Fundamentals of Spatial Analysis
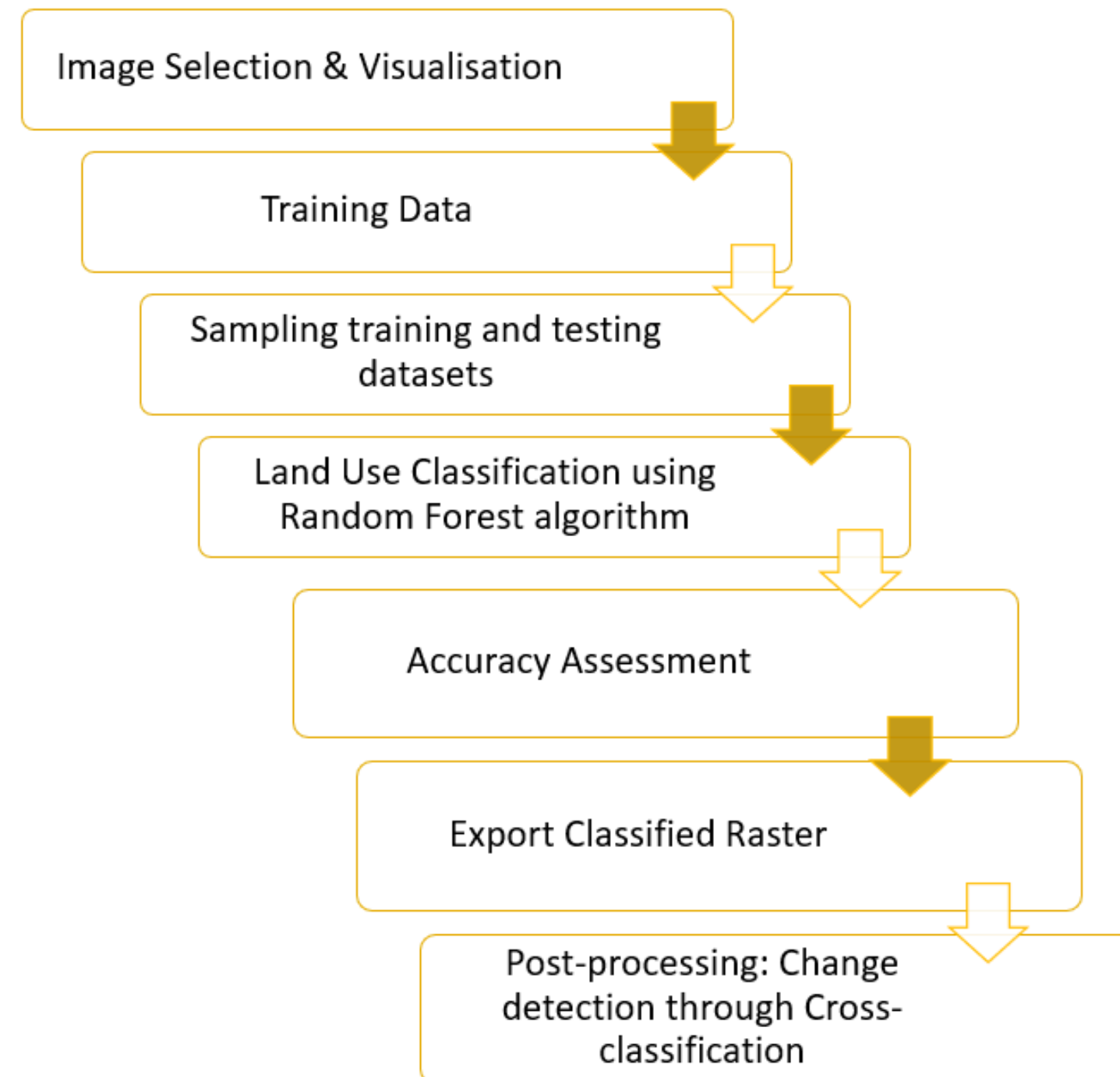