Very High Spatial Resolution in
AGRICULTURE
and expectations

Camille LELONG (CIRAD-UMR TETIS)

- **Accurate identification of land use**
  - detailed mapping for spotting, detection, mapping, inventory, control…
  - vineyards, orchards, olive, dry nuts groves, pine or poplar plantations *recognition*…
  - perennial crops (market-garden) distinction
  - grass/waste/fallow-lands and crops discrimination
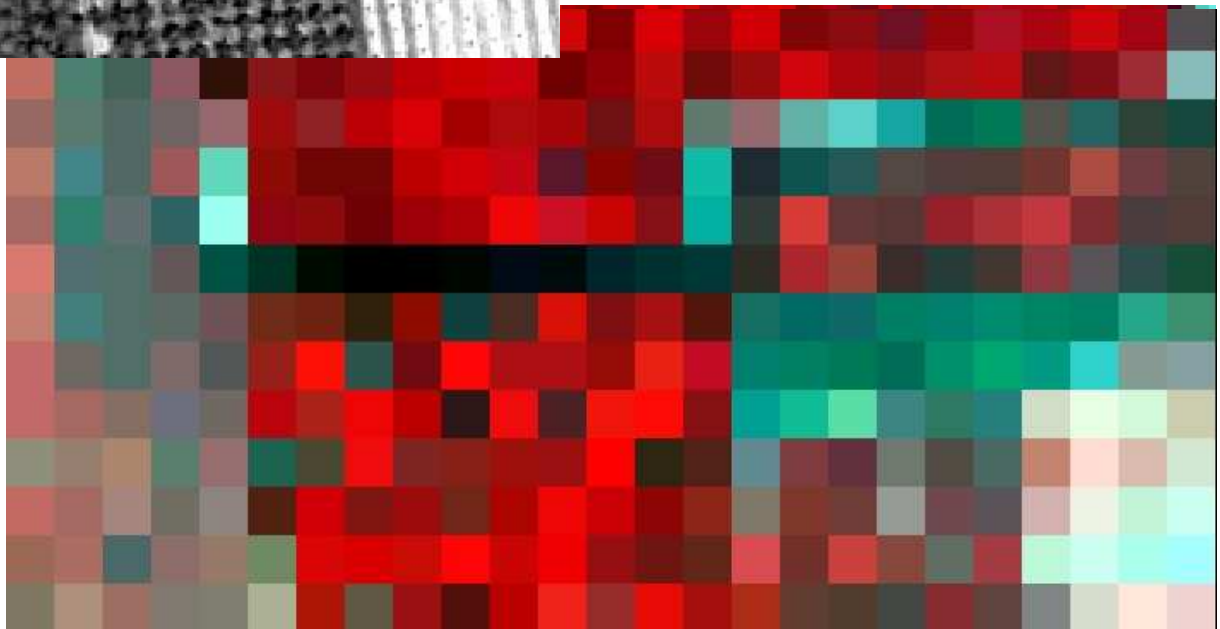
- **Crop monitoring and precision farming**
  eg. adapted to tree crops & market-garden crops   + accidents
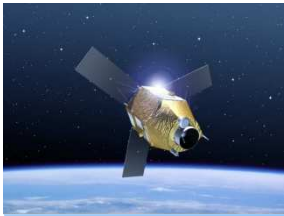
Structured crops (orchards, vineyards,…)
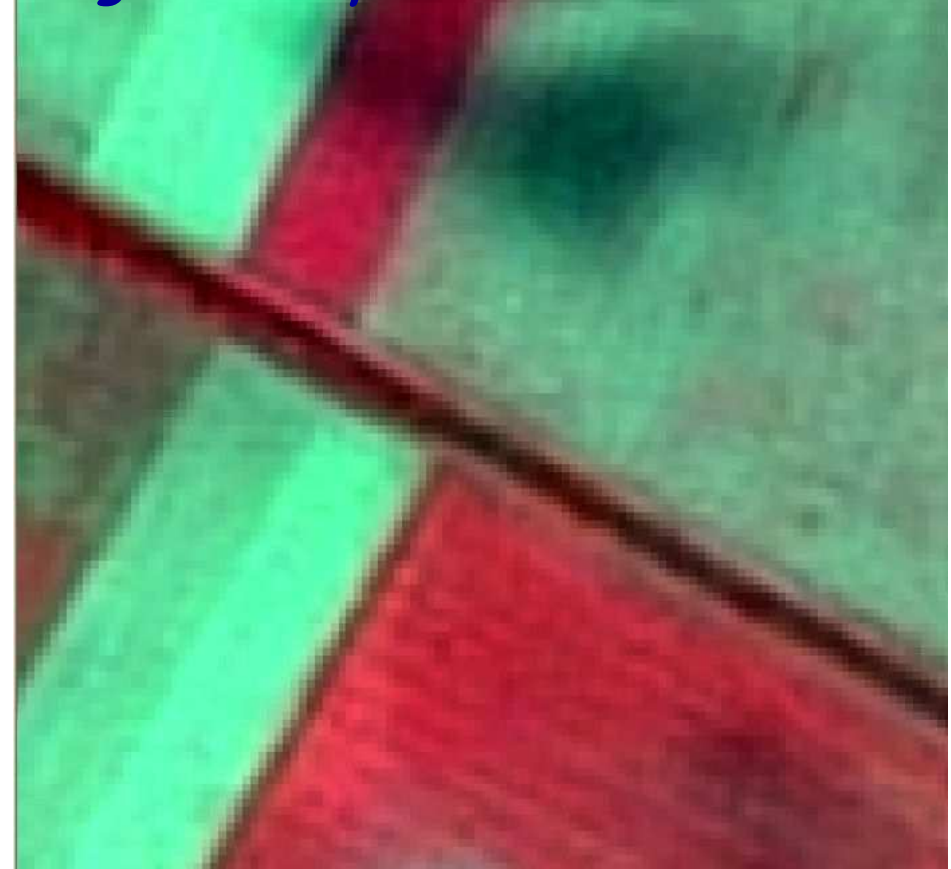

