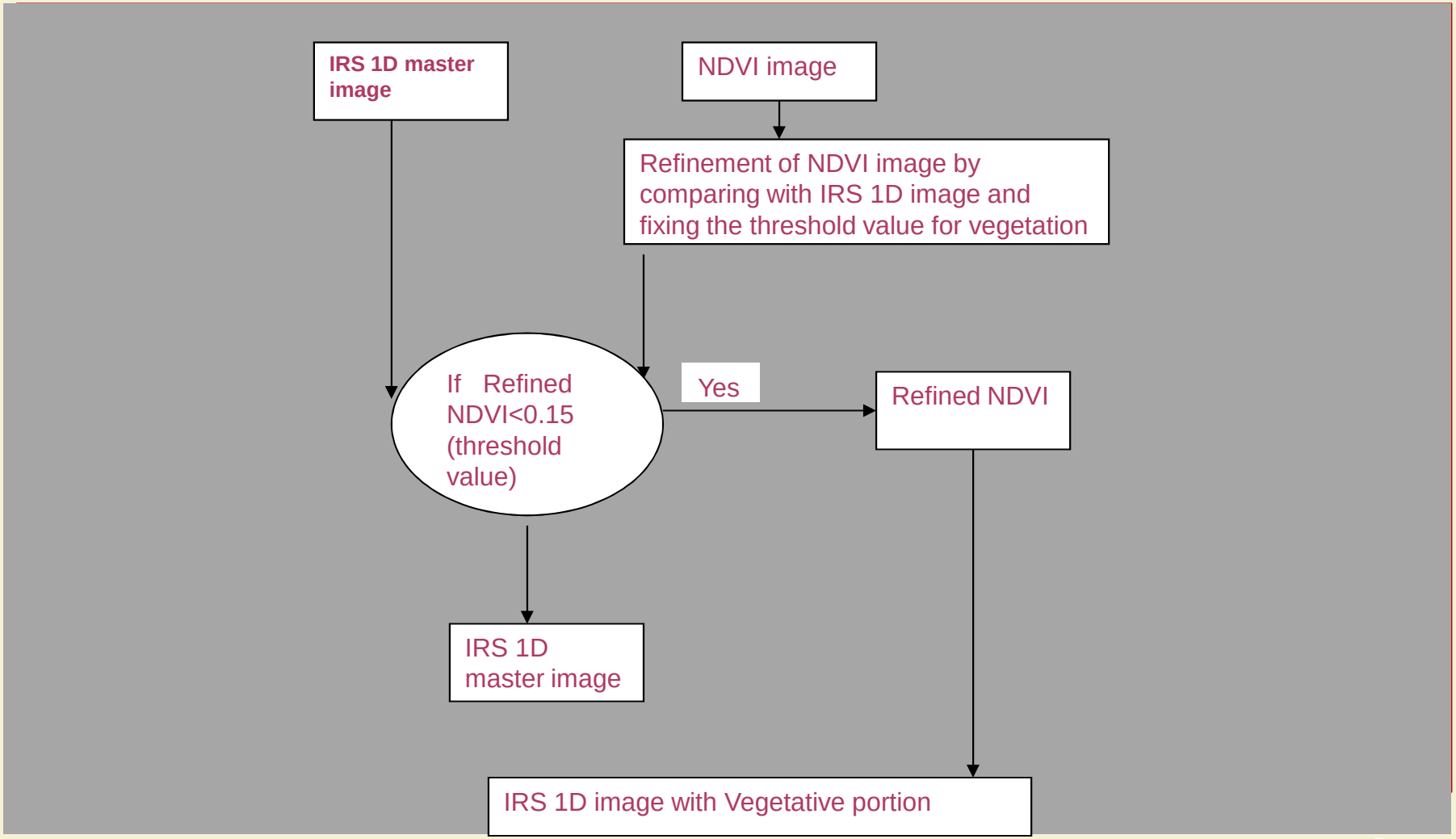
Shamerpet

NDVI+Un Supervised Classification(Method 3)

