

# LPIS update by remote sensing techniques

# Outline

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- Swedish LPIS
- Test of new techniques for LPIS update
  1. Classification of satellite data to identify LPIS anomalies
  2. Automatic tree count by image analysis
  3. Laser scanning and image acquisition from low altitude

# LPIS in Sweden

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- LPIS in full operation 1998
- 1 million reference parcels, 3.5 million ha
- Ongoing large project to increase quality (2008-2009, budget approx 22 M€)

For more information see presentation at LPIS-Workshop in Sofia:  
<http://mars.jrc.ec.europa.eu/mars/News-Events/Workshop-on-LPIS-Application-and-quality-SDIC/Agenda>

- After review: Maximum eligible area = Block area (no ineligible area within block)

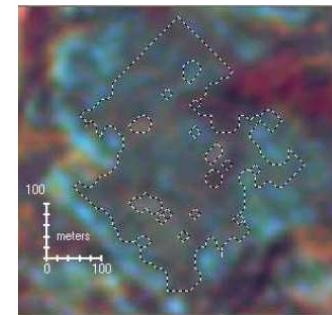
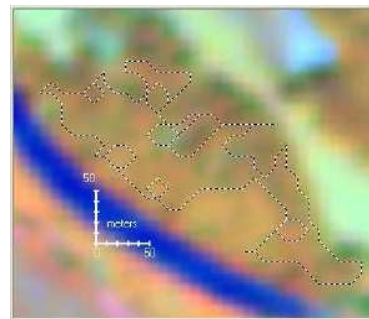
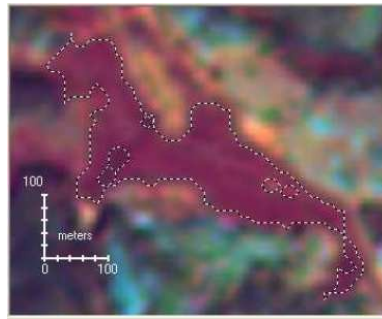
# Plan for continuous LPIS update

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- Systematic check of areas with new orthophotos
- Test of new techniques as a tool for LPIS update

# 1. Classification of satellite data

- Identification of LPIS anomalies (trees and water)
- Classification using SPOT-5 (10 m) from two dates (8 band used in classification)
- Supervised method with training areas used

