

Tecnologie innovative per la gestione del vigneto



Vittorino Novello

AIVV, VinoVip, Cortina 14-07-2013

XXI secolo

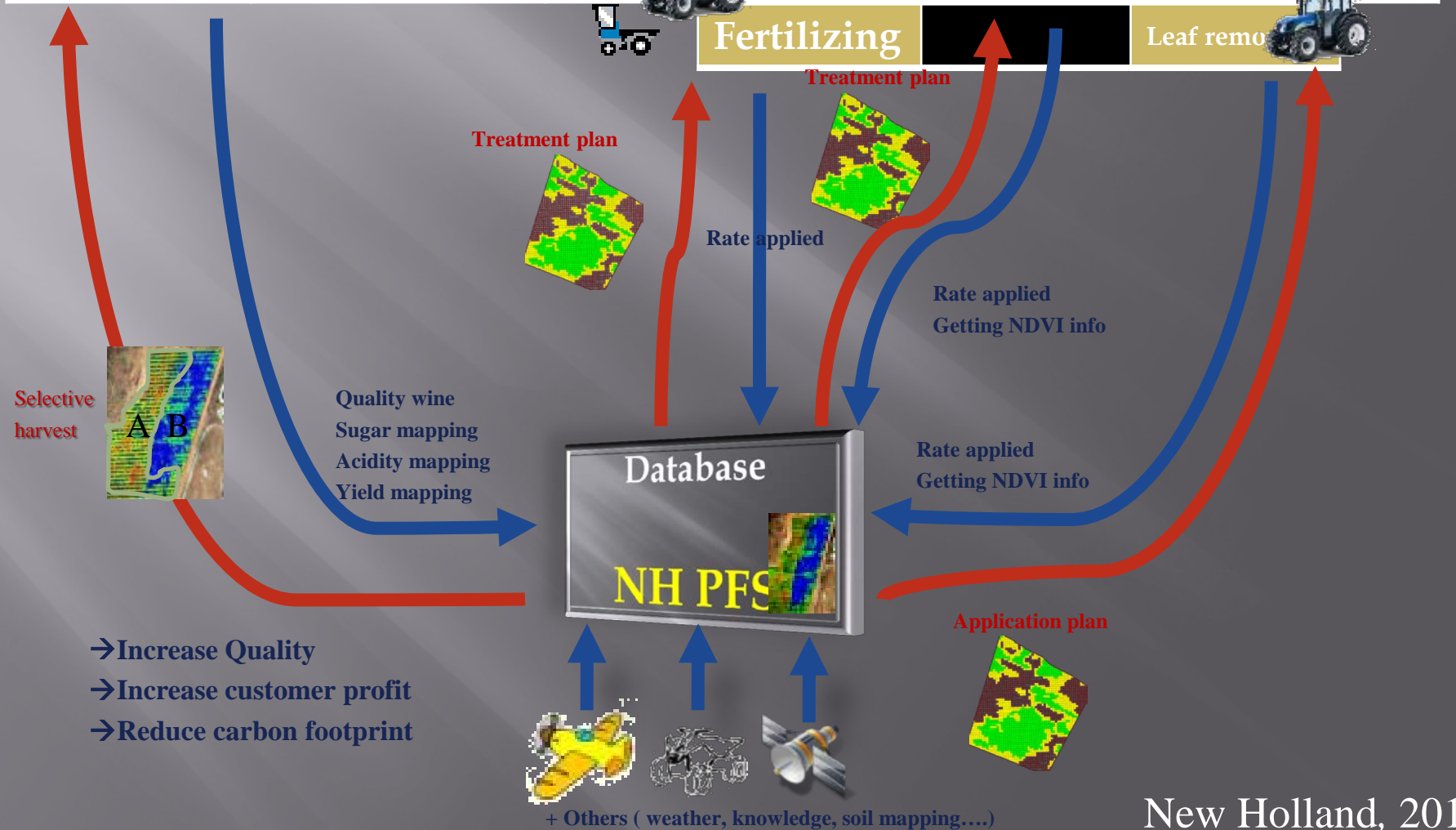


viticoltura di precisione

- **Impianti di precisione**  **laser, GPS**
- **Gestione remota**  **satelliti, GPS, GIS, sensori remoti**
 - **irrigazione**
 - **concimazione**
 - **difesa**
 - **gestione della chioma**
 - **vendemmia**



