
RIBATEJO - PORTUGAL

# Precision Viticulture, State of the art and perspectives

**adapted from**

**Viticulture de précision® :**
**Etat des lieux dix ans après son avènement**

**by**
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Presented for

5e Journée scientifique de la vigne et du vin

# Introduction

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- **1990 - Begining of precision agriculture**
  - A significant development with cereals in France
    - (GPS guidance) 50 % des exploitations céréalières,
    - Support to N fertilization (600 000 ha using Remote Sensing),
- **2000 - Adaptation to viticulture (VP)**
  - 10 years of feed-back to identify:
    - failures and setbacks,
    - factors of adoption,
    - evolutions and perspectives,
    - issues for scientists and professionals.

# First examples of embedded systems for VP

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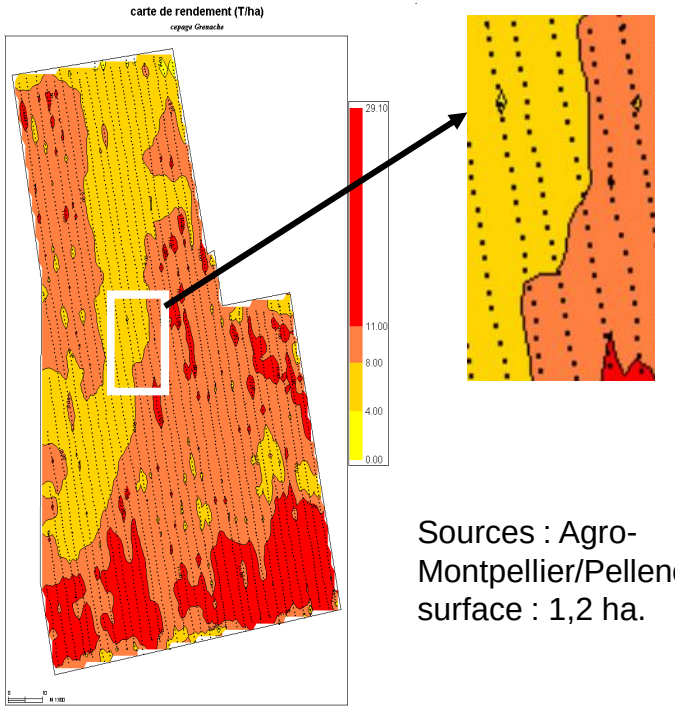
- First yield sensors provided by equipment manufacturers (in the same way as for cereals),
- A first revolution.

- Localisation by DGPS,
- Embedded measurement systems,
- Possibility of high resolution (m) mapping




Sources : Agro-Montpellier/Pellenc S.A.
surface : 1,2 ha.

# Feed back

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- **A rather mixed review :**
  - Adoption by a few number of big companies
    (Southcorp- Australie, San Pedro-Chili, Raïmat/Torres-Espagne),
  - Only one manufacturer (ATV),

- **Factors of adoption :**
  - Whole fleet equiped in the same way,
  - One specialist in geoscience
    (dedicated to data treatment and maintenance),
  - Interest of executives and share-holders in terms of reporting tools,

# Feed back

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- **A rather low interest of other structures**
  - For traders/coop. wineries
    - Heterogeneity of supplies and types harvesters (the whole domain is not mapped),
    - Difficulty to collect and consolidate heterogeneous data,
  - For producers/vineyard
    - Necessary skills and investments,
    - Low value information of crop monitoring (end of production),
    - No reference for the use of this information,
    - Low interest for high added value vineyard (manual harvest).

# Towards new observation systems

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- New spécifications :
  - Getting data during the whole production cycle,
  - Building Decision Support tools.

- Common aspects
  - Geo-referenced data and time record,

- Typology of data needed
  - Spatially high resolution,
  - Temporal high resolution,
  - Intermediate tools.

