Use of Hyperspectral Data for Supporting the Classification of Agricultural Land and Semi-Natural Vegetation Using Multi-Temporal Satellite Sensor Data

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Aims

- To highlight issues that are likely to enhance the regional mapping of land cover from spaceborne and airborne remote sensing data.
- To focus on the supportive role that hyperspectral remote sensing data can play in:
    - understanding the information content of optical data from spaceborne sensors;
    - developing classification algorithms; and
    - evaluating classification accuracy.

Why is this necessary?

- Increased interest by government and conservation agencies in the use of remote sensing data as a complementary or supplementary tool for land cover mapping.
- Recognition that:
  - Available maps/datasets are either outdated, of insufficient accuracy or inconsistent.
  - Replacement surveys are expensive and time-consuming.
- Requirement for regular land cover updates.

Temporal datasets

- Vegetation is typically dynamic over the annual cycle. Integration of imagery acquired on several key dates provides greater opportunities for land cover discrimination.
- Limited by the frequency and persistence of cloud-cover.
- More flexible approach to land cover mapping required.
- Classifications undertaken and/or updated routinely based on each new image, with multi-temporal information from previous images or classifications used to assist the process.

Image segmentation

- There has been an effort to capture land unit boundaries as digital layers.
- Boundaries enable differential segmentation of the landscape into objects.
- Creation of sub objects within land units based on similarities in reflectance allows internal structures to be mapped.
- Individual pixel values or statistics from objects can then be used as input to classification algorithms.