> UNIFORMITA' DI PRODUZIONE



- Increase Quality
- Increase customer profit
- Reduce carbon footprint



Scannerizzazione elettromagnetica



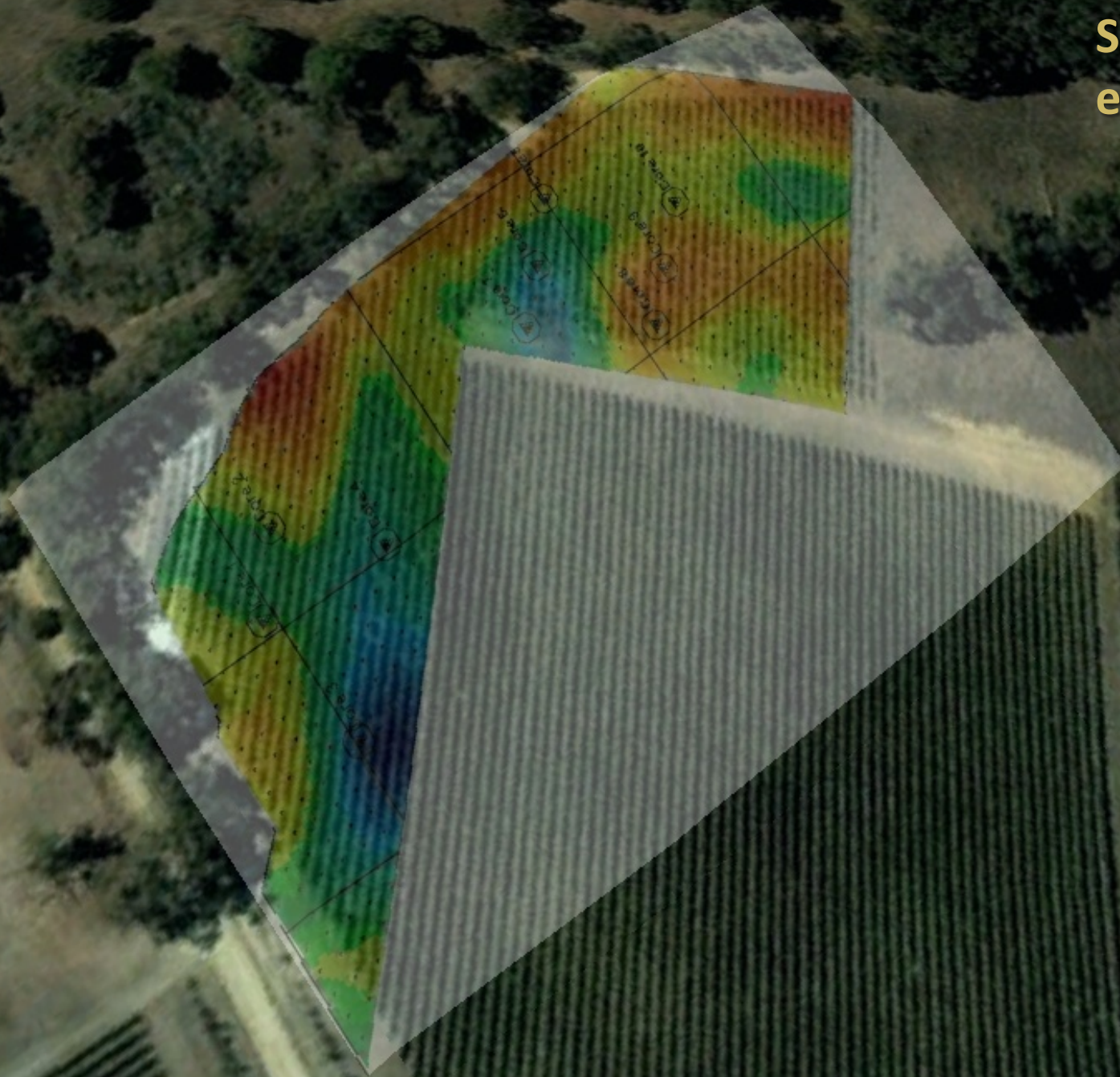
Scannerizzazione elettromagnetica

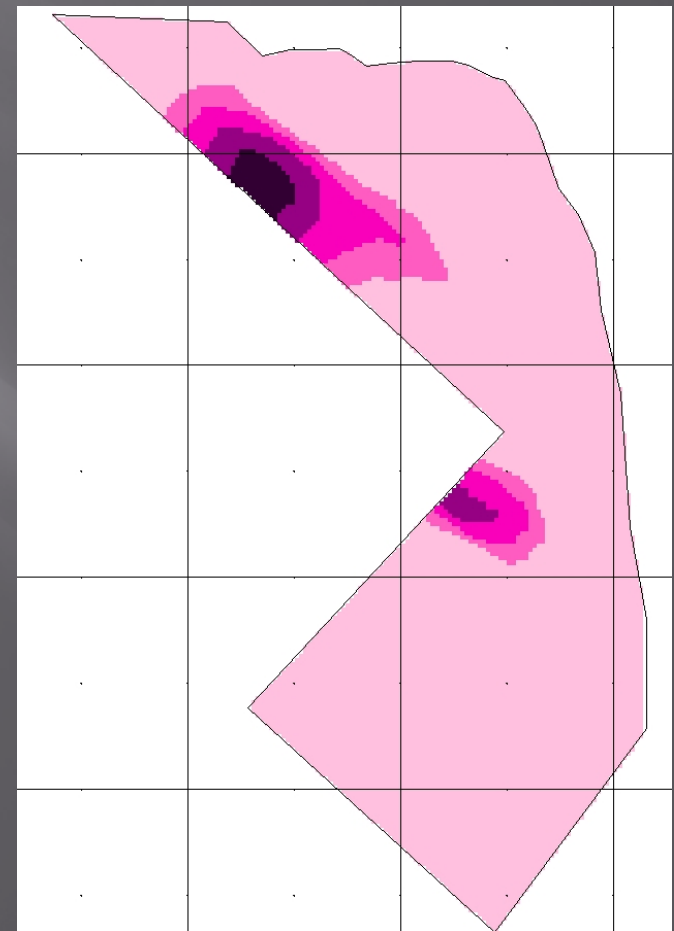
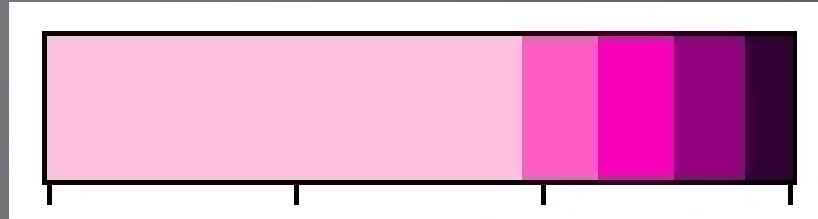
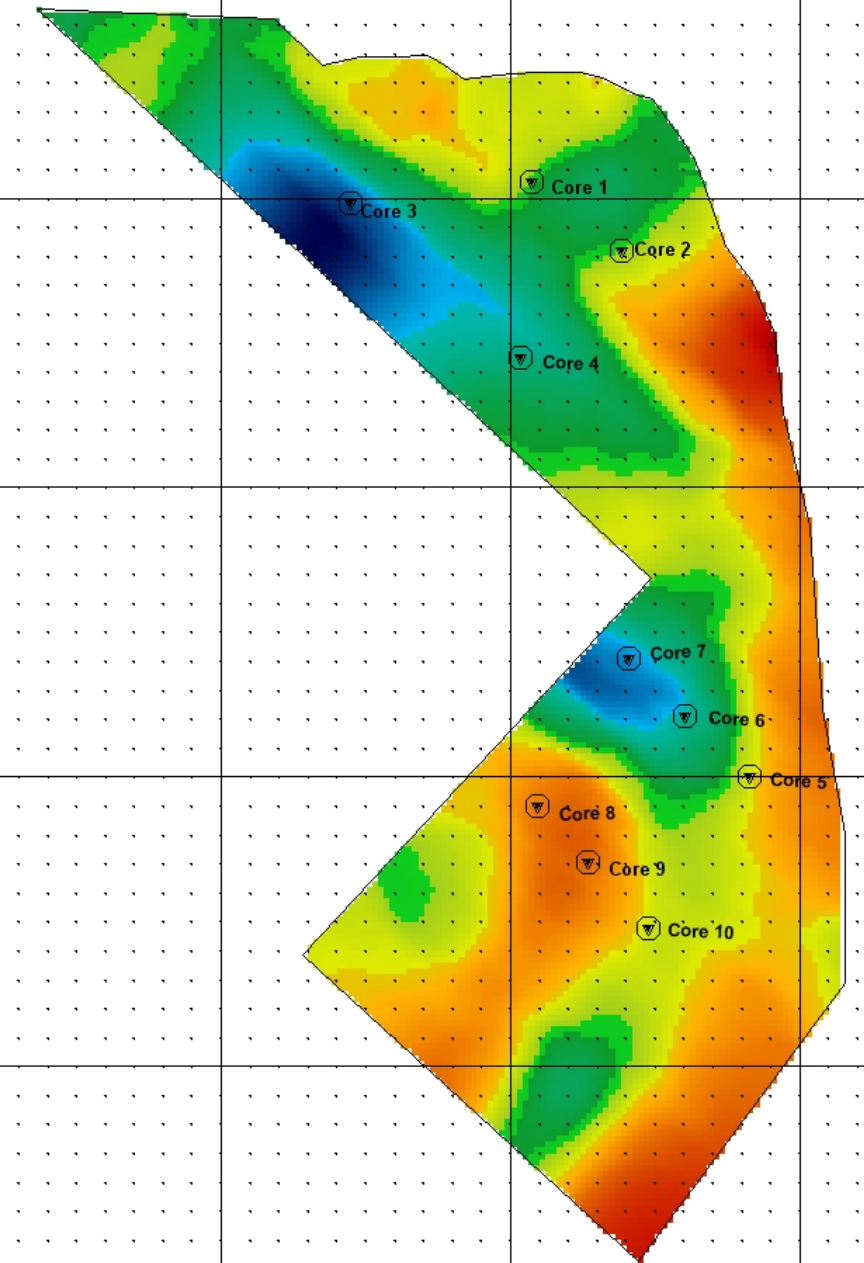


Scannerizzazione elettromagnetica



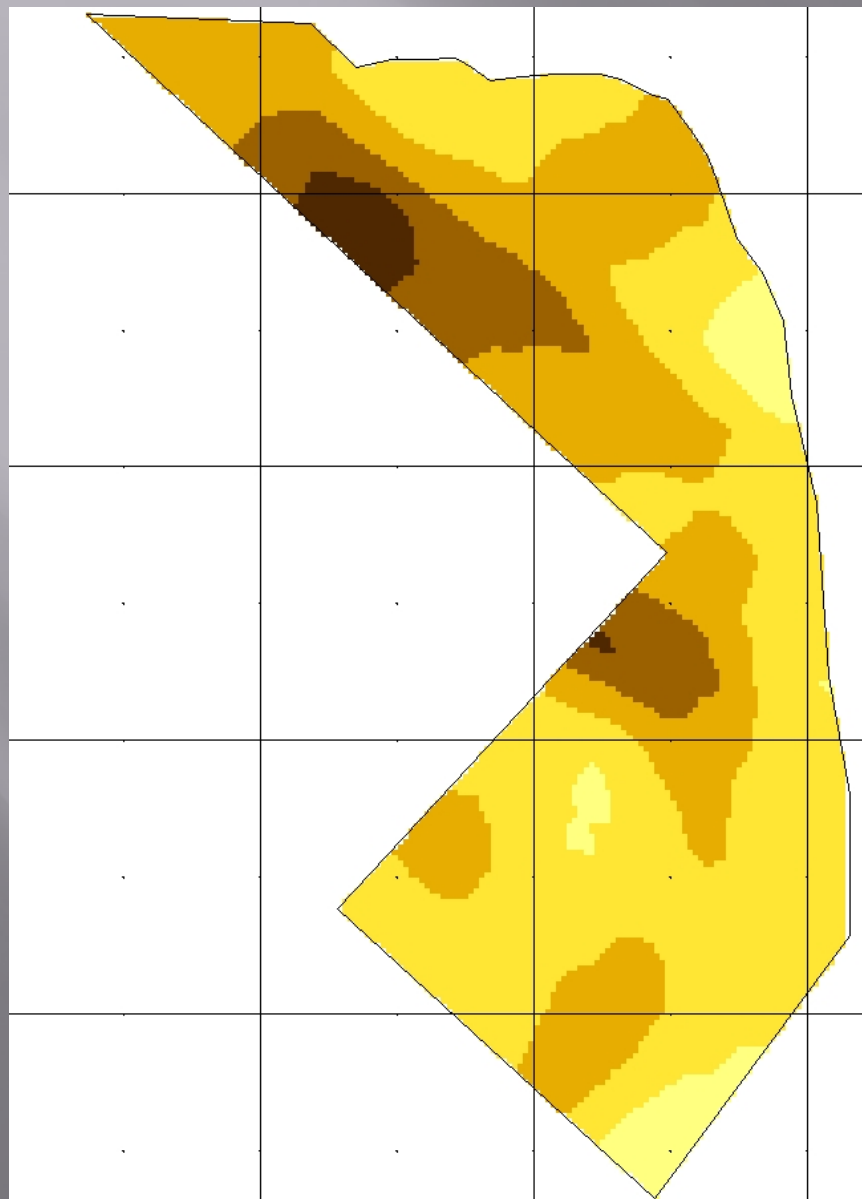
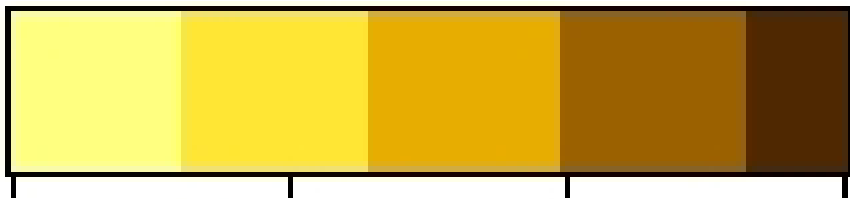
Scannerizzazione elettromagnetica