# Towards new observation systems

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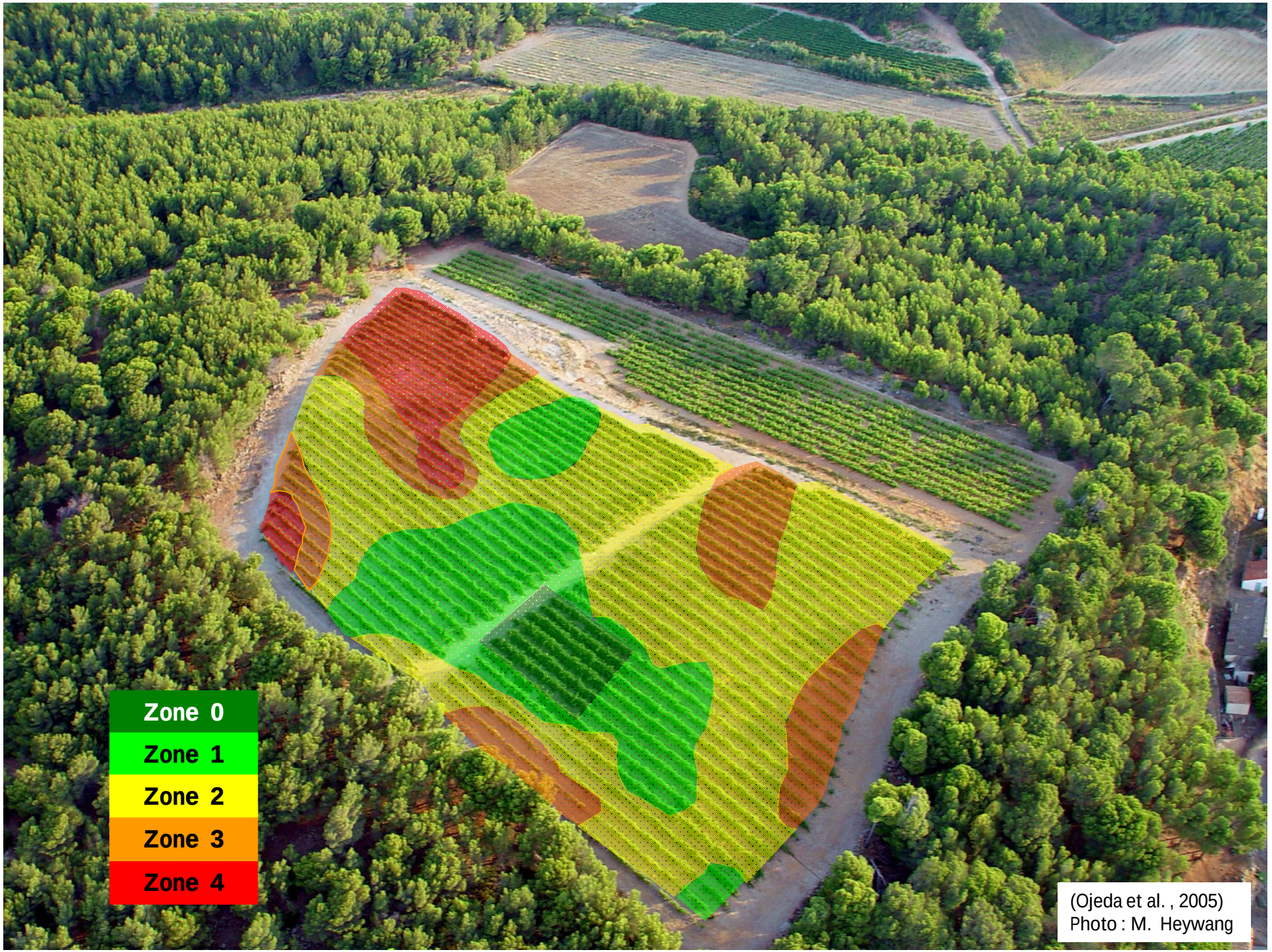
- **Spatially exhaustive information**
  - Vegetation mapping by remote sensing,

    Instant view of the whole production system
    (ex. Oenoview ®-ICV-Astrium)

Aerial photography, false color - 1 m²,
(source Oenoview, ICV, Astrium, Avion-Jaune, Pech-Rouge)

- Information during the production cycle,
- New applications
  - Plot sélection
  - Adapted management,
  - Adapted harvest,
  - Selective sampling,


Zone 0
Zone 1
Zone 2
Zone 3
Zone 4
(Ojeda et al. , 2005)
Photo : M. Heywang

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- **Spatially high resolution information**
  - Vegetation mapping by proxy-detection
    - grass management in vineyard
    - ultimately, real time adjustment of rates of herbicide

Drissi et al., 2009

Several commercial solutions

- Greenseeker™ (Ntech)
- Cropcircle ® (NZ)
- GrapeSense (Lincoln Venture-NZ)