Image segmentation

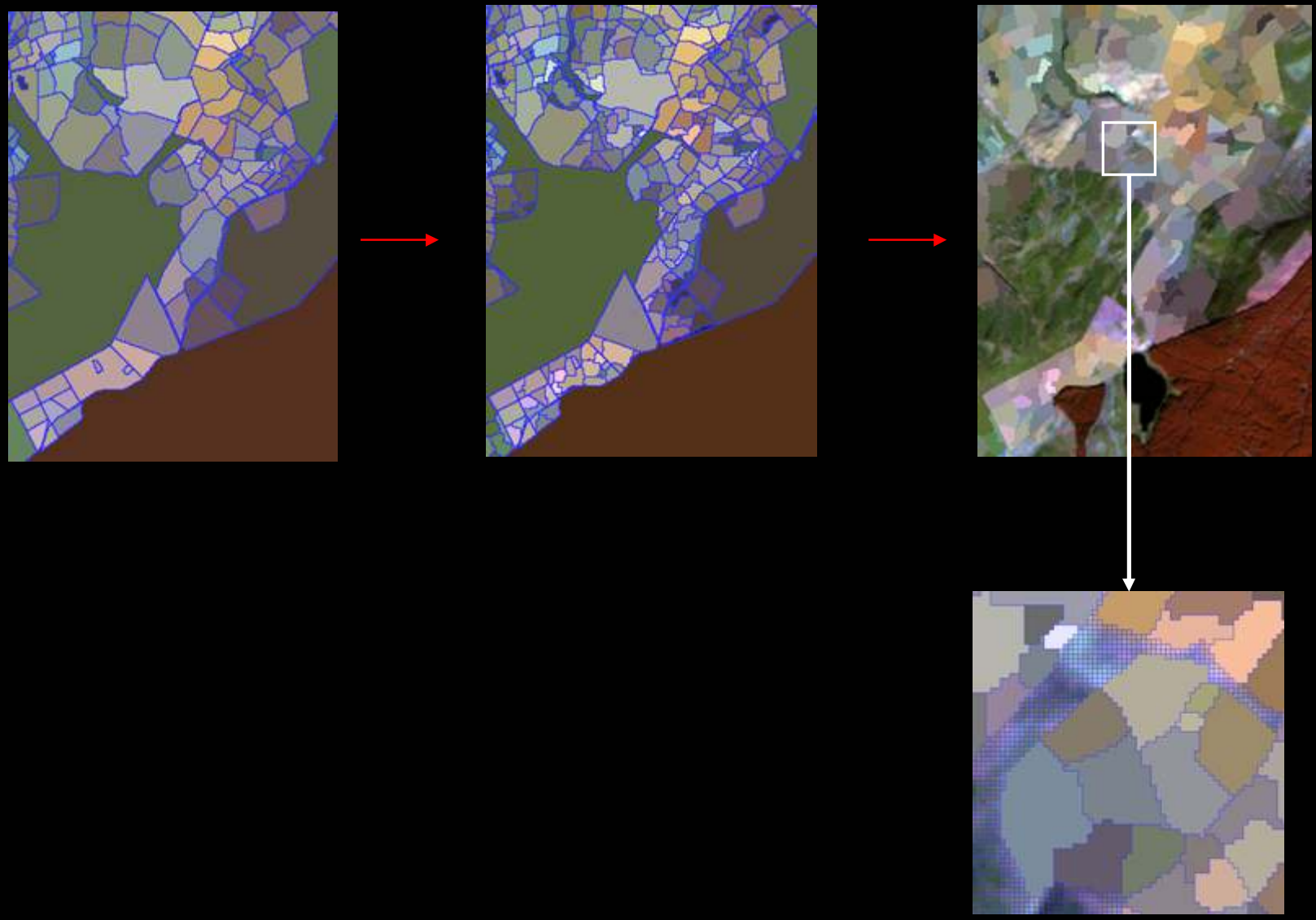
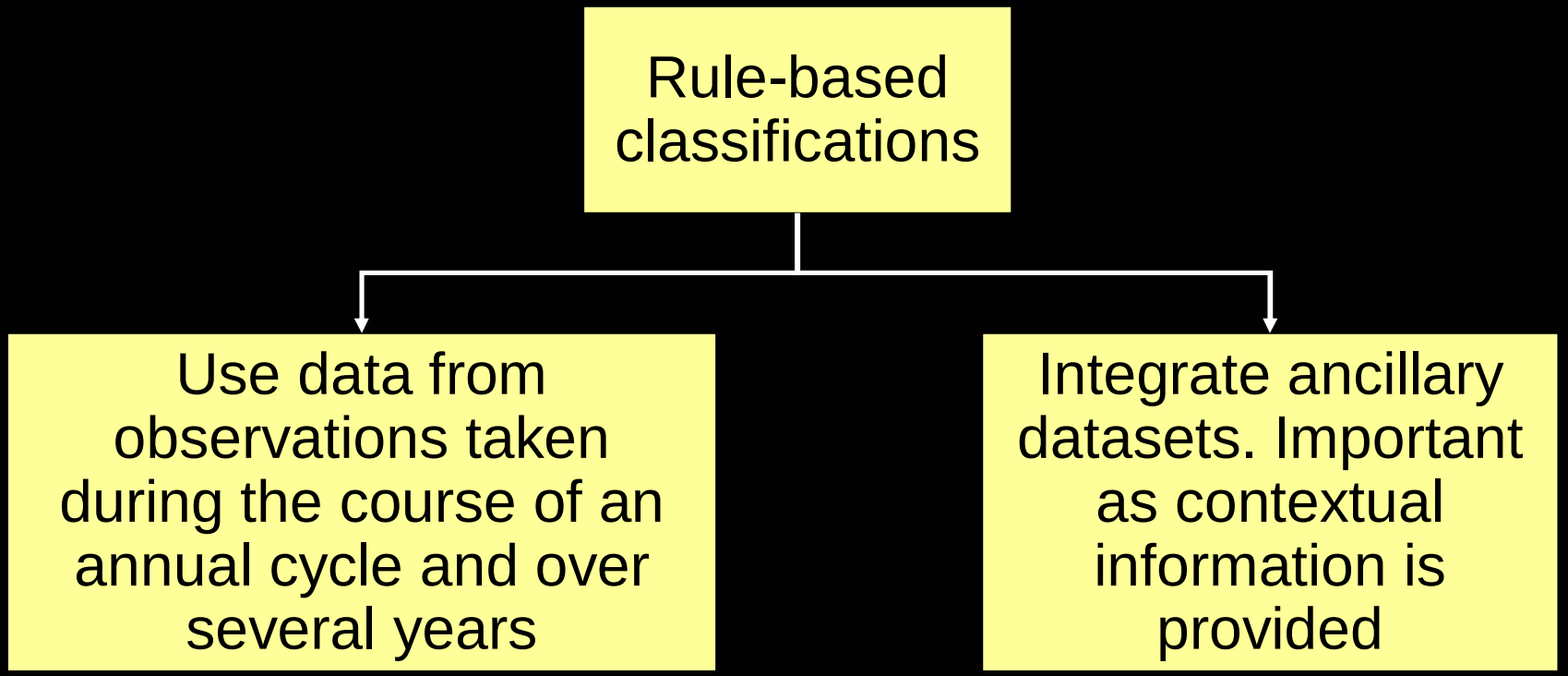


Image classification

- Multi-temporal approach to classification.
- Methods that interpret imagery in the context of known changes in the landscape required.