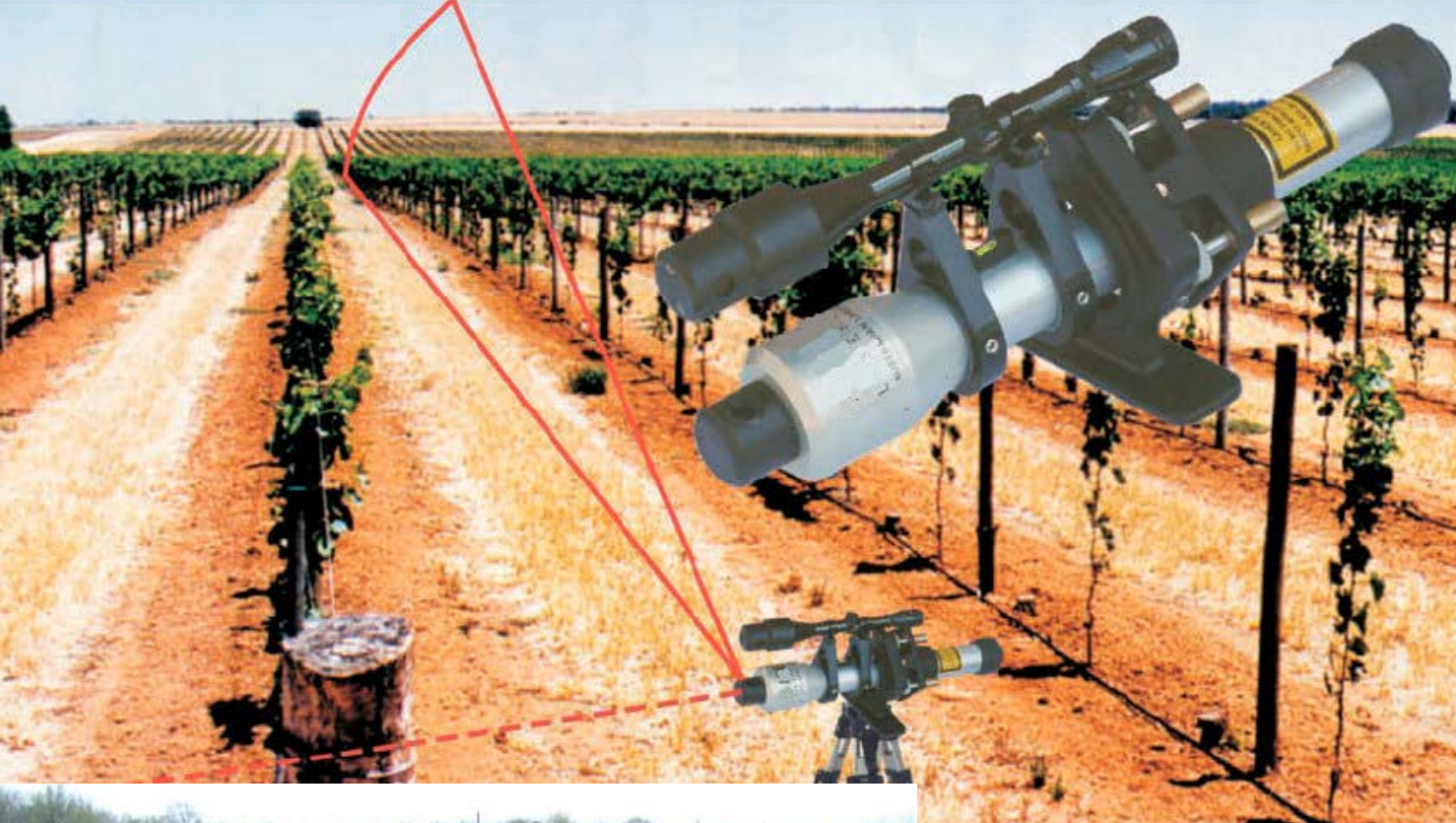




Scannerizzazione
elettromagnetica

Scannerizzazione elettromagnetica





Impianto al laser





Laser Planting means straight and evenly spaced rows

Impianto al laser

Progetto di vigneto



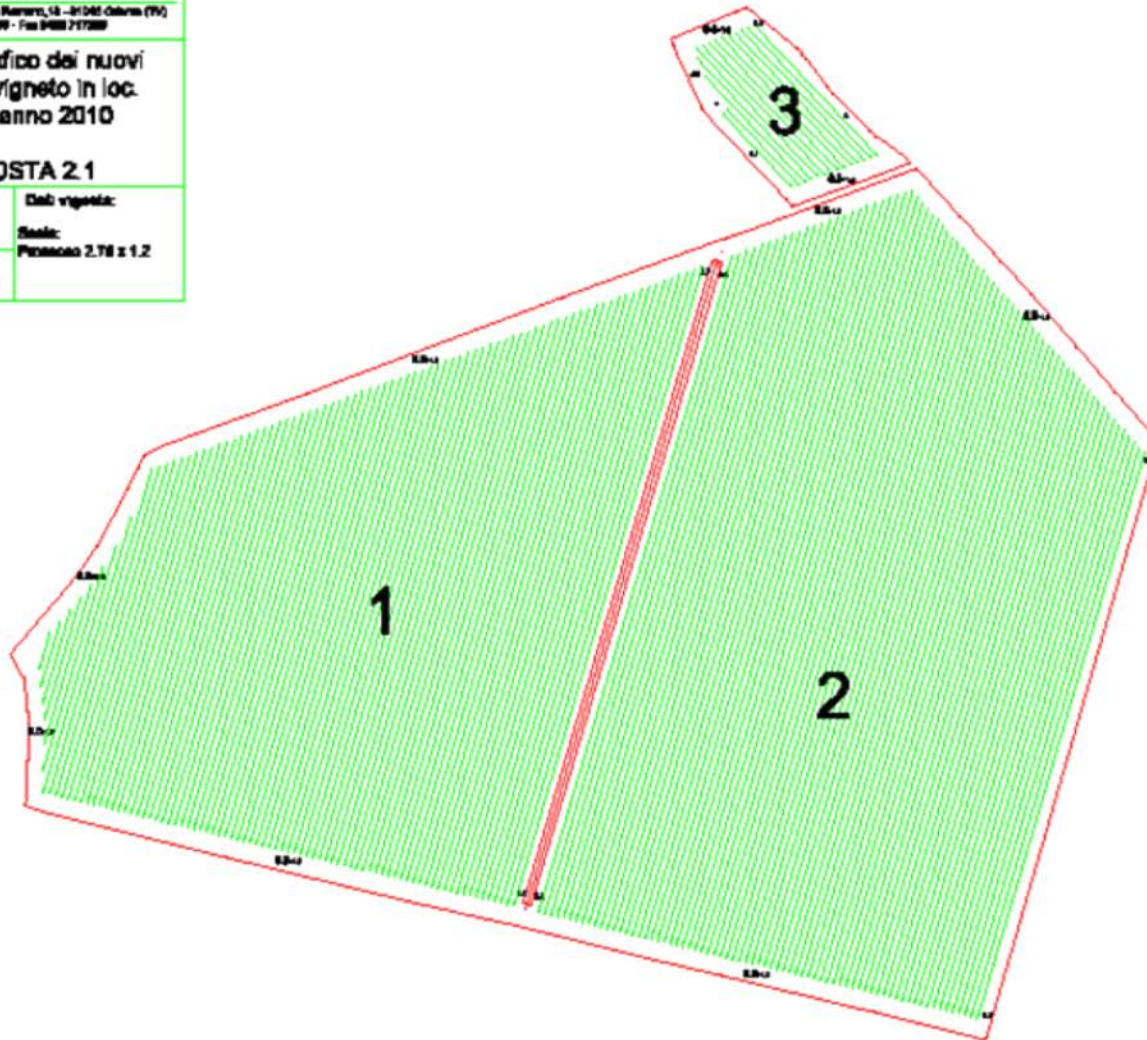
EVOLUZIONE AMBIENTE

Piazza del Pomo Nero, 13 - 31042 Osimo (TV)
Tel. 0423 717000 - Fax 0423 717000

Schema grafico dei nuovi
impianti di vigneto in loc.
Noventa anno 2010

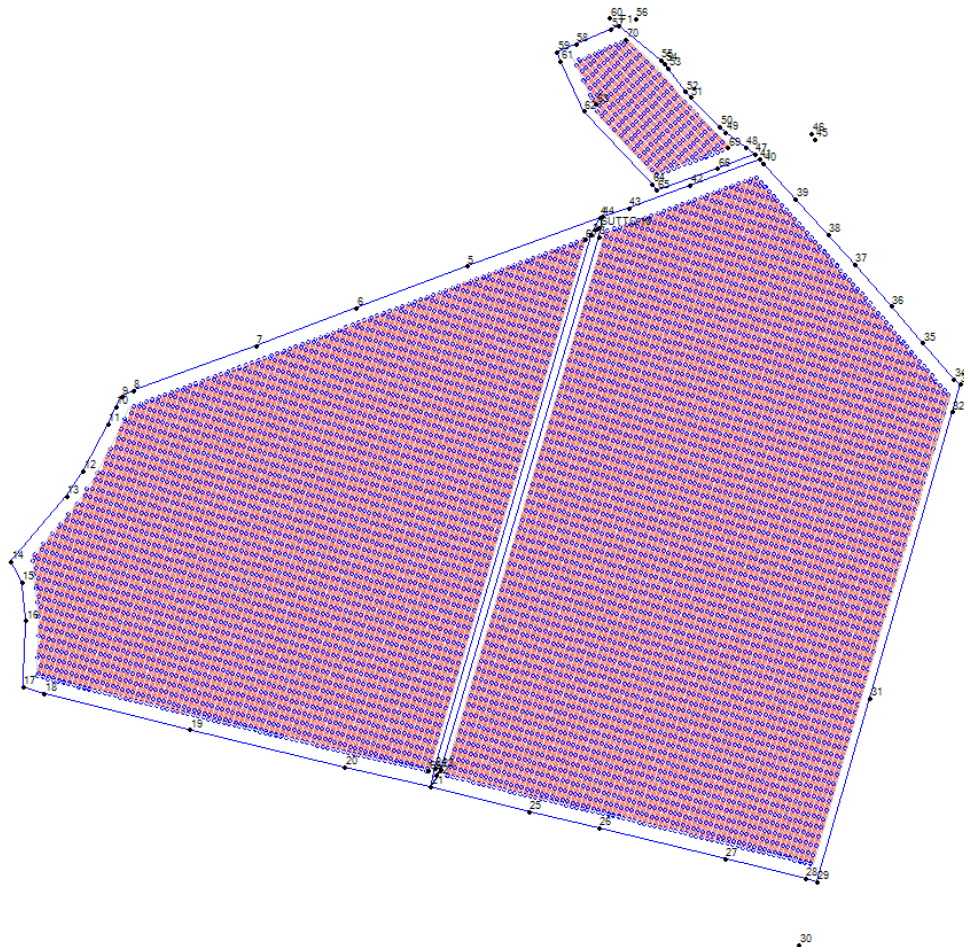
PROPOSTA 2.1

Comune/Località:		Data vignetta:	
Az. Bizio / Crizzo		Scala:	
Data:		Piantaggio 2,78 x 1,2	
14 Luglio 2010	Scale:		
	1:2500		

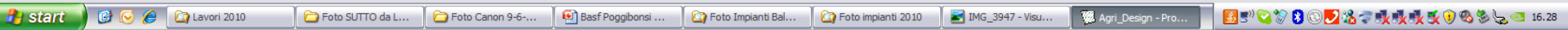


Programma per le macchine

Agri_Design - Progettazione Impianti Agricoli



E=-264.019 , N=55.753





Agri_Guide v2.1.5

Filare 71/112

Linea 132.16 / -101.45 m

Squadro 4.8 cm

Posizione Avanzamento Pista

Stop Guida Comandi

Vel 2.32 Km/h

Dir 352.6

Configura Direzione di Marcia

Inparto Macchina

Gps 42.750.183.988.49.684

Stato

2.9 Fused

Riavvia GPS

Inclinometro

Riavvia Inclinometro

Start Agri_Guide v2.1.5

INDUSTRIAL MONITOR 15.2" LCD
Manufactured by GUDMONTORINI S.p.A.
Tel. +3905126078 Sede F. Nocera

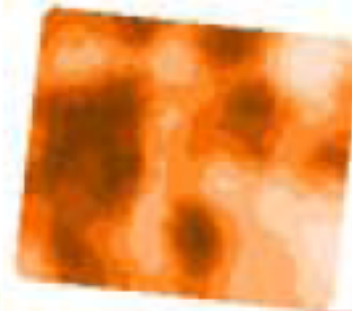
Piantatrice con GPS



Piantapali guidata da GPS

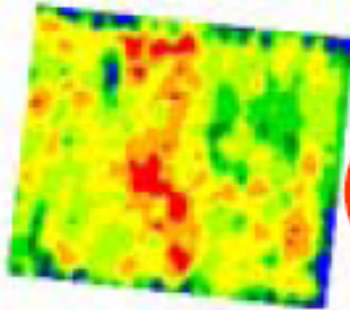


Observation

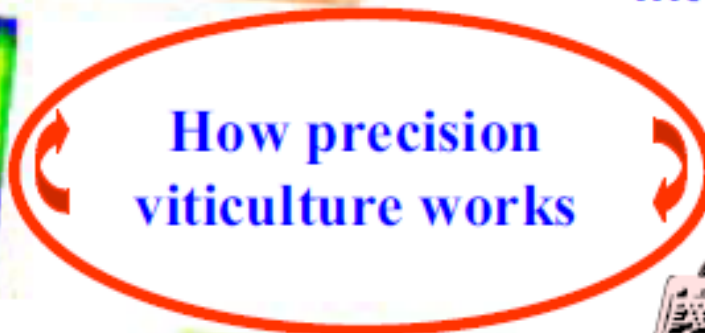


Supplementary information
eg Remote sensing, Digital
elevation model, Soil and tissue
testing, Soil mapping (Grid ?
EM38 ? γ -radiometrics ?), Crop
assessment