Quickbird - 0.7 m

SPOT - 10 m

•Agricultural practices

**Cropping systems evaluation, GAECs control
(ploughing directions, stubbles burning, mechanization…)**

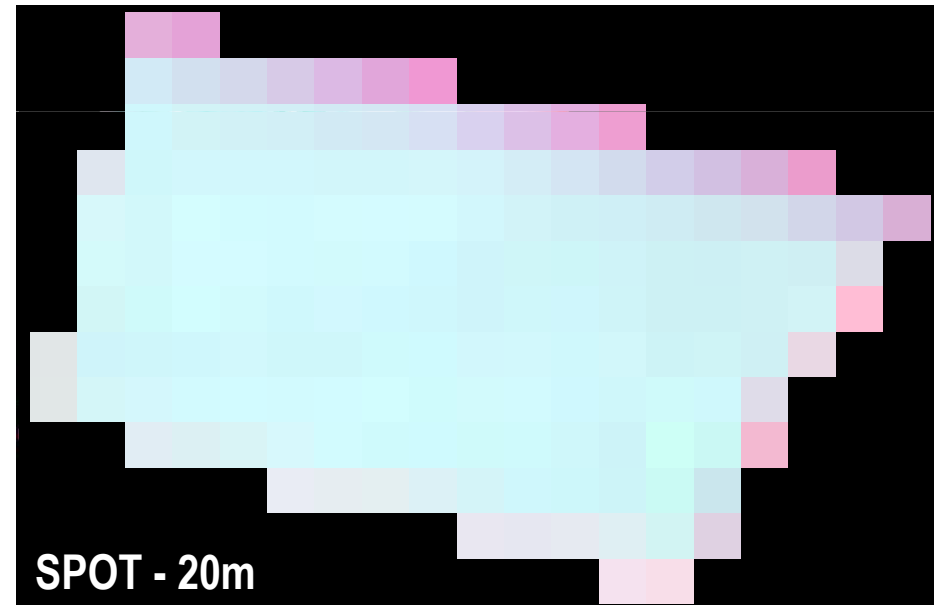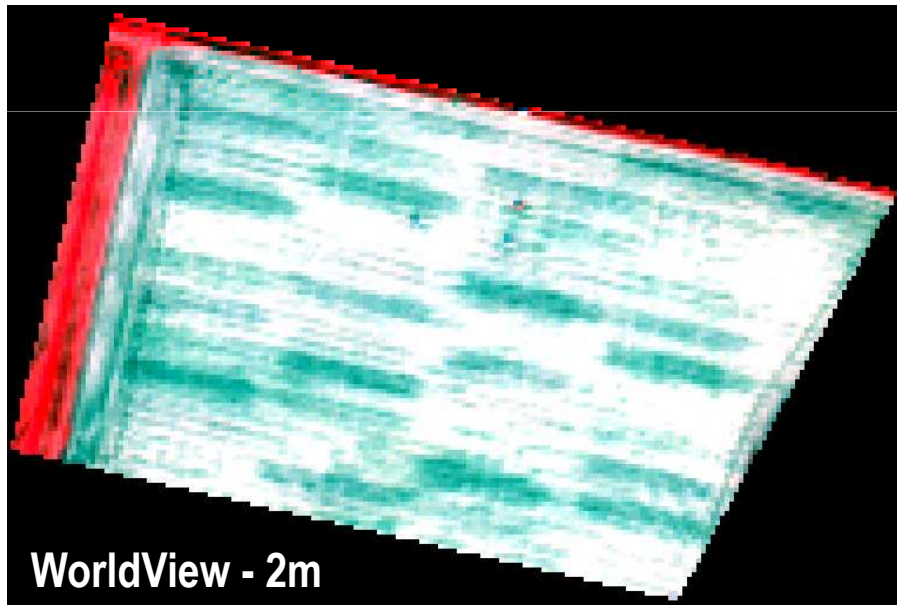**GEOEYE – 0.5m** *Riverside trees or grass strips* **SPOT – 2.5m**