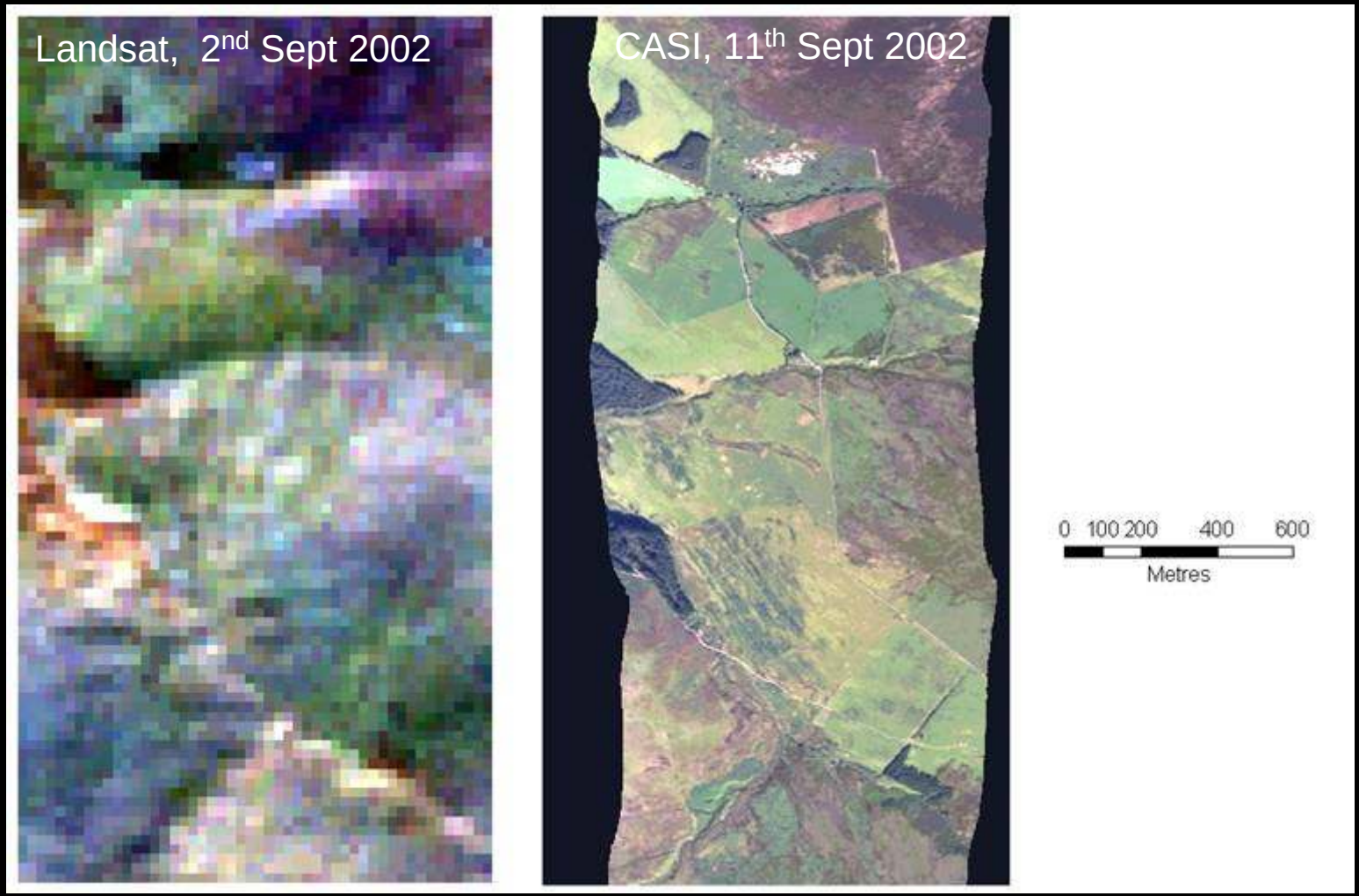
Role of Hyperspectral imagery

- Key role in understanding the information content of coarser resolution remote sensing data, developing approaches to classification and validating the resulting maps.
- Specifically:

    1. issues relating to spectral discrimination of land covers.