Interpretation



Yield map



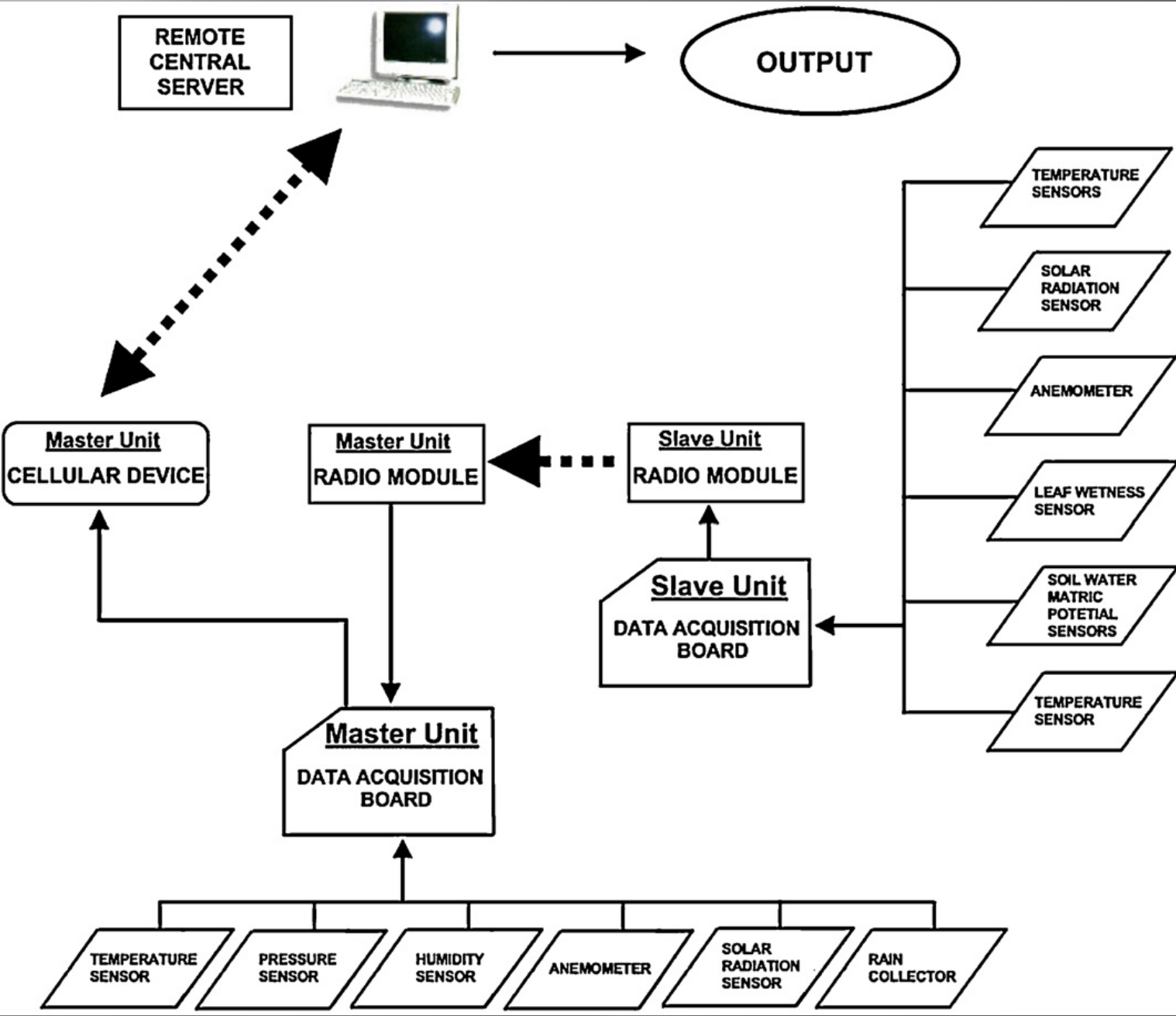
Implementation



Targeted
management plan

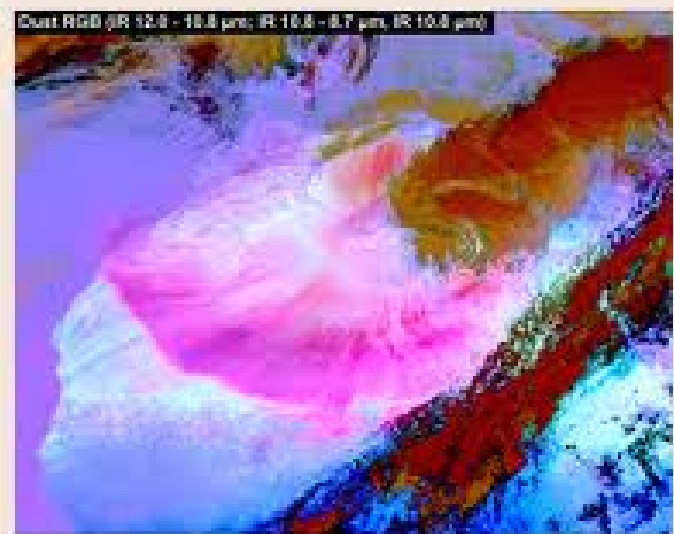
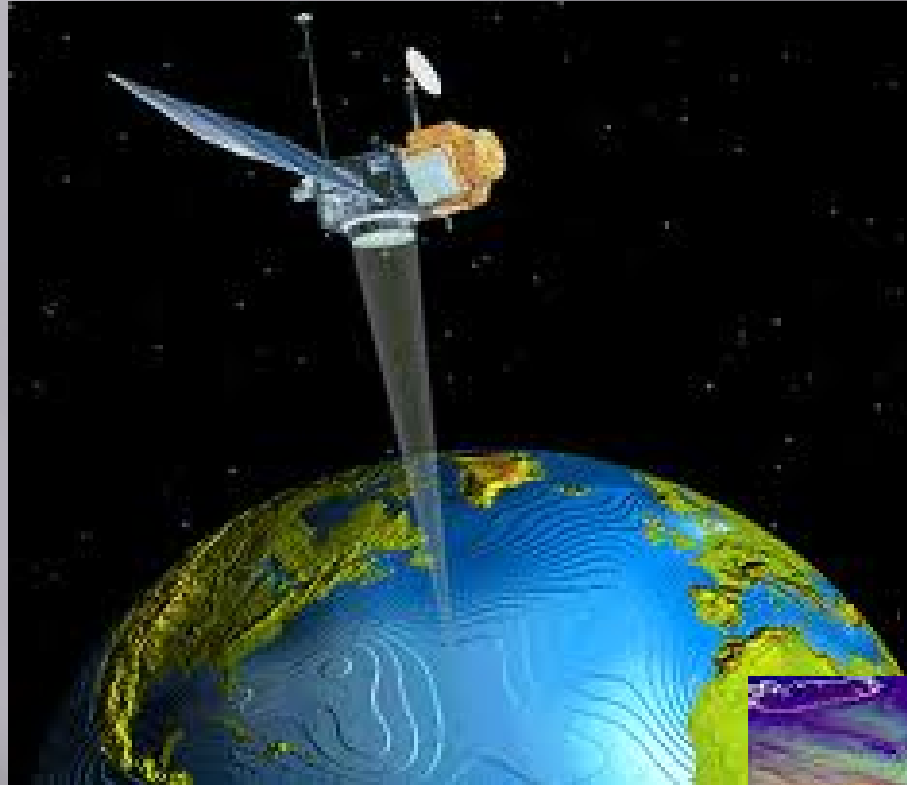
Evaluation