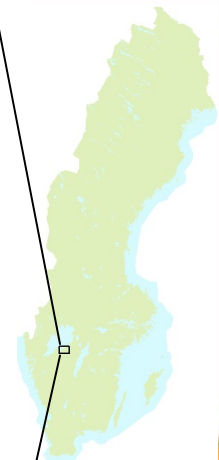
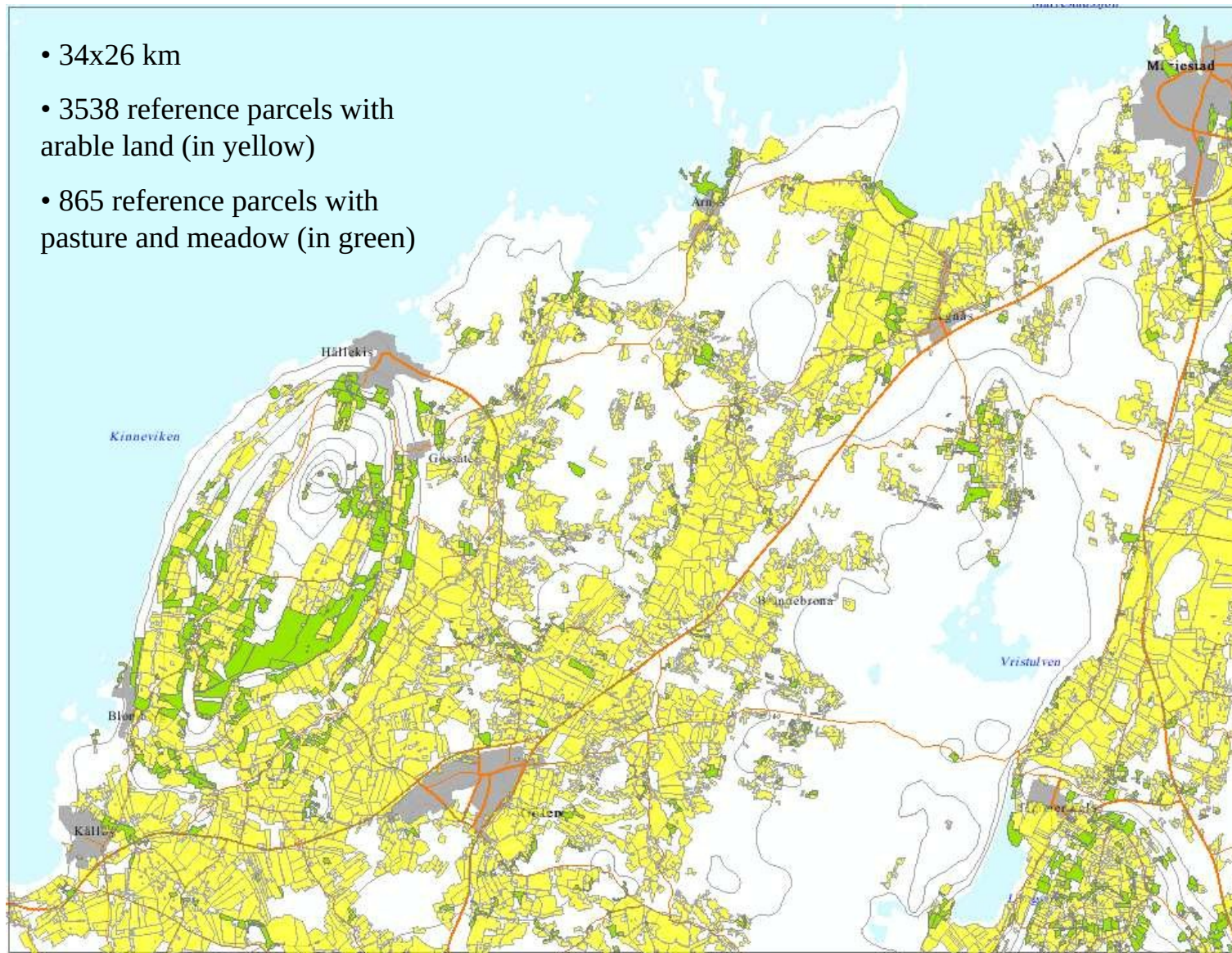