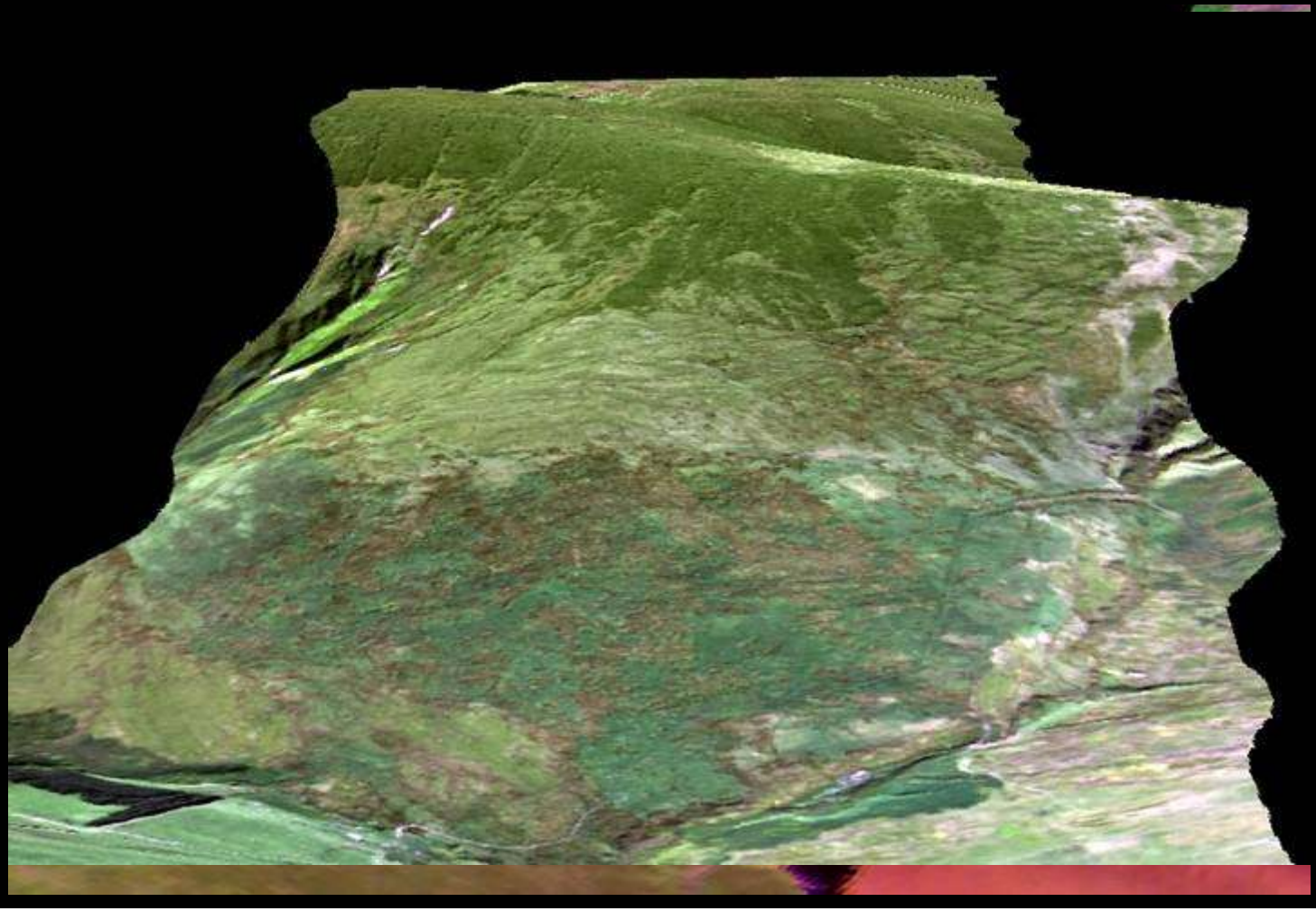
Role of Hyperspectral imagery

2. To better understand the spectral mixing processes that occur at coarser spatial resolutions.



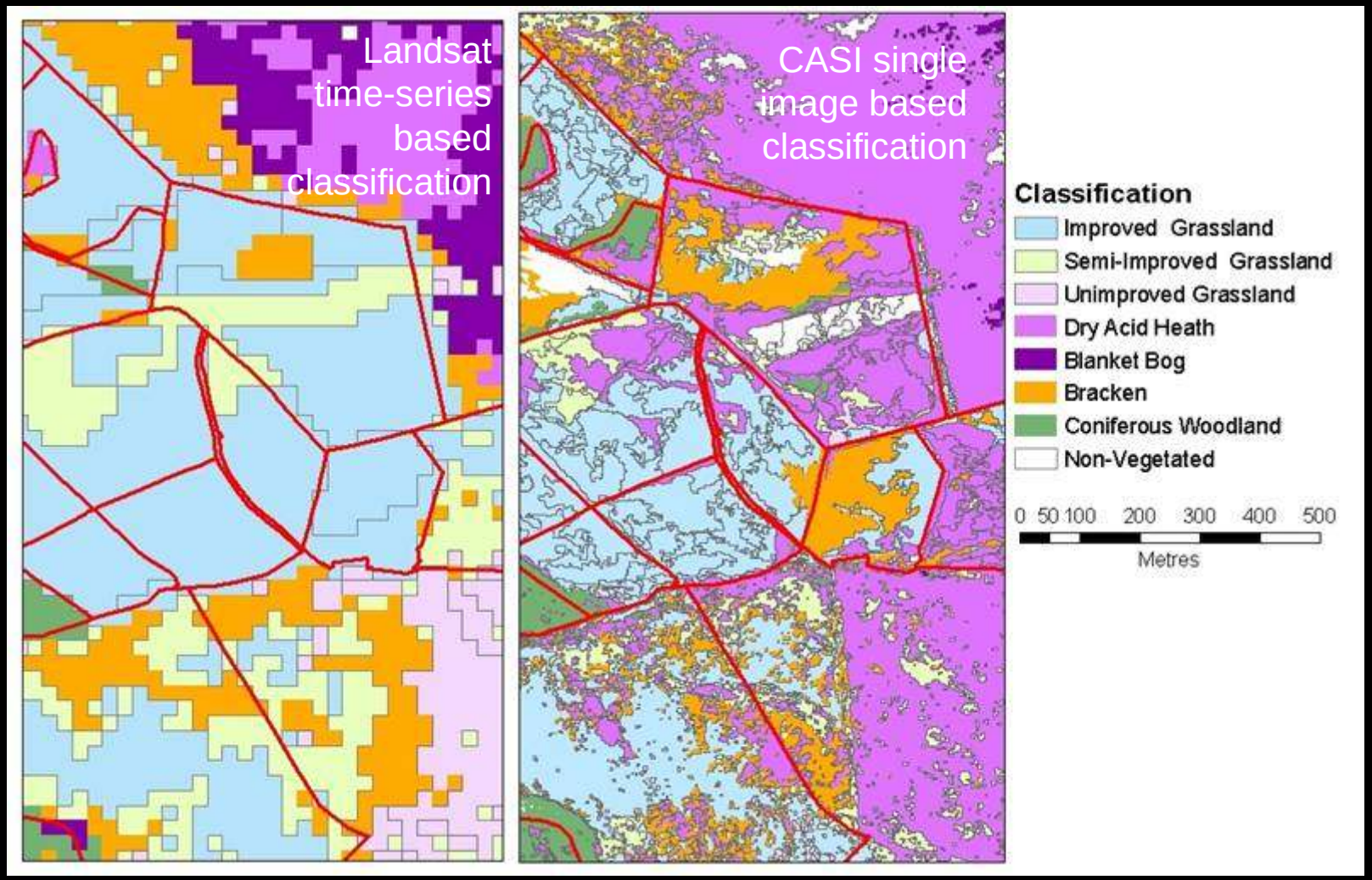
Role of Hyperspectral imagery

3. To provide contextual information (e.g., when used in conjunction with ancillary datasets such as DEMs).



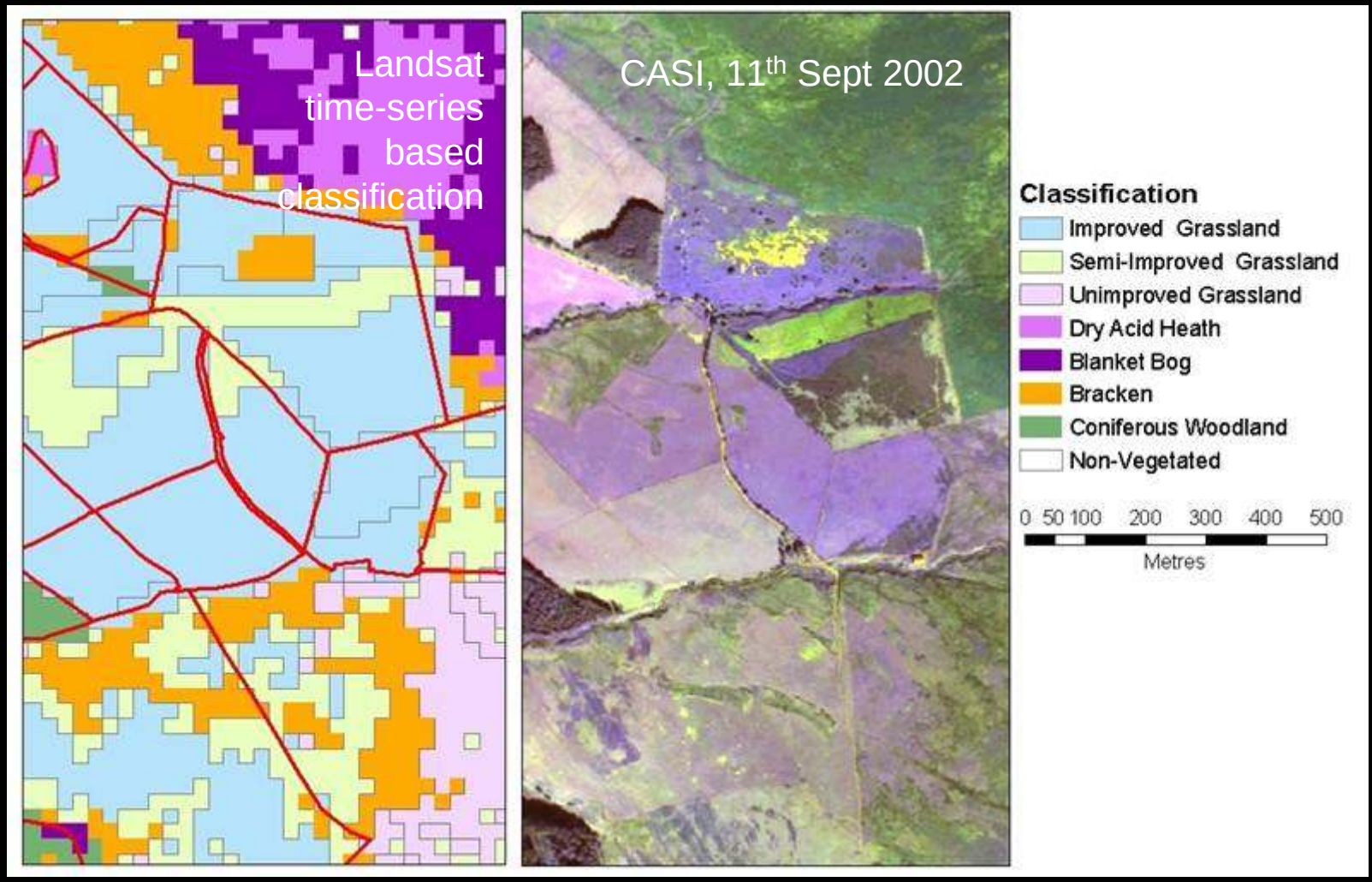
Role of Hyperspectral imagery