Sensori locali



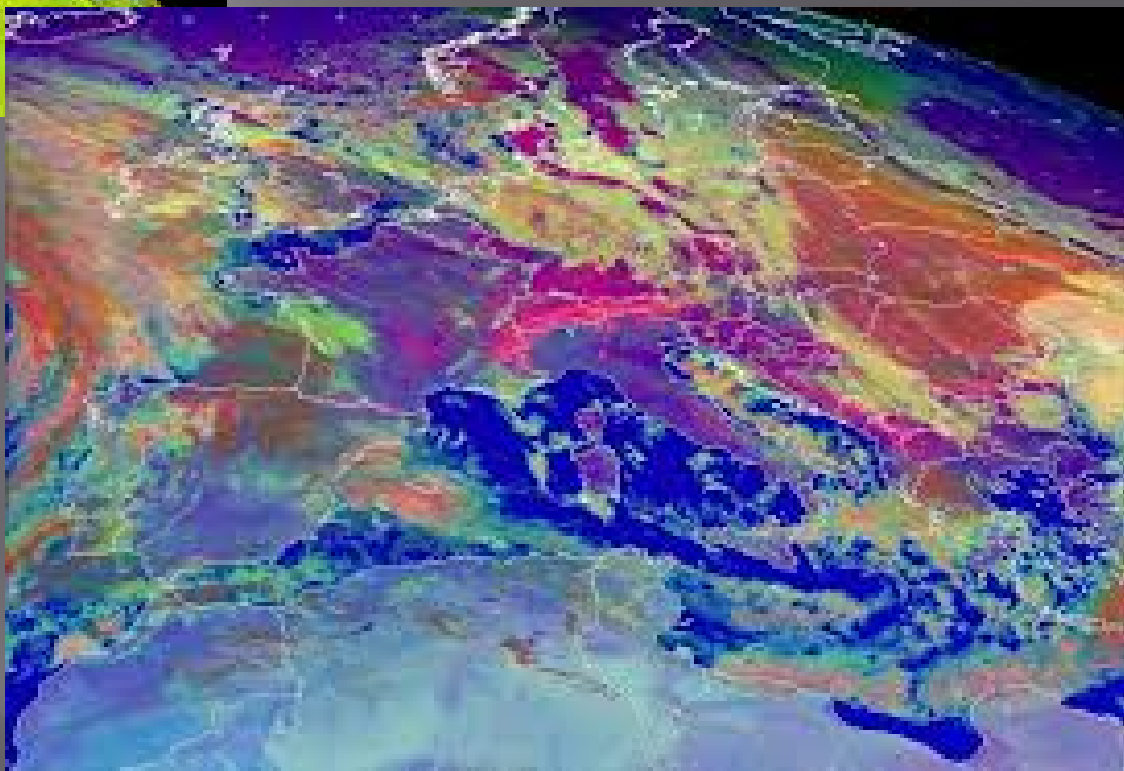
Sensori locali



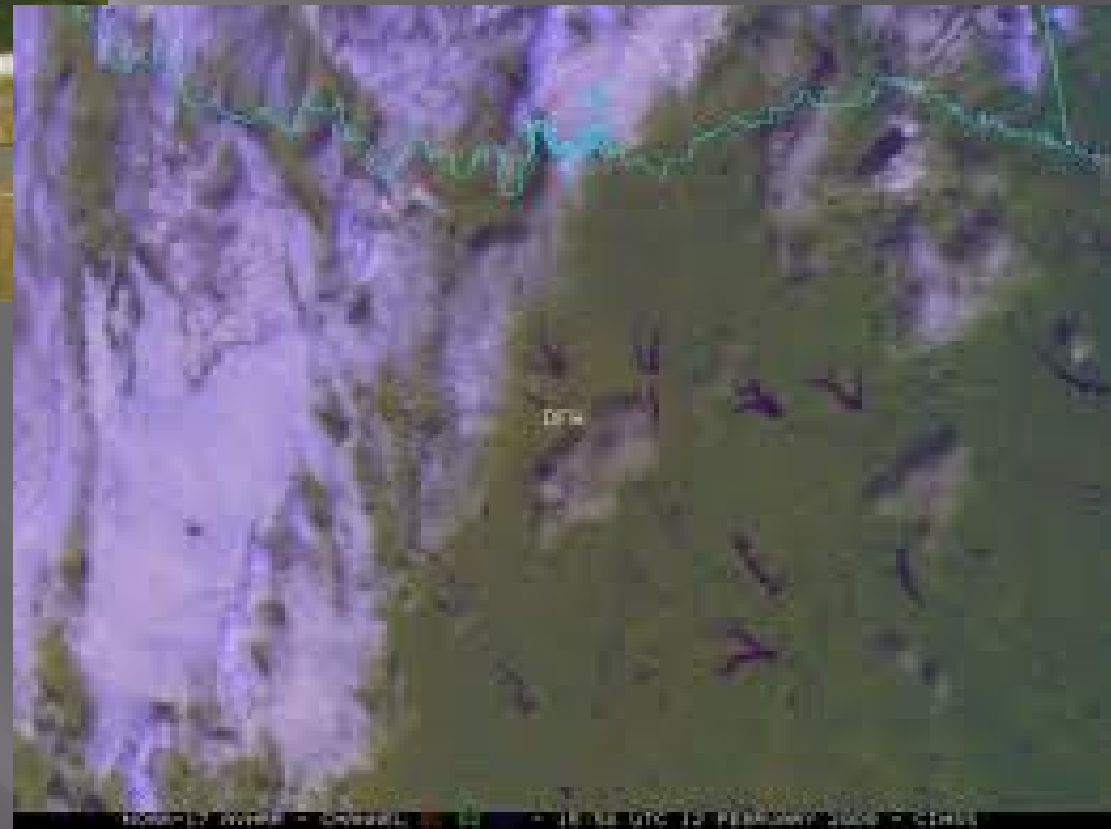


© EUMETSAT / The COMET Program

Sensori remoti



Sensori remoti





Draganflier X6

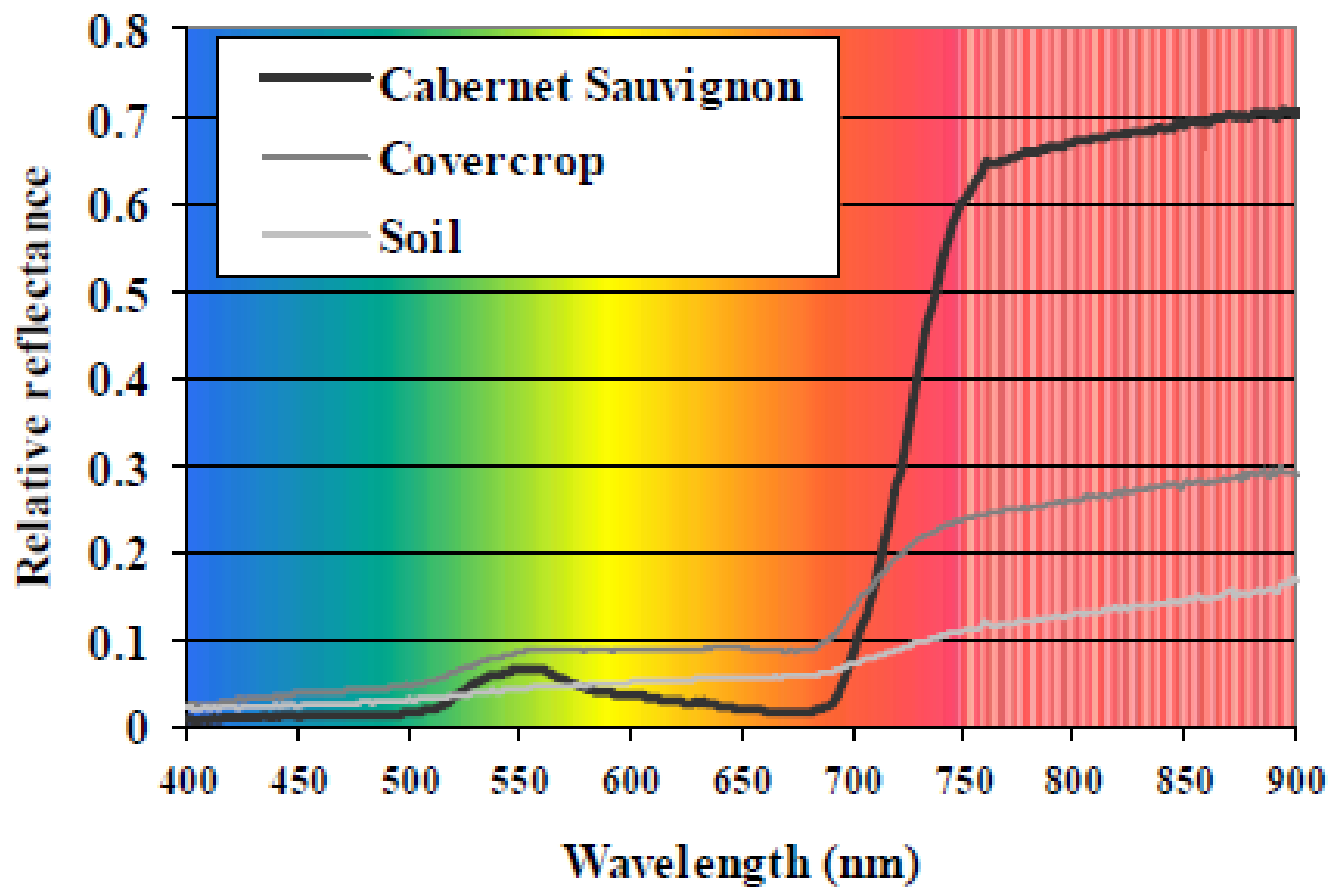
Featuring the Panasonic TM-030 1080p 60fps HD camera system for spectacular HD aerial photography.