Training areas for different type of areas with trees

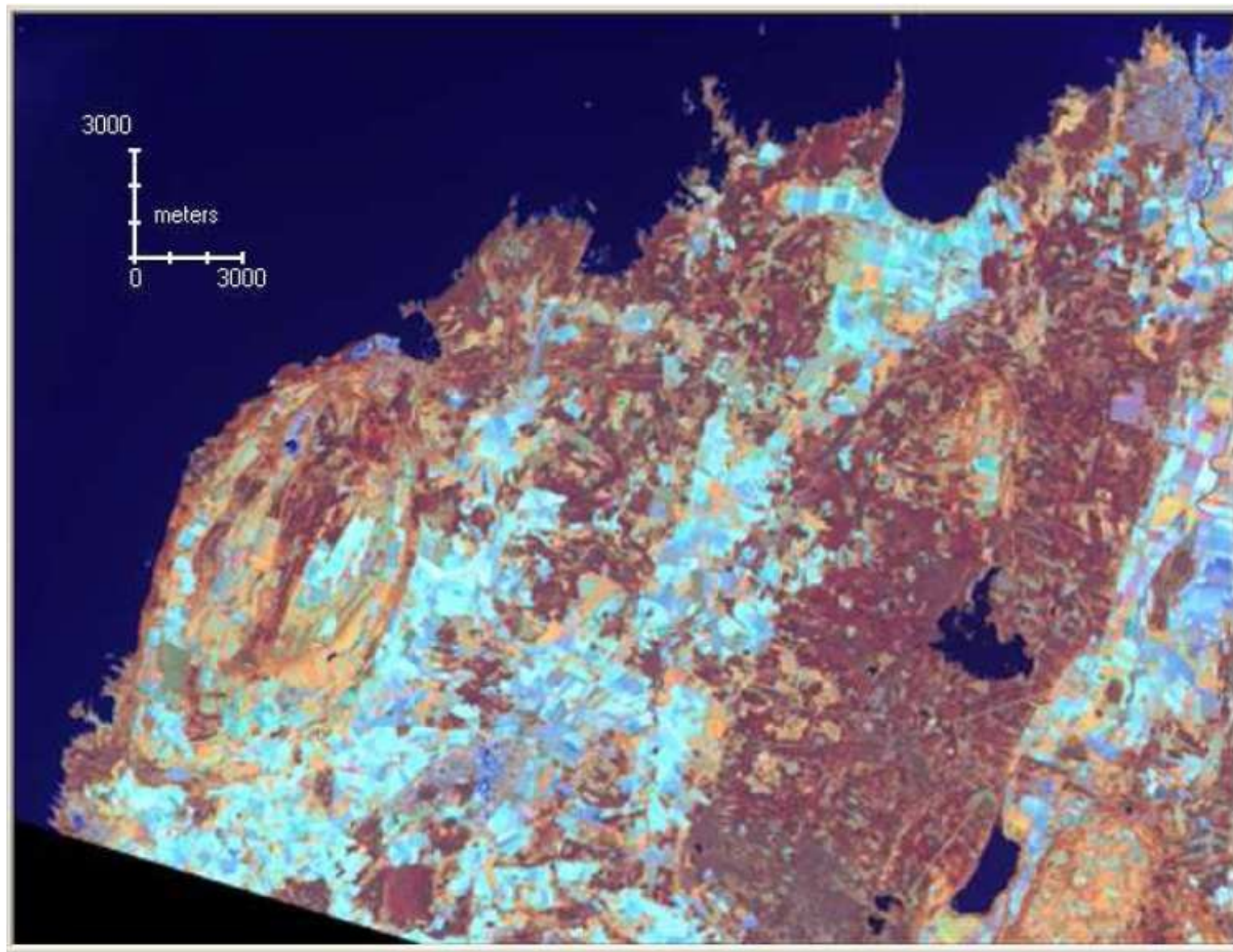
- Give pixels with classification probability
- Final result: Polygons enclosing areas probably dominated with trees