4. To guide and validate image segmentation procedures (particularly within larger objects) and classifications.

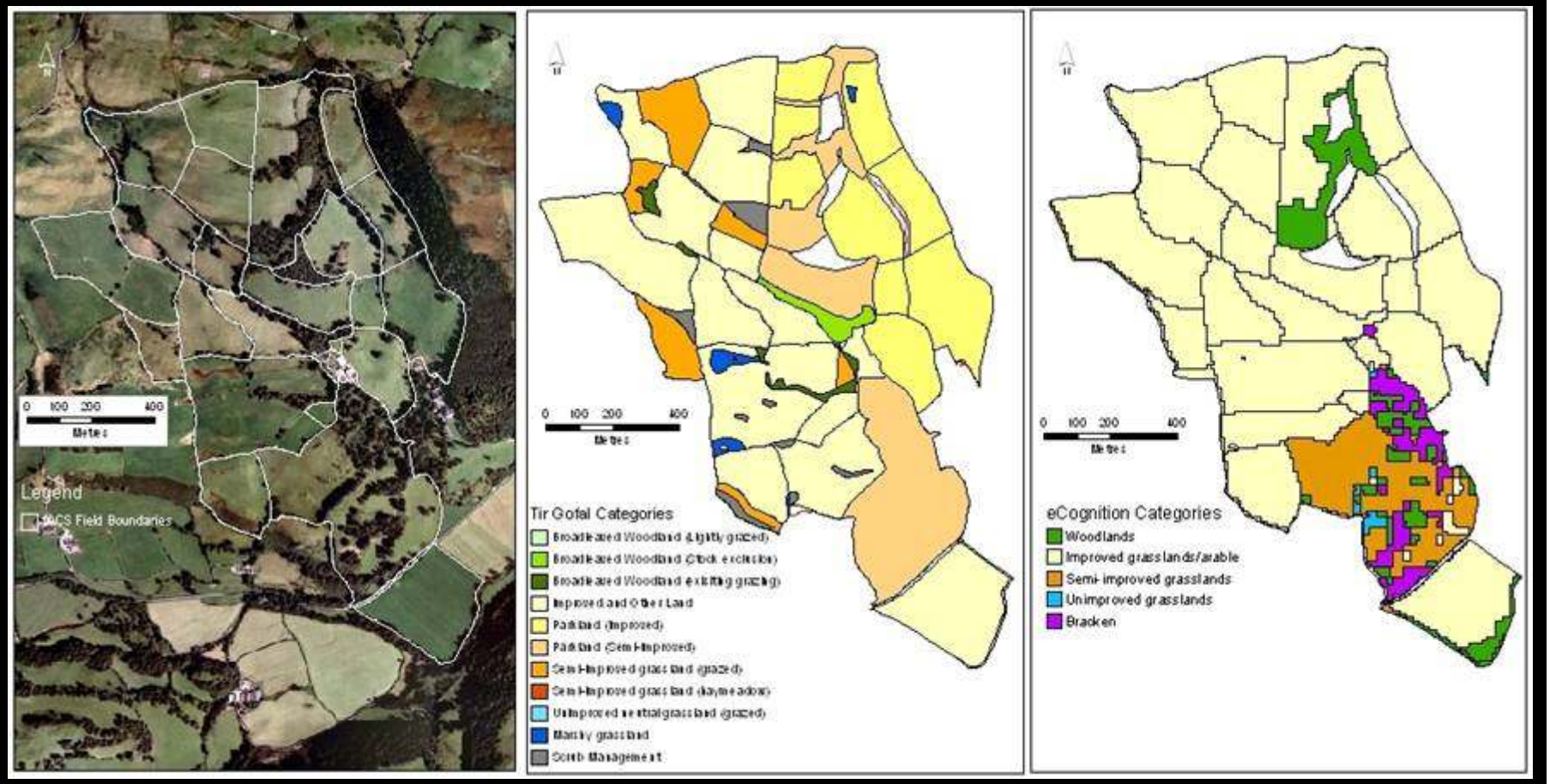


Role of Hyperspectral imagery

5. To assess the accuracy of classifications produced using spaceborne remote sensing data.



Output


0 100 200 400
Metres
Legend
LPIS Field Boundaries
0 100 200 400
Metres
Tir Gofal Categories
Broadleaved Woodland (Lightly grazed)
Broadleaved Woodland (Stock exclusion)
Broadleaved Woodland (existing grazing)
Improved and Other Land
Parkland (Improved)
Parkland (Semi-Improved)
Semi-Improved grassland (grazed)
Semi-Improved grassland (hay meadow)
Unimproved neutral grassland (grazed)
Marshy grassland
Scrub Management
0 100 200 400
Metres
eCognition Categories
Woodlands
Improved grasslands/arable
Semi-improved grasslands
Unimproved grasslands
Bracken

Conclusions

- Major benefits when adopting a dynamic rather than static mapping and monitoring approach.
- Integration of ancillary information (e.g., land unit boundaries and digital elevation data) offer additional benefits.
- Introduction of hyperspectral data is beneficial for:
  - evaluating the segmentation and classifications of landscapes based on medium resolution data.
  - refining previous classifications.