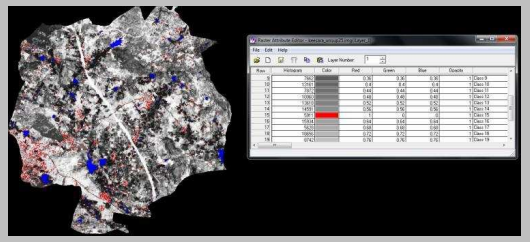
- The remote sensing data is used extensively for large area vegetation monitoring. Typically the spectral bands used for this purpose are visible and near IR bands.
- Spectral vegetation indices are mathematical combinations of different spectral bands mostly in the visible and near infrared regions (IR) of the electromagnetic spectrum for vegetation monitoring.
- The Normalized Difference Vegetation Index (NDVI) is frequently used Vegetation indices derived from satellite imagery.
- NDVI values are calculated in each pixel .NDVI is given by

  NDVI = (near IR band - red band) / (near IR band + red band)
- Maximum range of NDVI is[-1 1].
- NDVI being typically between 0.1 and 0.6 values at the higher end of the range indicating increased photosynthetic activity and a greater density of the canopy .

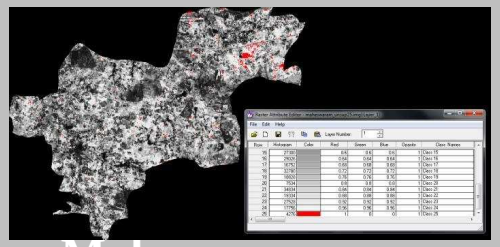
NDVI+ Un Supervised Classification(Method 3)



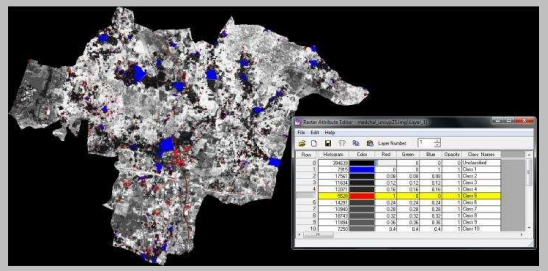
NDVI + Unsupervised Classification



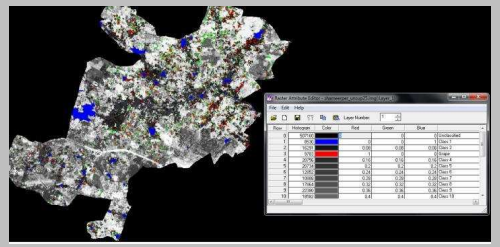
Keesara



Maheswaram



Medchal



Shamerpet

Grape area estimated under different classification methods

Mandal name	Grape area (hectares) under different classifications) (percentage of difference between observed and calculated values)			
	Supervised	**Unsupervised**	**NDVI+Unsupervised**	**Observed Data**
Grape area				
Shamerpet	1531.5(-21.25)	1470.26(-17.97)	1315.32(-8.31)	1206
Keesara	1104.34(-34.62)	1002.43(-27.97)	886.78(-18.58)	722
Medchal	1009.65(-39.48)	997.28(-38.7)	712.63(-14.26)	611
Maheswaram	836.22(-38.8)	771.14(-34.7)	575.36(-12.57)	503
	4481.71	4241.11	3490.09	3042
Perc.diff	-32.14	-28.27	-12.83	

Table : Grape are estimated under different classification methods and percentage of differences over observed values

Conclusion

- By the supervised classification process grape area was overestimated on an average by 32.14% for 4 major grape growing mandals.
- There was 28.27 % over estimation observed with unsupervised classification.
- ✓The combination method of NDVI and unsupervised classification appears to be effective for estimating area under grape in this study


THANK YOU