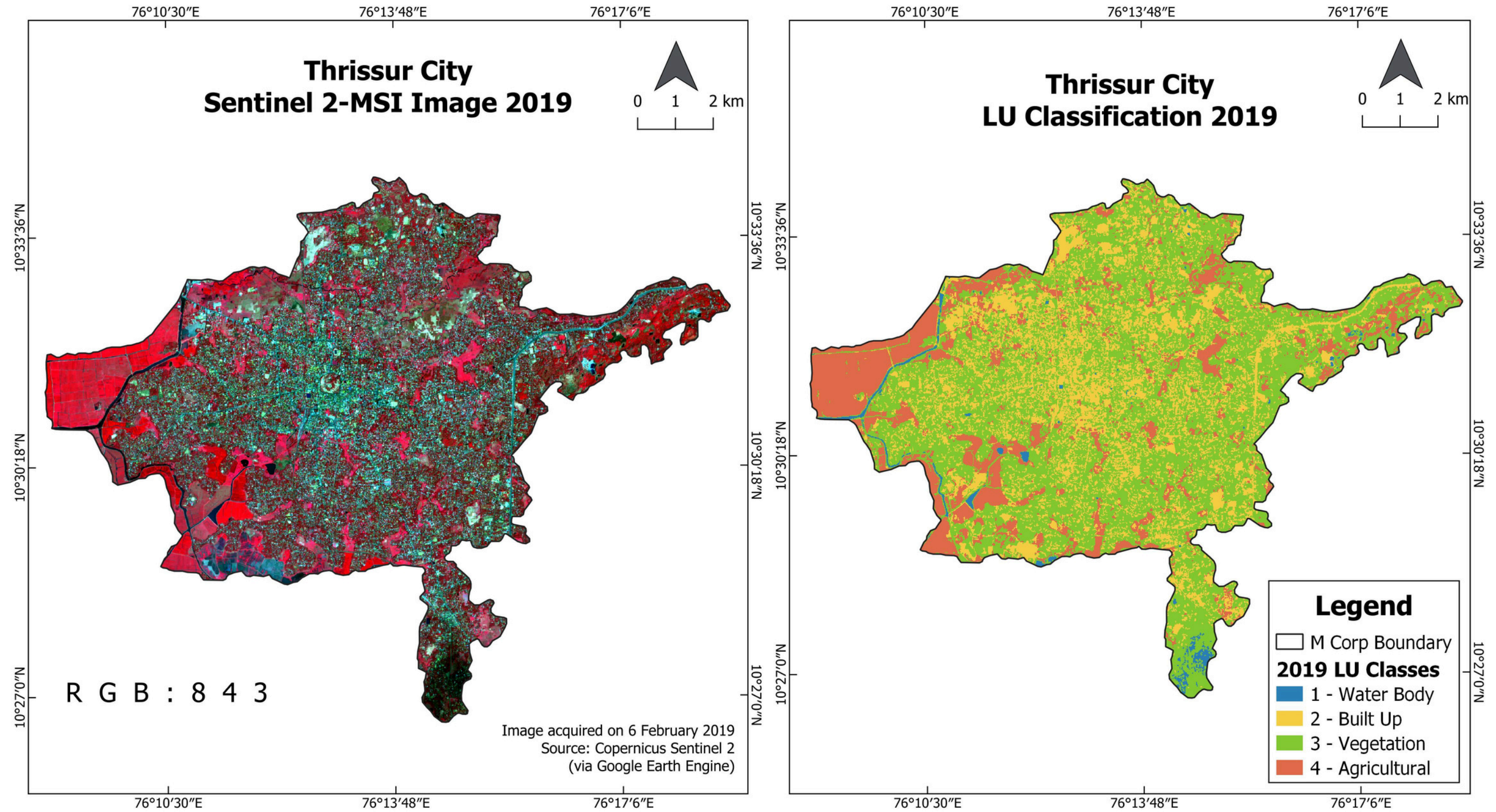
THRISSUR CITY