Sensori remoti



Sensori remoti



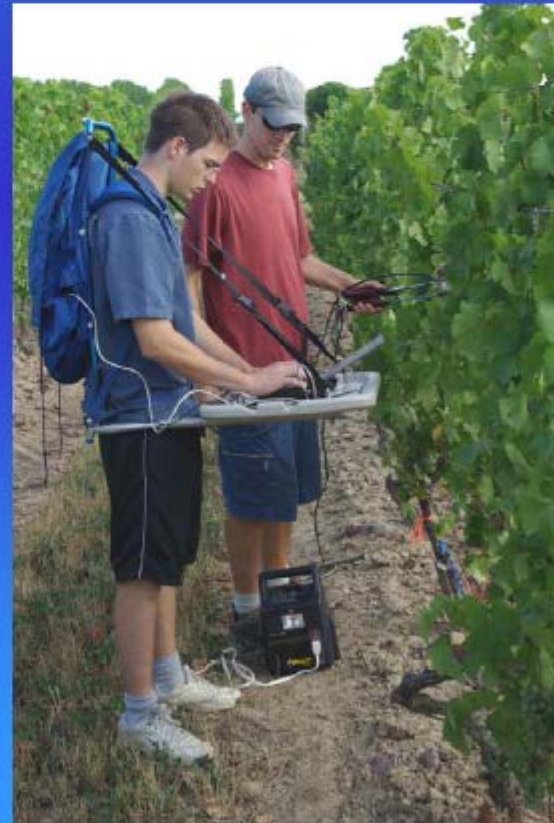


Ground data collected from sentinel vines



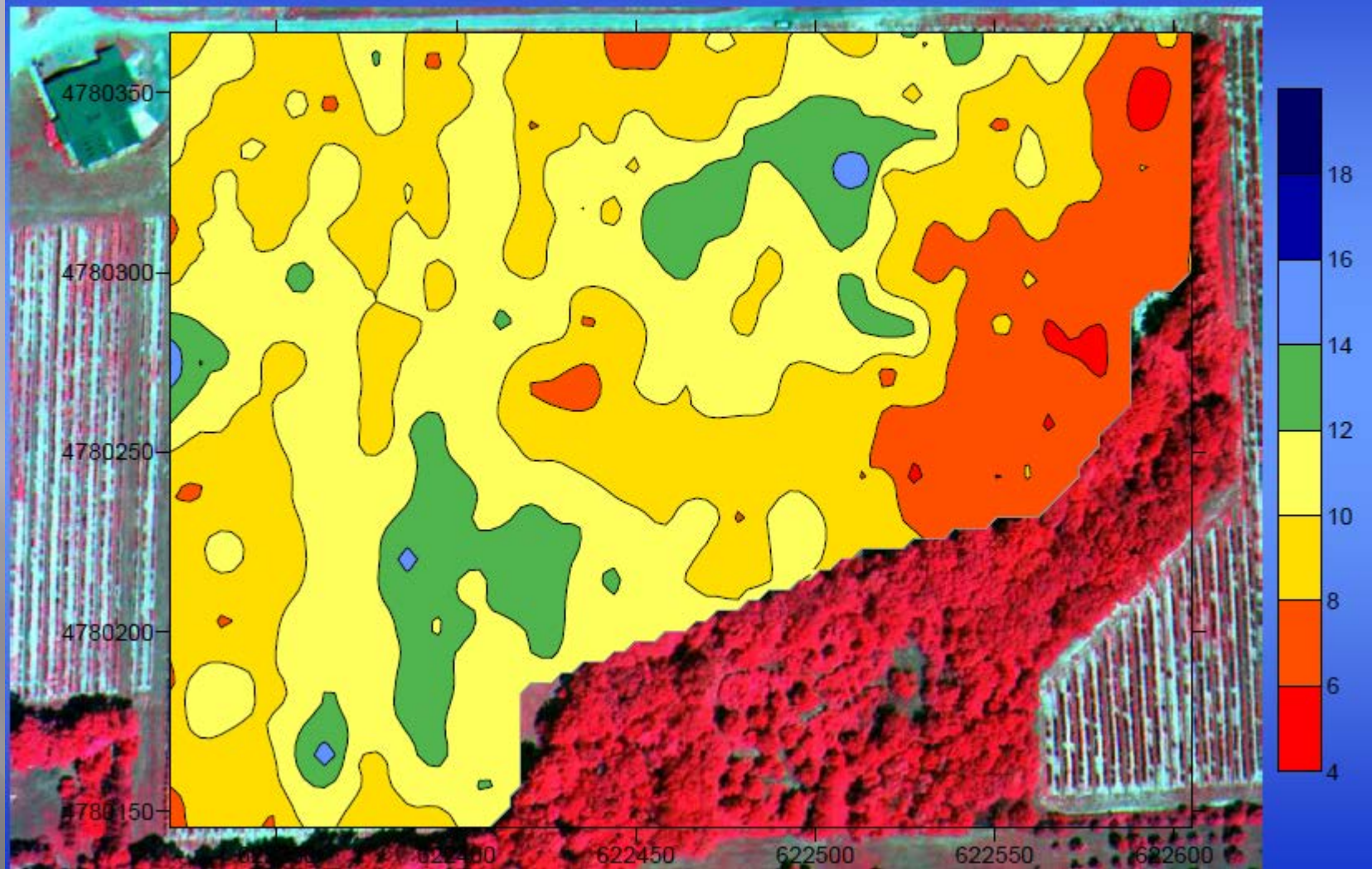
- Soil moisture from portable TDR
- Vine water status from pressure bomb
- Leaf reflectance spectrum
- Harvest data – yield, berry weight, Brix, pH, etc.
- Sensory and chemical wine data