# Evaluation area (Kinnekulle)

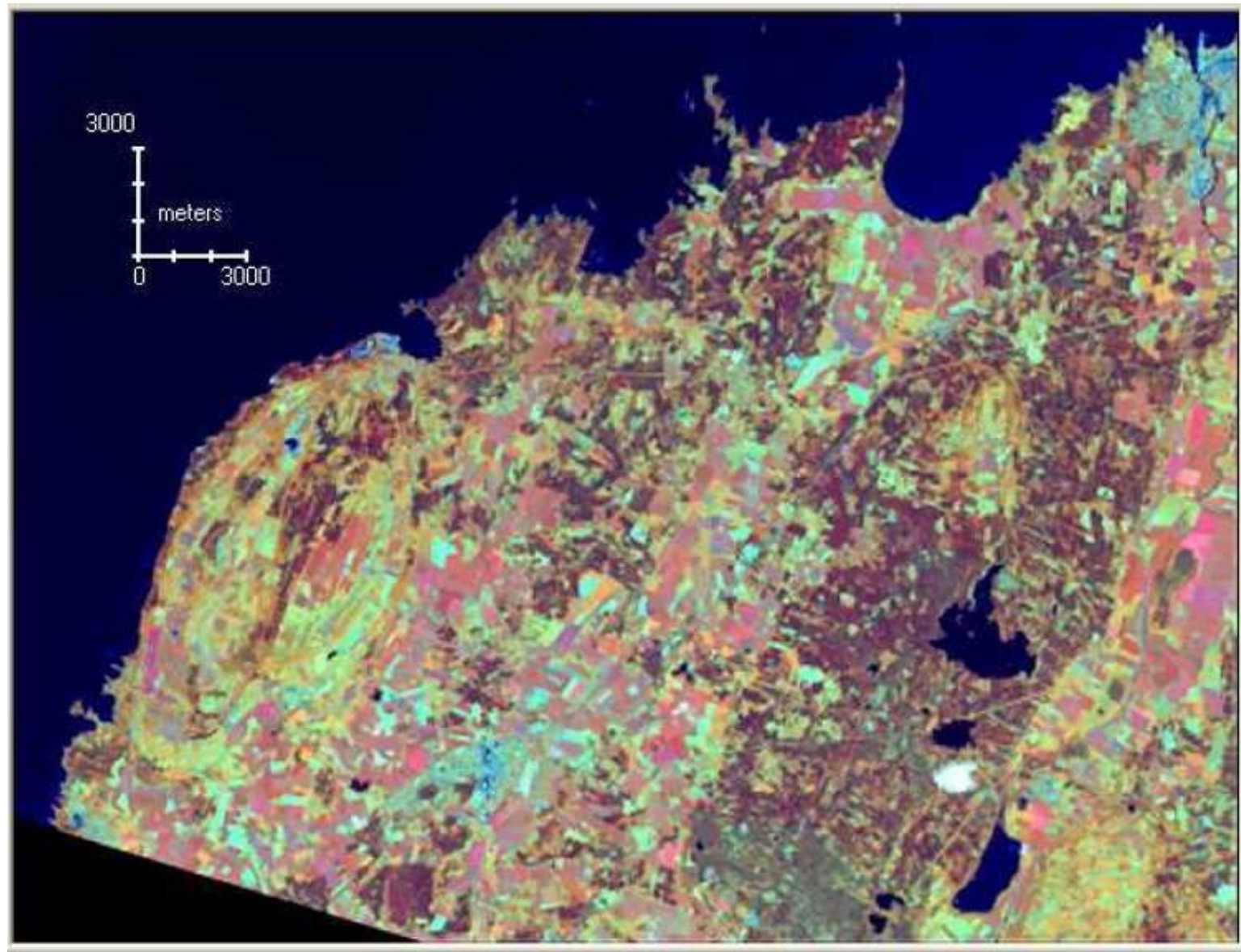
- 34x26 km
- 3538 reference parcels with arable land (in yellow)
- 865 reference parcels with pasture and meadow (in green)



# Image 1: 1 sept 2005



## Image 2: 15 July 2006



# Evaluation

- Example from result (arable land)



Reference parcel 6488-367-5873

Area 4,86 ha, Application 2,90 ha, Area classified as trees 1,26 ha

1. Classification of satellite data

# Evaluation

- Example from result (pasture and meadow)



Reference parcel 6503-366-9622

Area 1,08 ha, Application 1,00 ha, Area classified as trees 0,17 ha

# Evaluation, statistics

- Areas less than 0,1 ha excluded

Arable land

Area (ha)	No of RP	%
0	3173	90
0,01-0,1	183	5
0,1-0,5	158	4
0,5-1	16	0
1-5	8	0
	3538	100

Pasture and meadows

Area (ha)	No of RP	%
0	345	40
0,01-0,1	32	4
0,1-0,5	214	25
0,5-1	88	10
1-5	148	17
5-10	27	3
10-62	11	1
	865	100

- Evaluation shows that the method works.  
Areas with trees can be identified.

# Possible use of method

- For arable land clearly useful as areas with trees normally not eligible.
- Method could be used to identify anomalies.



6490-370-2506 Arable land updated in current LPIS-review  
Area 11,22 ha, Application 7,49 ha, Area classified as trees 2,48 ha  
Area after update 7,56 ha

# Possible use of method

- For pasture and meadows areas carrying trees can be eligible. The method could be used to separate RP in classes (for ex 0%, 1-10%, > 10%)
- Could be used in current review to distinct RP possible to check at office from RP that needs to be field checked.