Supervised LU classification, Accuracy Assessment & Change Detection

Nandini Bhatnagar   *H2024CG012*   *M. A. Cities and Governance, Sem II*

Supervised LU Classification: Methodology

Image Selection & Visualisation

Training Data

Sampling training and testing datasets

Land Use Classification using Random Forest algorithm

Accuracy Assessment

Export Classified Raster

Post-processing: Change detection through Cross-classification

Supervised LU Classification for Thrissur City
using Sentinel 2 Imagery 2019

**Thrissur City
Sentinel 2-MSI Image 2019**

0   1   2 km

R G B : 8 4 3

Image acquired on 6 February 2019
Source: Copernicus Sentinel 2
(via Google Earth Engine)

**Thrissur City
LU Classification 2019**

0   1   2 km

Legend
☐ M Corp Boundary
2019 LU Classes
■ 1 - Water Body
■ 2 - Built Up
■ 3 - Vegetation
■ 4 - Agricultural

Accuracy for Supervised LU Classification 2019

Confusion Matrix:

▼List (5 elements)
 ▶0: [0,0,0,0,0]
 ▶1: [0,3,0,2,0]
 ▶2: [0,0,10,0,0]
 ▶3: [0,0,0,6,0]
 ▶4: [0,0,1,1,8]

Overall Accuracy:

0.8709677419354839

Kappa Coefficient:

0.8233618233618232

Producer's Accuracy:

[[0],[0.6],[1],[1],[0.8]]
 ▶0: [0]
 ▶1: [0.6]
 ▶2: [1]
 ▶3: [1]
 ▶4: [0.8]
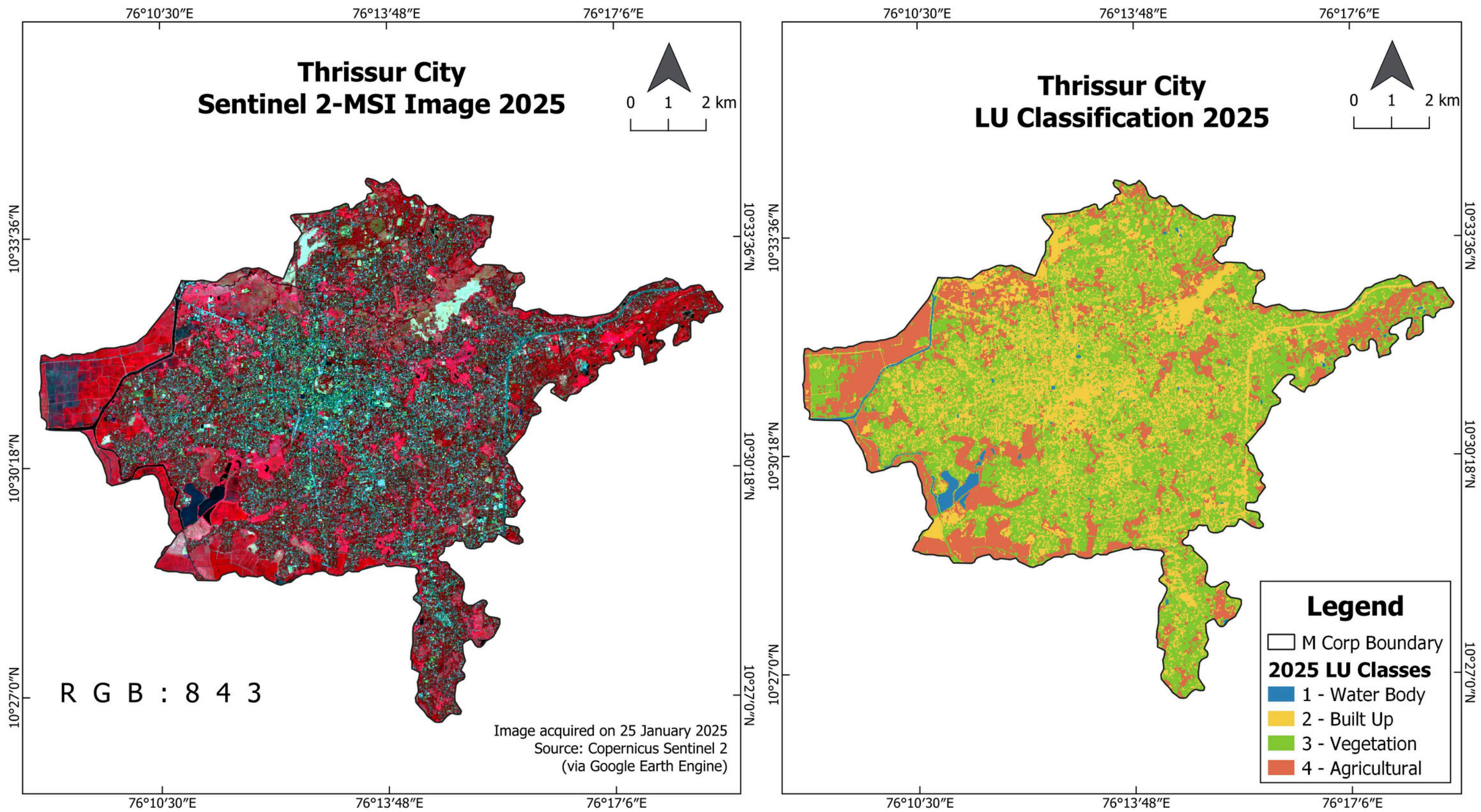
User's Accuracy: JSON