# Towards new observation systems

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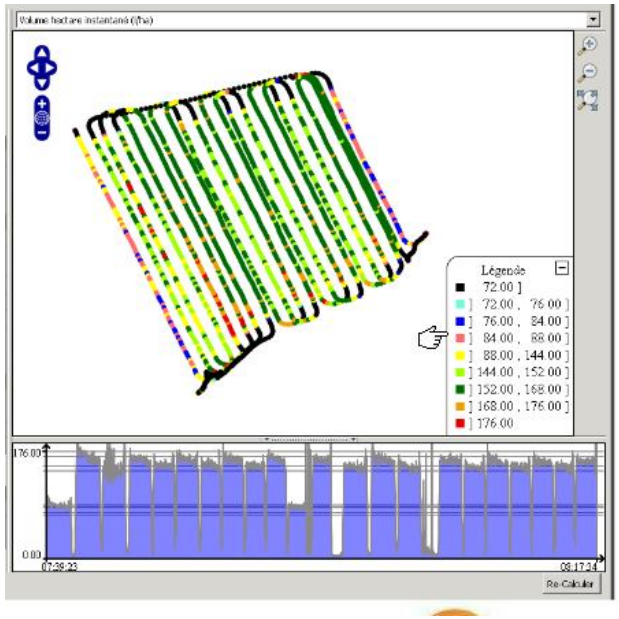
- **Spatially high resolution information**
  - Phyto-product application follow-up and traceability
    - A posteriori checking of the spray results and spatial efficiency
    - expected lower environmental impact and economical savings

Tixad www.tixad.eu


Sources : IRSTEA, TICSAD

# Towards new observation systems

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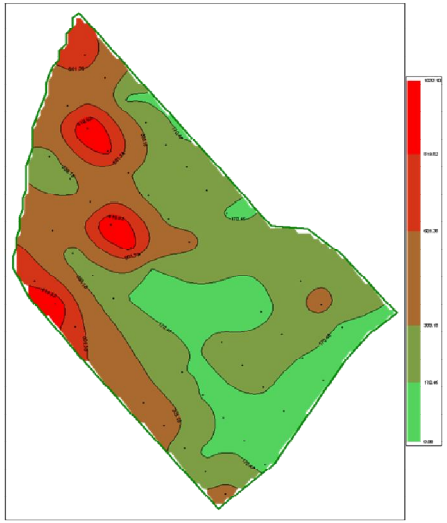
- **Spatially high resolution information**
  - Mapping of soil conductivity,
    - Decision support for optimized sampling design before harvest
    - Decision support for crop management (plantation, treatment)

Géocarta

Sources : www.geocarta.net



# Towards new observation systems



- **Temporally exhaustive information spatially punctual**
  - Follow-up of the production system (climate, soil water, water demand)
  - Multi-sensors network (GPRS, ZigBEE, etc.),
    - Water supply /water stress monitoring,

FP6-IST-1-508774-IP

Many enterprises :
- Agriscope,
- Fruition science,
- TCSD,
- Verdtech, etc.

# Towards new observation systems

- **Hand-held sensors**
  - Non destructive grape maturity monitoring to decide on optimised harvesting date (Ex. Spectron)
  - Vine physiological status monitoring for optimised application of factors of production (ex. Multiplex)
  - Yield and quality prediction (ex. Qualiris grappe)

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***SPECTRON™***
***Pellenc, Cemagref, IFV***

www.pellenc.com

***Qualiris grappe ™***

www.sodimel.fr

***Multiplex ™***
***Force-A***

www.force-a.eu

# And furthermore



- **Link with winery tools and information systems**
  - grape quality monitoring at reception (Qualiris reception™)
    assess cleanliness, integrity and colour of the grapes

Qualiris reception ™

www.sodimel.fr

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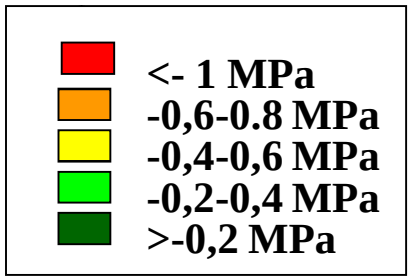
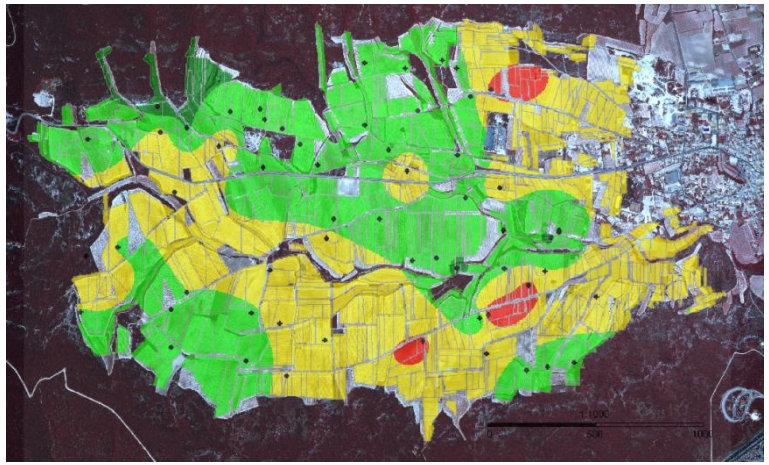
# Ongoing research on VP