6491-360-0824 pasture  
Area 2,65 ha, Application 2,65 ha  
Area classified as trees 0 ha

## 2. Automatic tree count

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- Identification of trees in pasture land
- Result: Number of trees/ha



2. Automatic tree count

## 2. Automatic tree count

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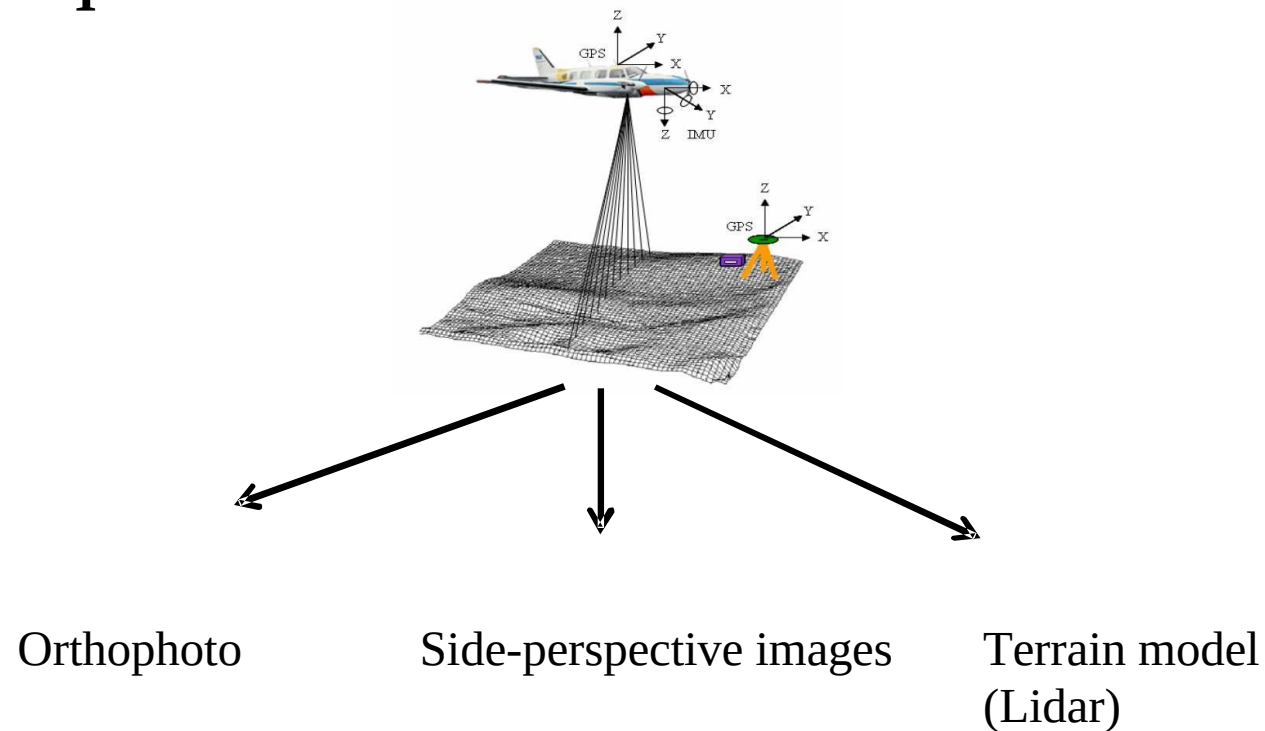
- Digital orthofotos (color and IR) used
- Segmentation used in method  
Tree density for subarea of RP possible



- Same use as the SPOT classification method,  
but probably more accurate result