Measuring leaf reflectance in management zones

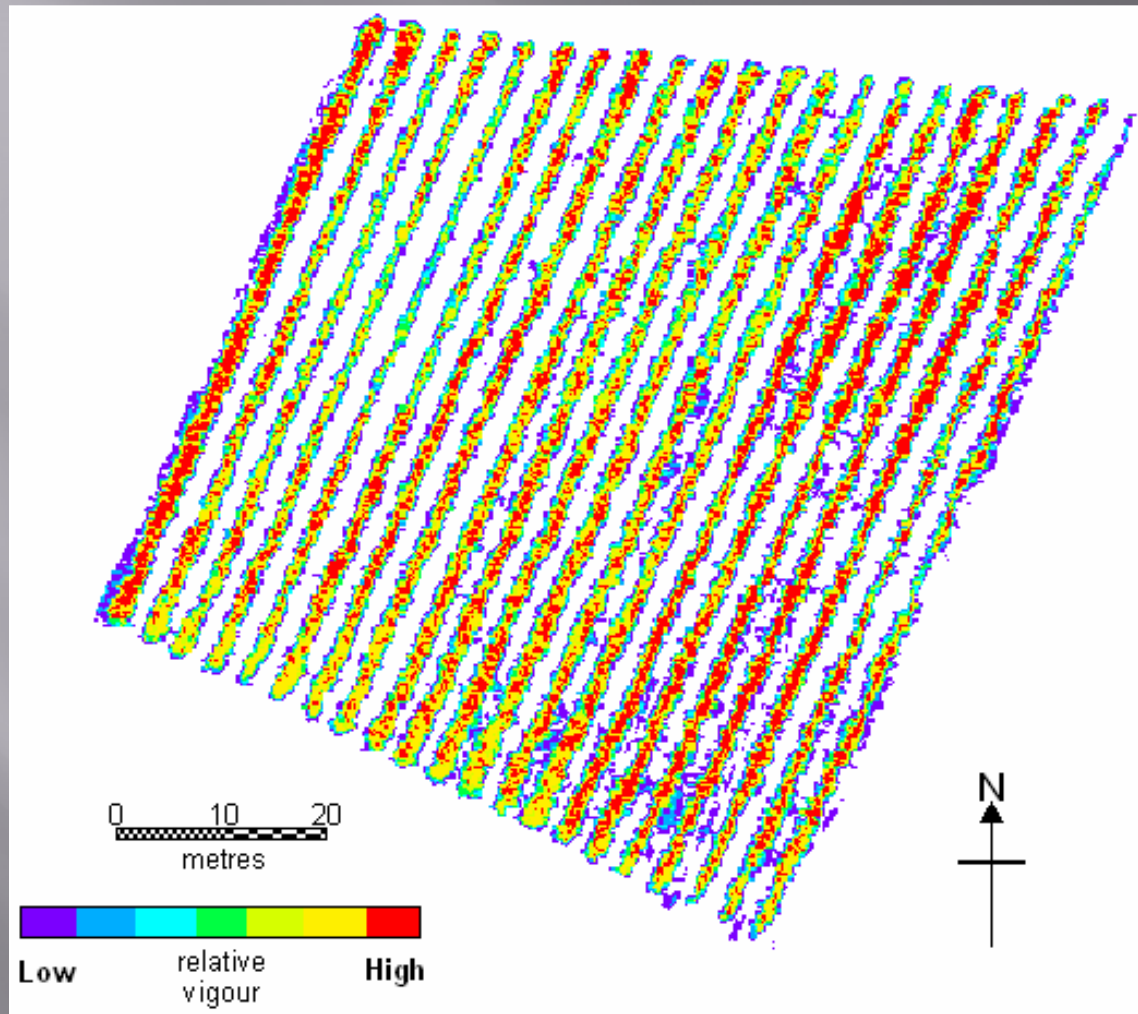


From Ralph Brown

2007 – hot and dry! Average soil moisture



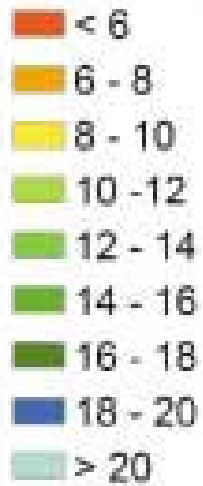
From Ralph Brown



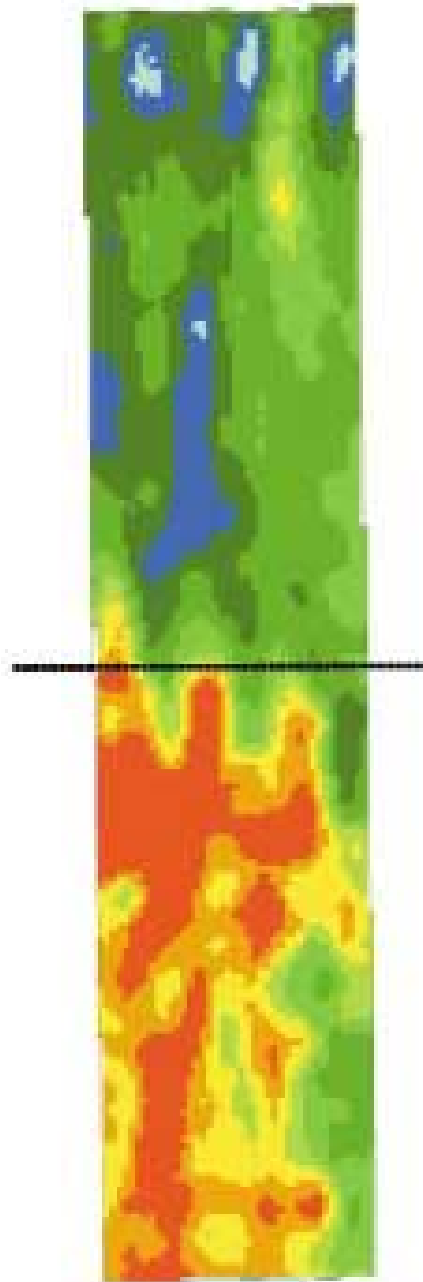
Pseudo-color NDVI image of vineyard with fully developed canopy, January 1999. Good indication of vine size as well as overall vigor.

From Hall et al.

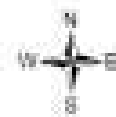
Yield (t/ha)



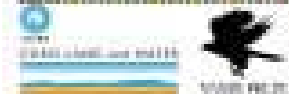
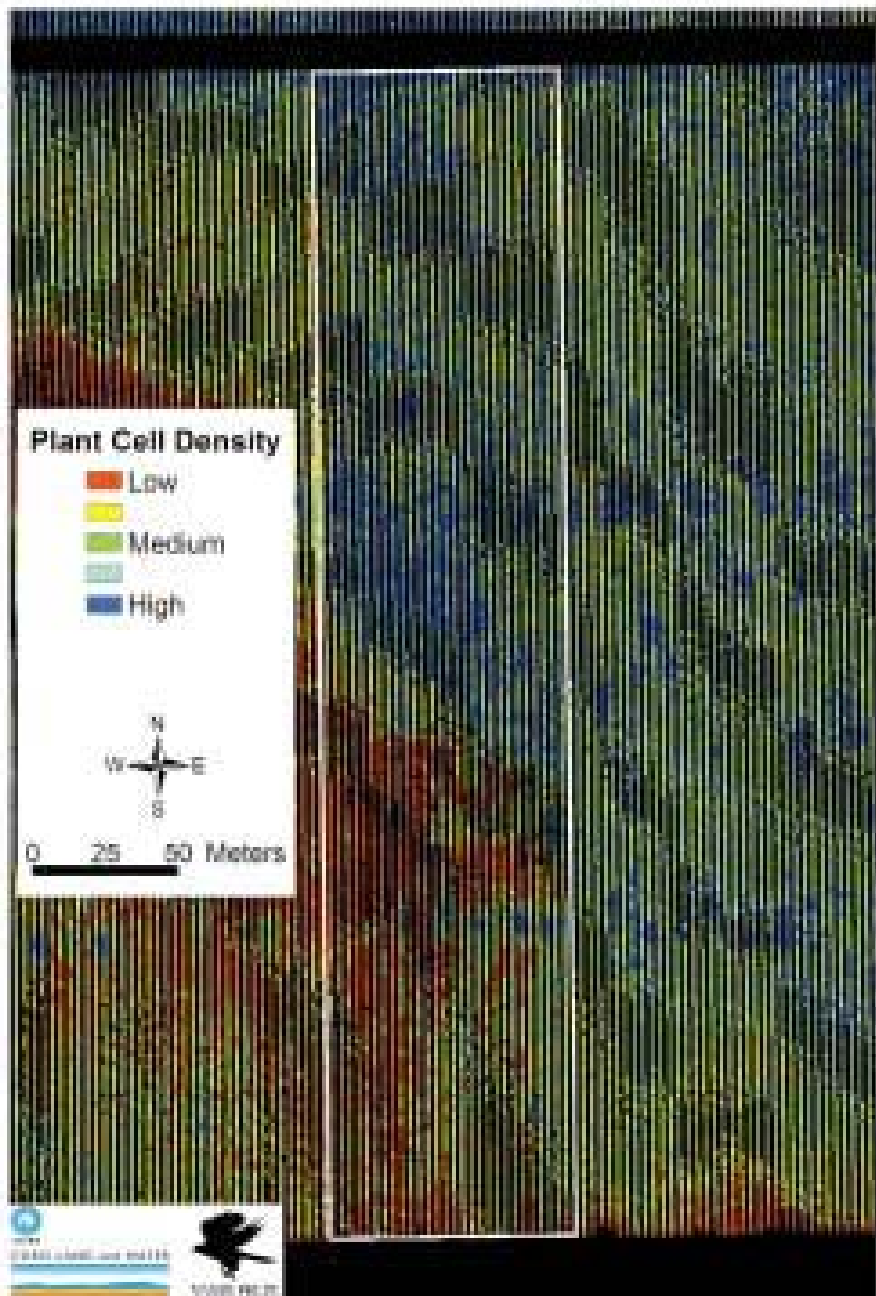
0 15 30 60 90 Meters