- **Measurement**
  - Optical properties (ex Spectron),
  - Remote sensing (ex Oenoview),
- **Embedded systems**
  - Spraying  traceability (ex. Tixad),
  - Smartphone applications (ex. smartGrape, Vinonomade)
- **Data processing and translation**
  - GeoFis (freeware for geodata processing),
  - Spider (method of water stress interpolation),
  - Spatial sampling methods,



# Ongoing research on VP

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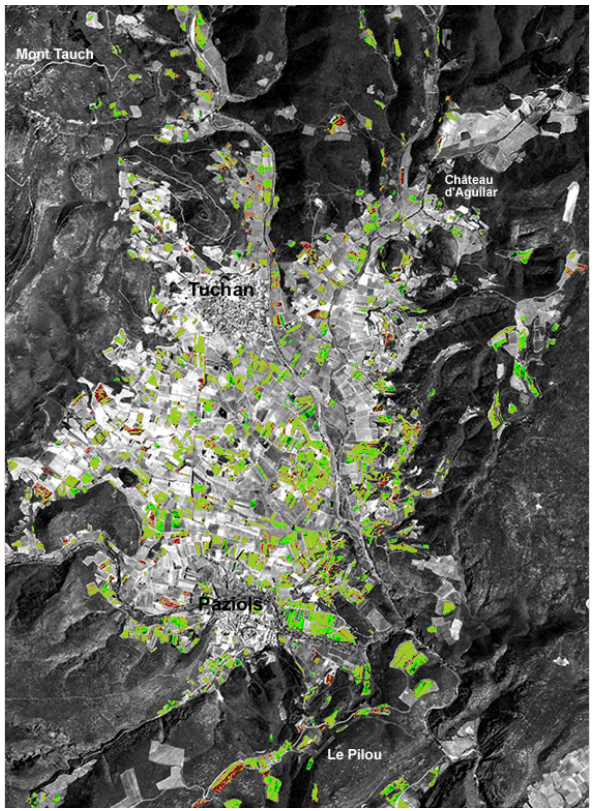
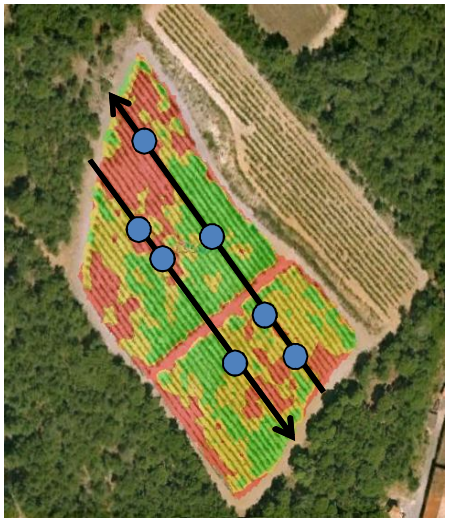
## Pre-harvest
## grape quality monitoring




Oenoview

Operational constraints :
- 30 plots visited /day,
- Support with geolocallized Smartphone,
- Best localisation of measures ?


Smartphone, Pocket-PC



Online sampling design



# Conclusions

- **Issues of**
  - Spatial heterogeneity assessment (traceability, logistic)
  - Vegetation mapping (crop management)
  - Phyto-product application monitoring (Env & econ impacts)
  - Soil mapping
  - Follow-up of water and physiological status (water/N supply monitoring)
  - Follow-up of production and quality (harvest forescast and wine quality monitoring)

- **Trend for hand-held, stand alone sensors**
  - High value information, rather expensive sensors vs.
  - Simple lower value application available on Smartphone

# Issues for the viti-viniculture sector

- **Joining geographic and temporal information**
  - Interpolation
  - Sampling design

- **Inter-operability**
  - Communicating systems
  - Data exchange standards
  - Integration of new tools in existing systems,

- **Links with robotics**

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# Thank you for your attention

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