- **Fine characterization of soils**
  (intraplot variability/heterogeneity)

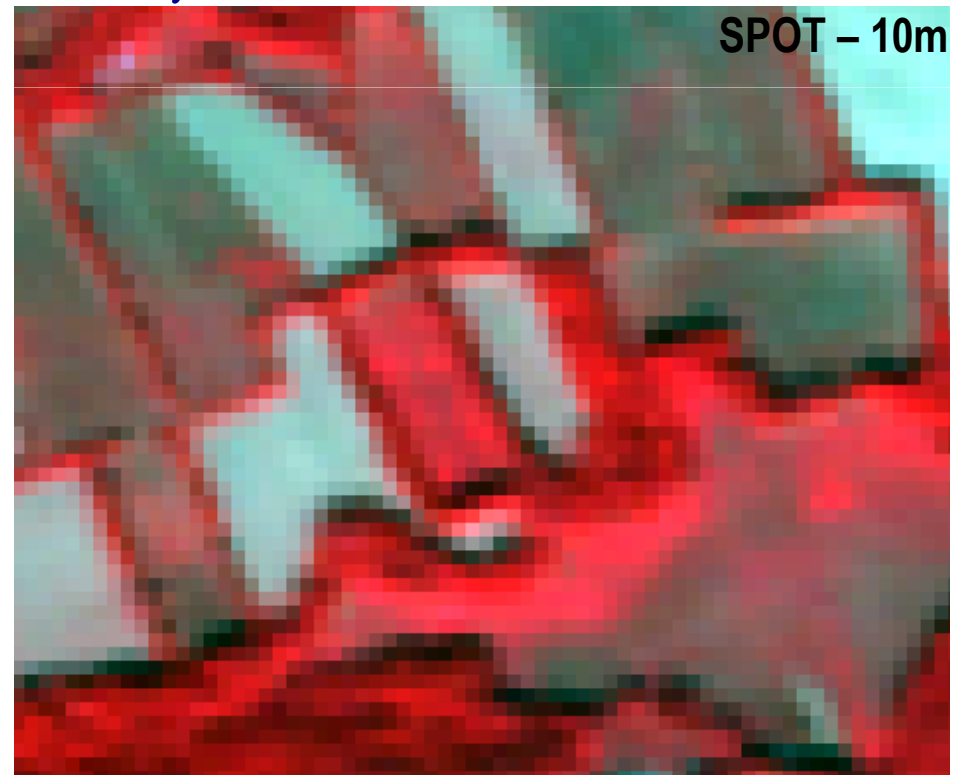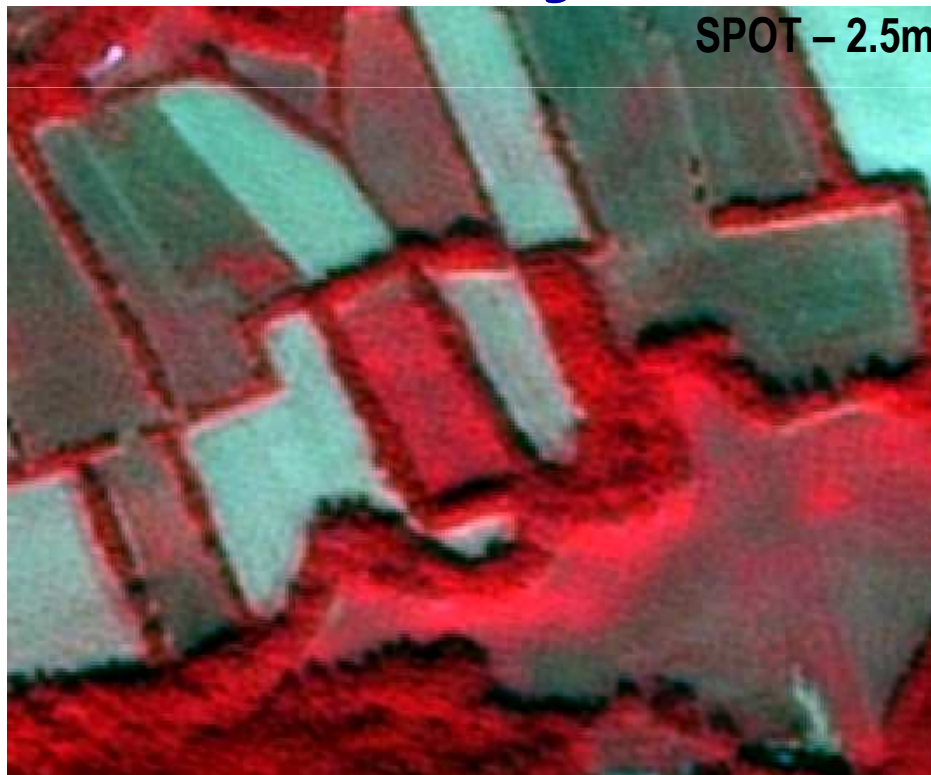*Soil organic content heterogeneity*