### 3. Laser scanning and image acquisition from low altitude

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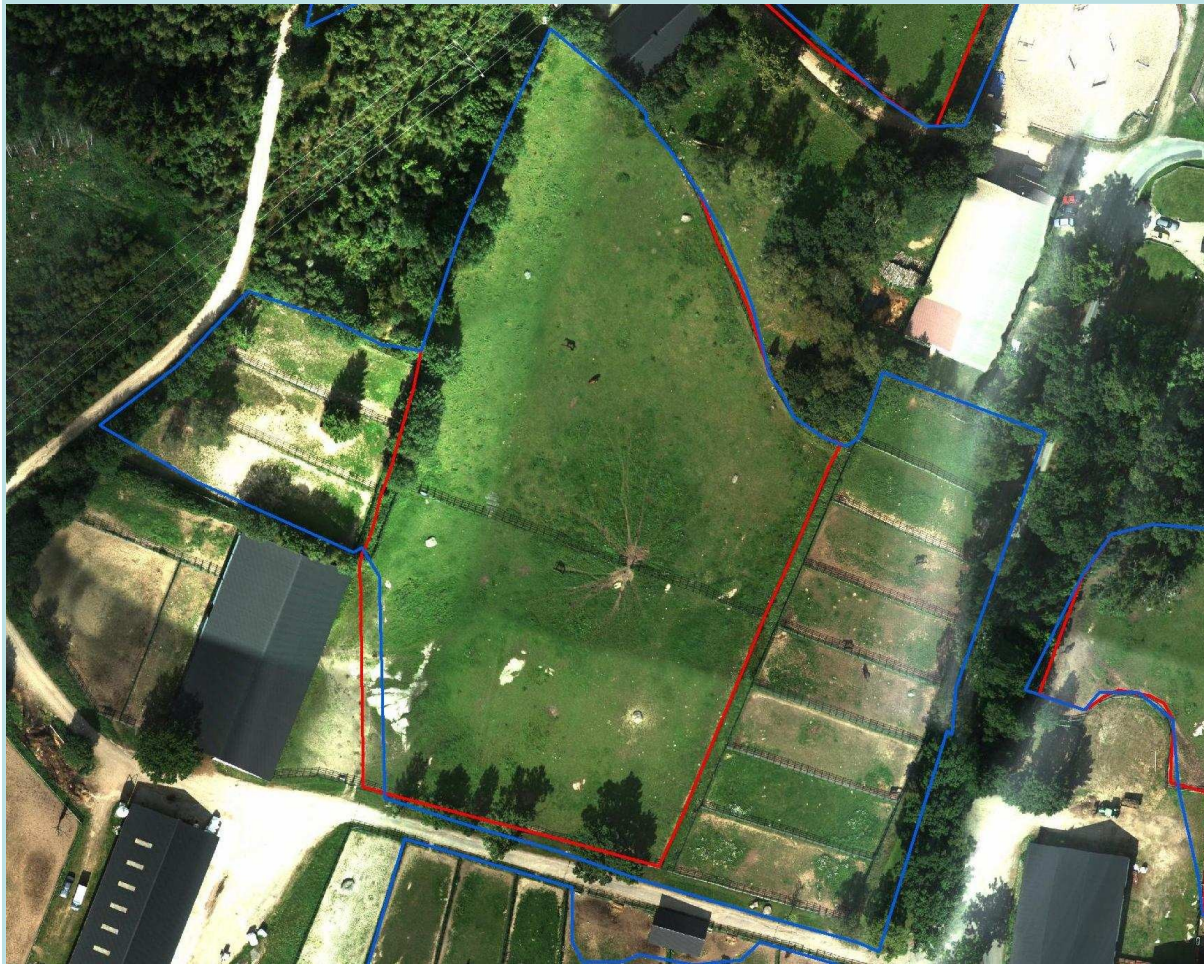


# Tested method

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- Data acquisition from 150 meters altitude
- Several sensors (4 cameras, Lidar, GPS/Glonass-receiver, IMU)
- Terrain model from LiDAR data
- High accuracy: RMS plane = 0.40 m, RMS height = 0.20 m
- Orthophotos created using terrain model