[[0,1,0.9090909090909091,0.6666666666666666...   JSON
 ▼0: [0,1,0.9090909090909091,0.6666666666666666...
    0: 0
    1: 1
    2: 0.9090909090909091
    3: 0.6666666666666666
    4: 1

Supervised LU Classification for Thrissur City using Sentinel 2 Imagery 2025

**Thrissur City
Sentinel 2-MSI Image 2025**

0 1 2 km

R G B : 8 4 3

Image acquired on 25 January 2025
Source: Copernicus Sentinel 2
(via Google Earth Engine)

**Thrissur City
LU Classification 2025**

0 1 2 km

Legend

☐ M Corp Boundary

2025 LU Classes
- 1 - Water Body
- 2 - Built Up
- 3 - Vegetation
- 4 - Agricultural

Accuracy for Supervised LU Classification 2025

Confusion Matrix:

▼List (5 elements)
- ▶0: [0,0,0,0,0]
- ▶1: [0,5,0,0,0]
- ▶2: [0,0,24,2,0]
- ▶3: [0,0,1,9,1]
- ▶4: [0,0,2,1,12]

Overall Accuracy:

0.8771929824561403

Kappa Coefficient:

0.818223346241457

Producer's Accuracy:

▼List (5 elements)
- ▶0: [0]
- ▶1: [1]
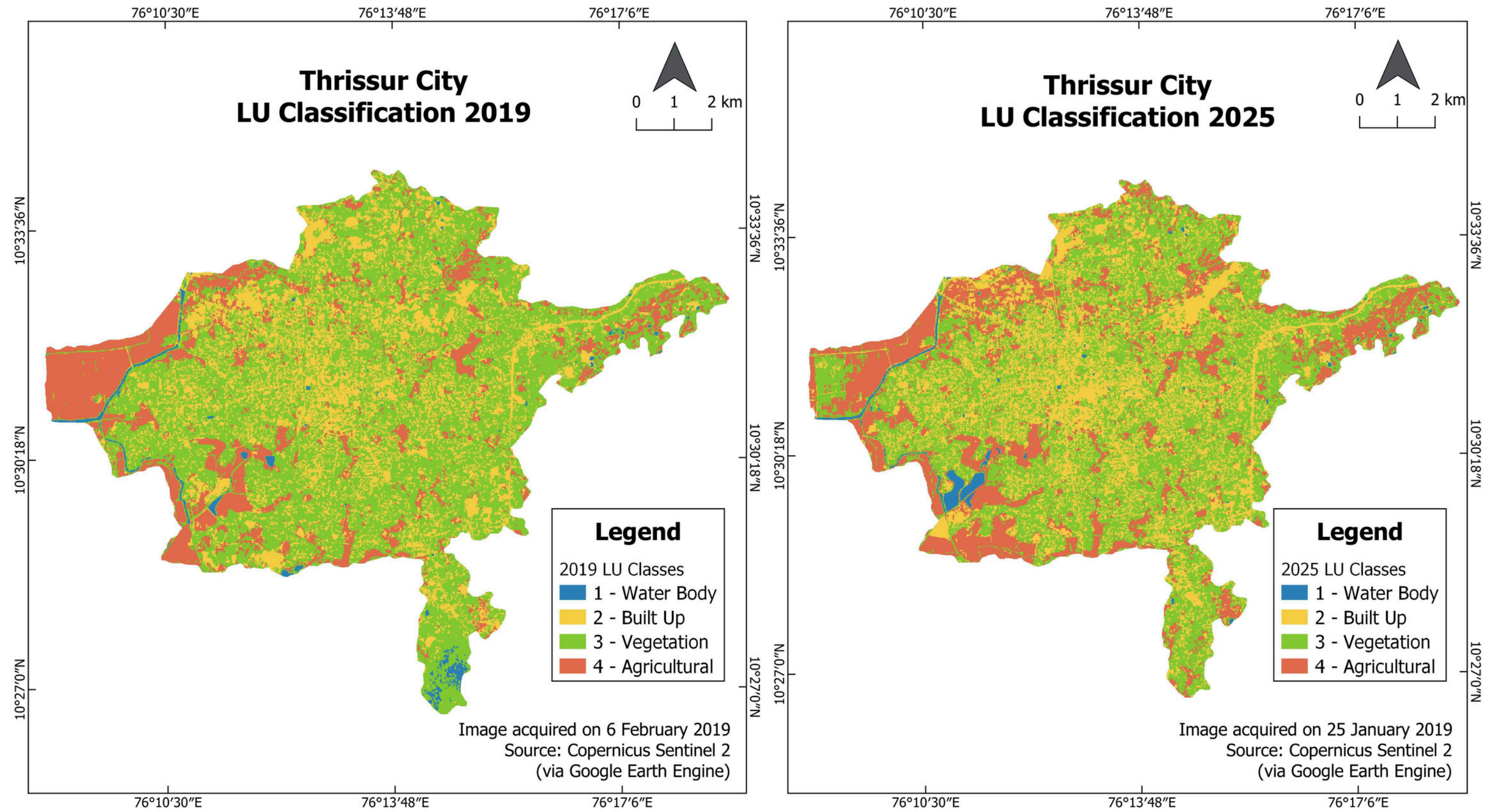- ▶2: [0.9230769230769231]
- ▶3: [0.8181818181818182]
- ▶4: [0.8]