WorldView - 2m

SPOT - 20m

Specific issues in agriculture (4/4)

- **Spotting and characterization of landscape elements**

  hedges, small woody elements, grass strips, etc…
  for CAP, "Grenelle-Environnement", biodiversity, hydrological models

Hedges (detection, density estimation)

SPOT – 2.5m

SPOT – 10m

What have been analyzed so far ?

Evaluation of X-band radar for the agricultural control over 4 sites, H. Kerdilès, O. Léo, AGRIFISH/MARS-PAC, JRC.

Detecting ineligible features and potentially incorrect LPIS boundaries, H. Kerdilès, O. Léo, AGRIFISH/MARS-PAC/JRC.

SPOT-FORMOSAT 8-20m temporal complementarity with VHSR (0.70-2.5m) for land cover monitoring, C. Marais-Sicre, D. Ducrot, CESBIO

Detection, segmentation, and classification of tree crops in optical VHSR images (St Gilles/Gard), C. Lelong, TETIS/CIRAD

Tropical tree plantations characterization (Costa Rica, Brazil), G. Lemaire, Eco&Sols/CIRAD

Structure indicators of tropical agroforestry systems, C. Lelong, TETIS/CIRAD

Sugar cane yield and intraplot heterogeneity (Île de la Réunion), A. Bégué, TETIS/CIRAD

Agriculture monitoring with X-band radar remote sensing, F. Baup, CESBIO

Soil spatial variability mapping (Boigneville/Beauce, Villamblain), B. DeSolan, ARVALIS

Soil hydric status and rugosity mapping based on optical and radar VHSR images (Villamblain), N. Zribi, CETP/BRGM, N. Baghdadi, TETIS/Cemagref

Soil organic carbon concentration estimation(Plaine de Versailles, Plateau des Alluets), E. Vaudour, Agroparistech

3D-characterization of the lanscape elements (Avignon/Vaucluse), INRA avignon

Agri-enrivonmental measures (plot limits, winter cover, spatiotemporal sonstraints on grass strips, Wallonie), D. Buffet, CRA –W

Small wood elements and grass strips extraction in agri-forested landscapes, D. Sheeren, F. Collard, Dynafor/ENSAT

Grass strips, A. Sombardier, Artelia (Sogreah)

What comes out of the different explorations ?

Availability of a much higher amount of information
(scale of objects and purity of associated signal)
accompanied by a higher amount of perturbations and complications
(large spectral heterogeneity & spatial incoherence)

Traditionnal remote sensing methodologies
are not suitable anymore

Specific needs for new algorithms and tools
and more time to generalize and operationalize the methods

Examples of tested orientations:
Object-based cognitive approaches
Higher level of classification algorithms (SVM, NN, Markov chains, waveletts …)
Use of texture/structure/radiometry+temporal informations

Perspectives of use of vhsr in agriculture

1. **Assistance for crops/resources management (precision farming) and production systems valuation**

2. **Landscape Ecology and Agri-environment (biodiversity management, ecosystemic services characterization...)**

3. **Management and control of agricultural and agri-environmental aids**

Perspectives of use of vhsr in agriculture

1. Assistance for crops/resources management (precision farming) and production systems valuation

1.1 Crops mapping and species identification
1.2 Parcels area estimation
1.3 Agricultural practices monitoring
1.4 Cropping systems valuation
1.5 Irrigated areas
1.6 Crop vitality (diagnostic)
1.7 Quantitative approach (eg: nitric status)
1.8 Quality approach (eg: proteins rate)
1.9 Agro climatic accidents impact on crops, fierce changes
1.10 Soil structure
1.11 Soil condition at surface
1.12 Soil moisture
1.13 Inter- and intra-parcel variability

2. Landscape Ecology and Agri-environment (biodiversity management, ecosystemic services characterization...)

2.1   Landscape composition, structure, organization, and dynamics
2.2   Damage assessment (area + intensity)

3.1   Parcels localisation

3.2   Area measurements

3.3   Crops species sorting (in subvention groups)

3.4   Census and density

3.5   Agri-agroenvironmental mesures control

3.6   Cross compliance control (GAECs)

3. Management and control of agricultural and agri-environmental aids

A diversity of challenges, and challengers!