# Example orthophoto



3. Laser scanning and low altitude image acquisition

# Example side-perspective image



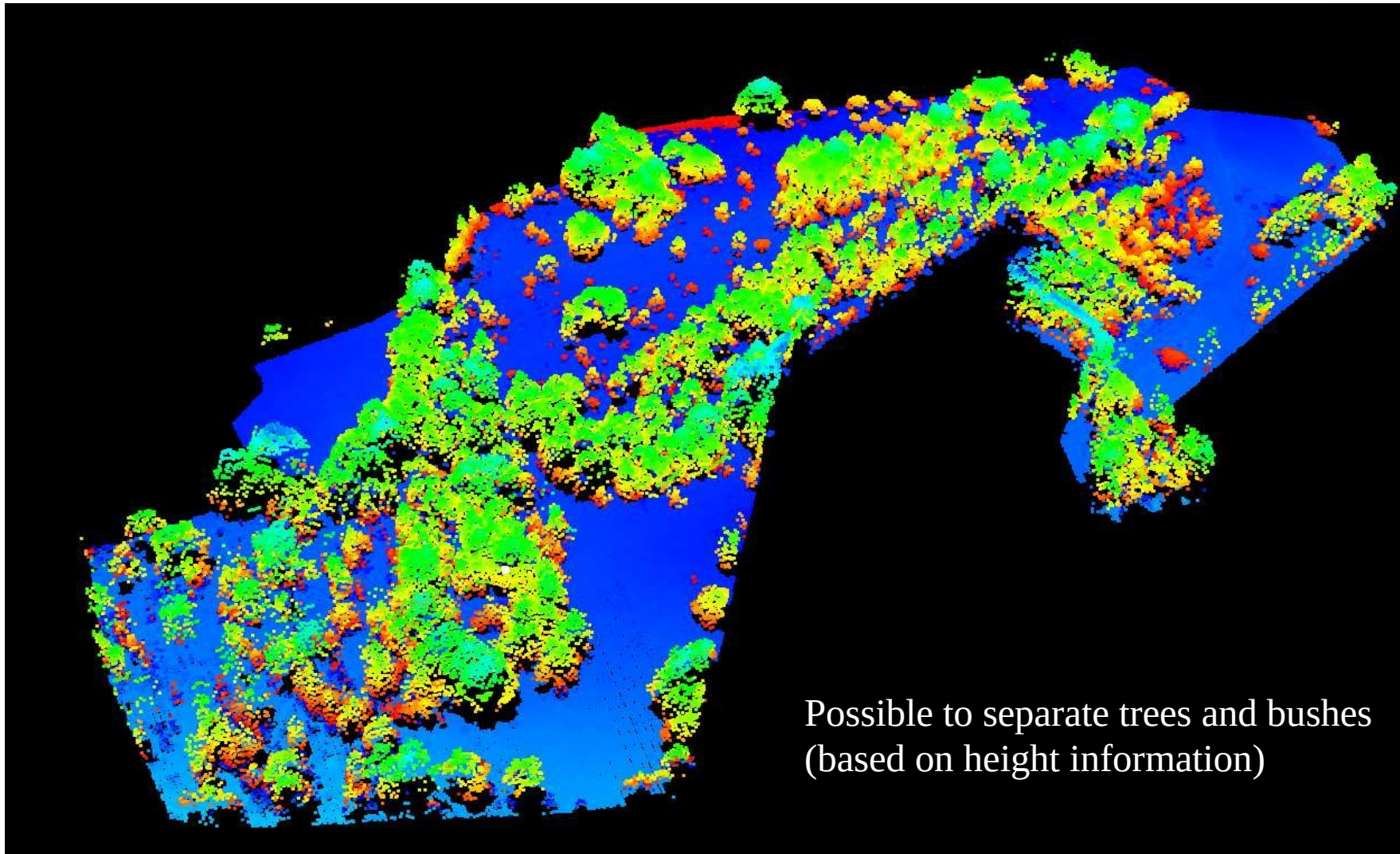
3. Laser scanning and low altitude image acquisition

# Borders in side-perspective



3. Laser scanning and low altitude image acquisition

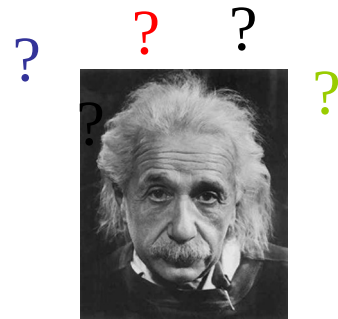
# Terrain model



# Summary, tested methods

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- First results from tests are positive:  
Remote sensing techniques seems to be possible  
to use as a tool for LPIS update
- Which metod/methods?
- How use the results?
- Tests and evaluation will continue...



Questions?

Thanks!