User's Accuracy: JSON
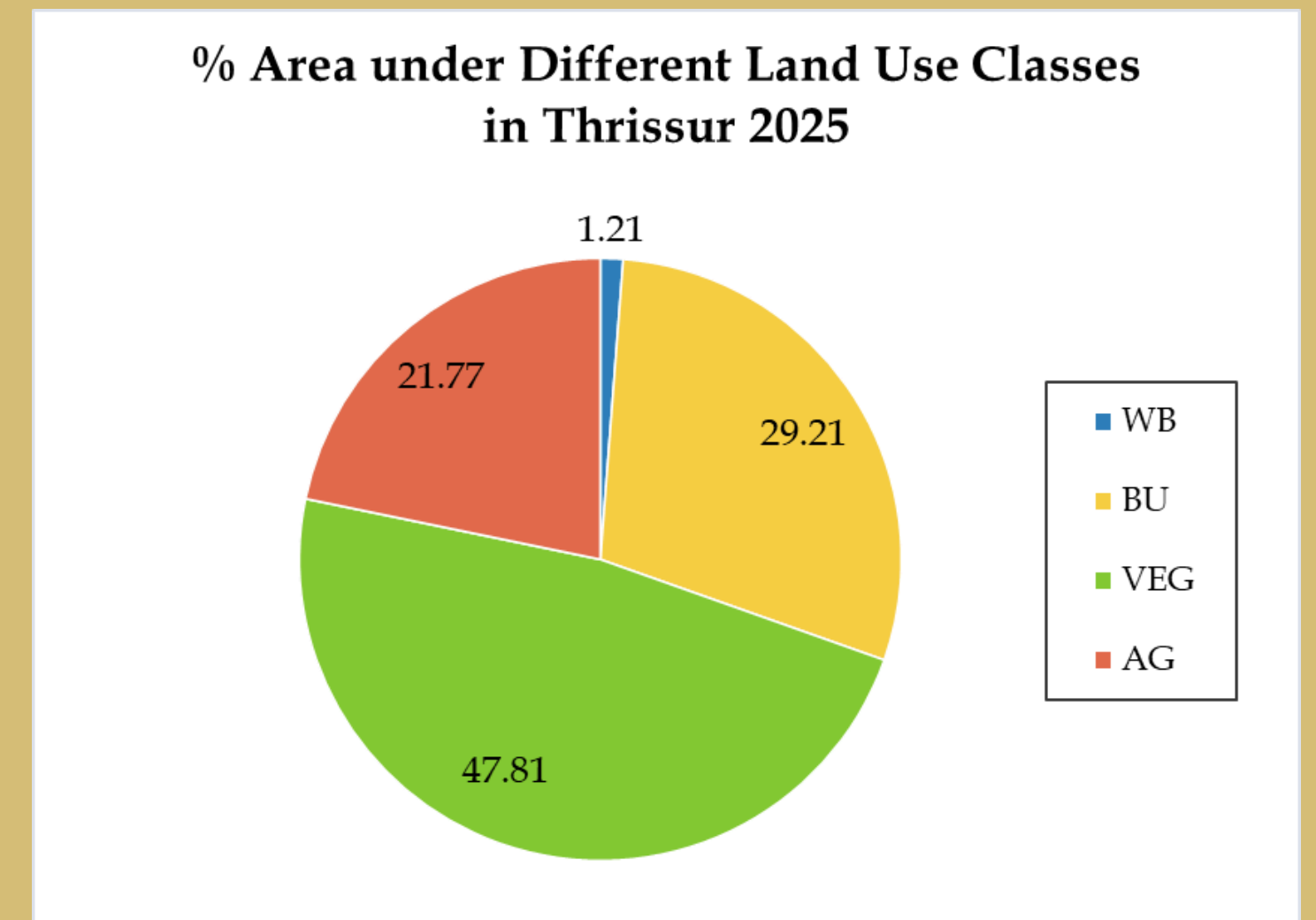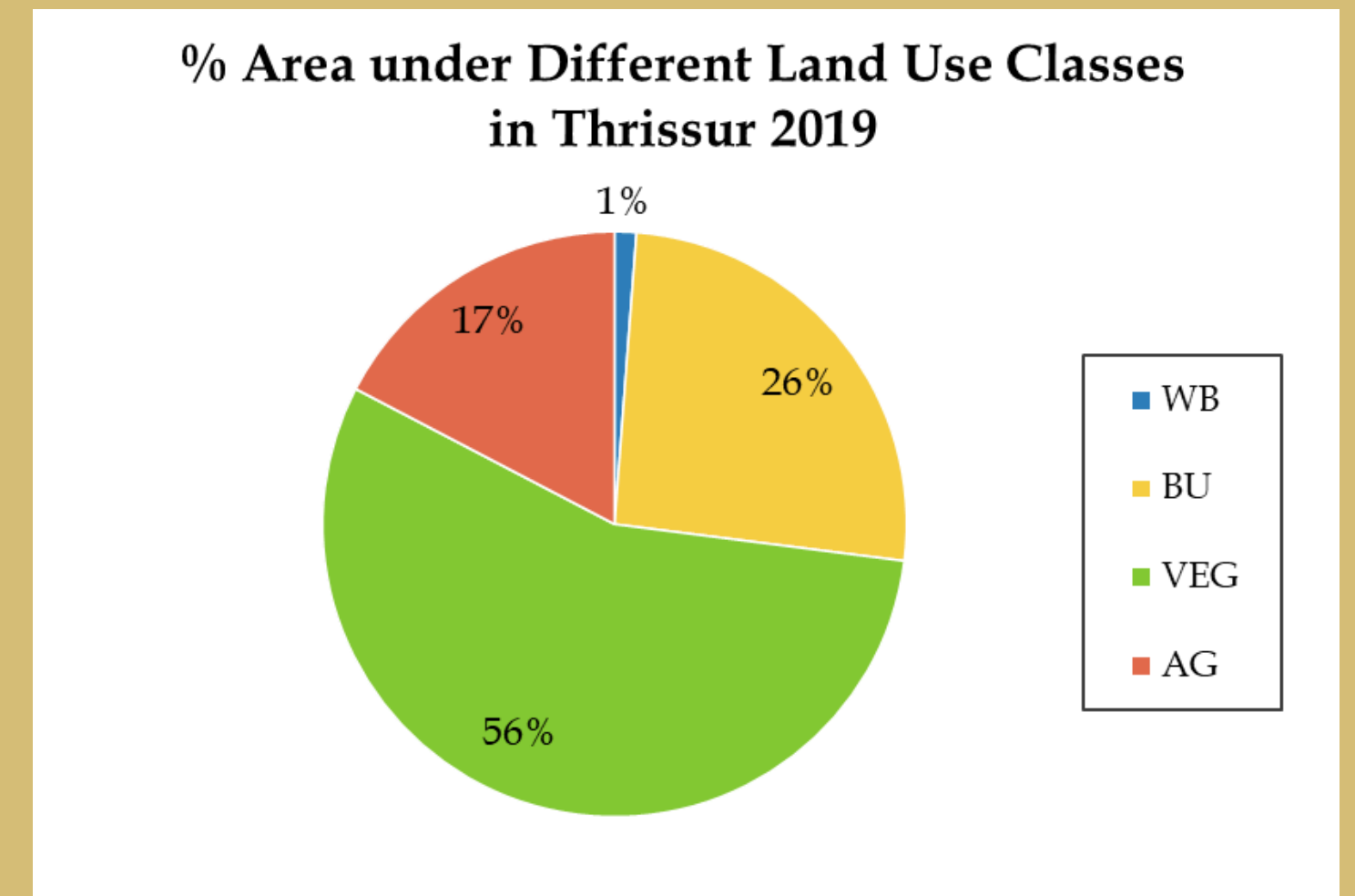
▼[[0,1,0.8888888888888888,0.75,0.9230769230769…   JSON
  ▼0: [0,1,0.8888888888888888,0.75,0.9230769230769…
    0: 0
    1: 1
    2: 0.8888888888888888
    3: 0.75
    4: 0.9230769230769231

LU Change in Thrissur City
2019 vs. 2025

**Thrissur City
LU Classification 2019**

0   1   2 km

76°10'30"E   76°13'48"E   76°17'6"E

10°33'36"N
10°30'18"N
10°27'0"N

Legend

2019 LU Classes
1 - Water Body
2 - Built Up
3 - Vegetation
4 - Agricultural

Image acquired on 6 February 2019
Source: Copernicus Sentinel 2
(via Google Earth Engine)

**Thrissur City
LU Classification 2025**

0   1   2 km

76°10'30"E   76°13'48"E   76°17'6"E

10°33'36"N
10°30'18"N
10°27'0"N

Legend

2025 LU Classes
1 - Water Body
2 - Built Up
3 - Vegetation
4 - Agricultural

Image acquired on 25 January 2019
Source: Copernicus Sentinel 2
(via Google Earth Engine)

Class-wise Land Use Distribution in 2019 and 2025

Area under Different Land Use Classes in Thrissur (2019 vs. 2025)

Area (sq. km)

Land Use Class	2019	2025
WB	1.285	1.289
BU	27.39	31.05
VEG	59.12	50.76
AG	18.43	23.12

■ 2019 ■ 2025

% Area under Different Land Use Classes in Thrissur 2019

1%
26%
17%
56%

- WB
- BU
- VEG
- AG

% Area under Different Land Use Classes in Thrissur 2025

1.21
29.21
21.77
47.81

- WB
- BU
- VEG
- AG

Land Use Change in Thrissur from 2019 to 2025

LULC Class	Area 2019	2019%	Area 2025	2025%	Change in Area	Change in %
WB	1.285	1.2	1.289	1.21	0.004	0.31
BU	27.39	25.8	31.05	29.21	3.66	13.35
VEG	59.12	55.65	50.76	47.81	-8.35	-14.13
AG	18.43	17.35	23.12	21.77	4.69	25.47
Total	106.22	100	106.22	100		

Land Use Change Matrix from 2019 to 2025

LULC Class	WB	BU	VEG	AG	LULC 2019
WB	0.46	0.07	0.53	0.14	1.21
BU	0.33	17.11	5.54	2.82	25.8
VEG	0.24	10.5	38.78	6.12	55.65
AG	0.19	1.51	2.96	12.69	17.35
LULC 2025	1.21	29.2	47.82	21.77	100

Conclusion

- Supervised classification shows an increase in the area under built-up and agriculture, a decrease in the vegetation cover, and almost no change in water bodies.

- An increase in agricultural land may be attributed to similar pixels in the training data for vegetation cover and agricultural land.

- The overall accuracy was 87% for both years, with high Kappa values (0.82 for 2019 and 0.81 for 2025), showing that the classification results closely match the training data.

- Despite high producer's accuracy (≥90%) for most classes, user's accuracy dropped in some cases due to misclassifications.

~fin~