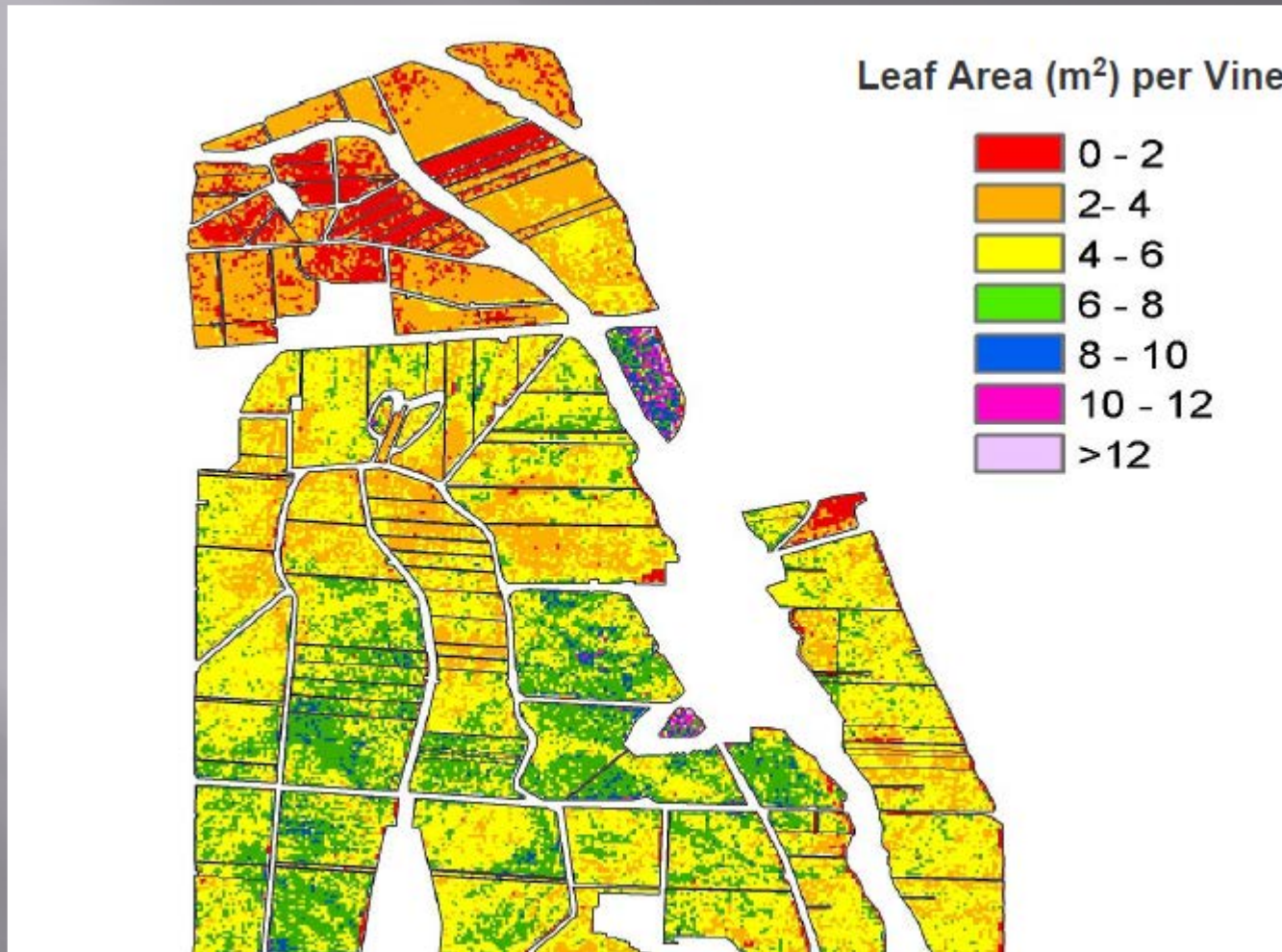


Plant Cell Density



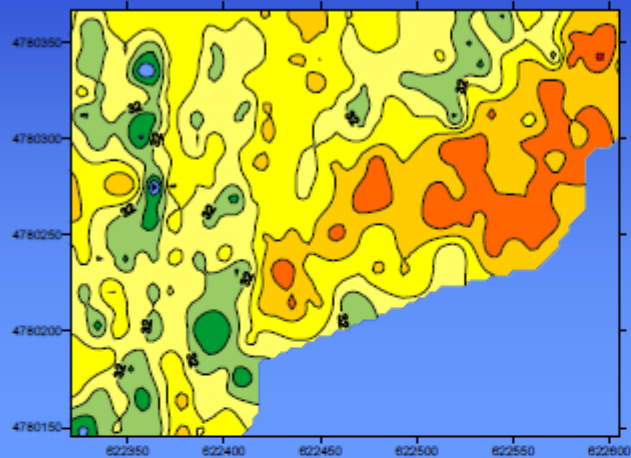
0 25 50 Meters



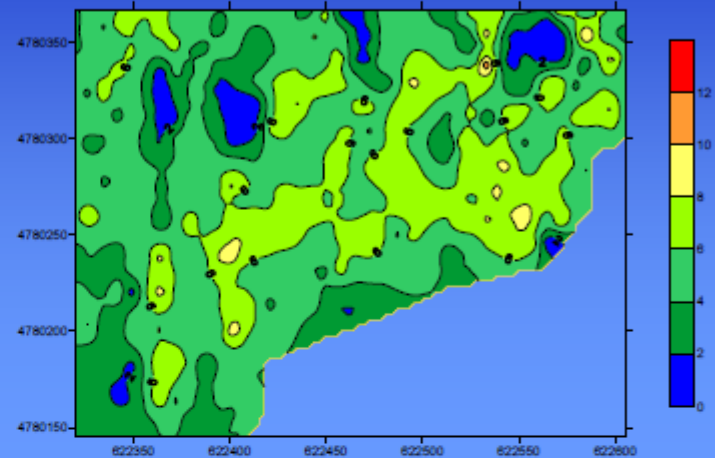


From Roczen

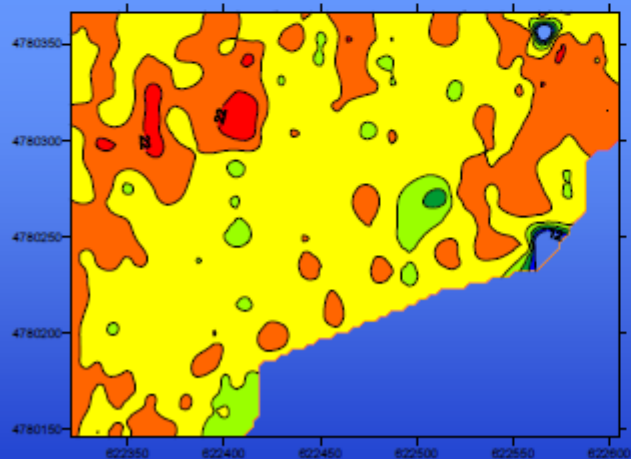
2006 cool and wet – pattern of variability



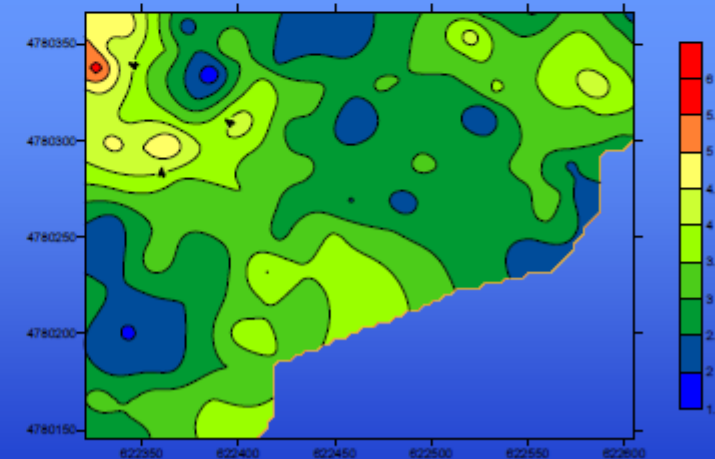
Soil Moisture



Yield per vine

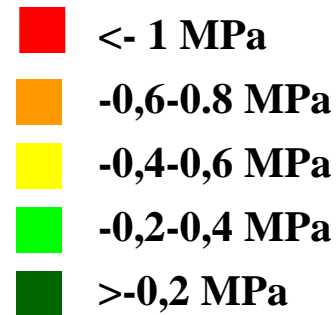
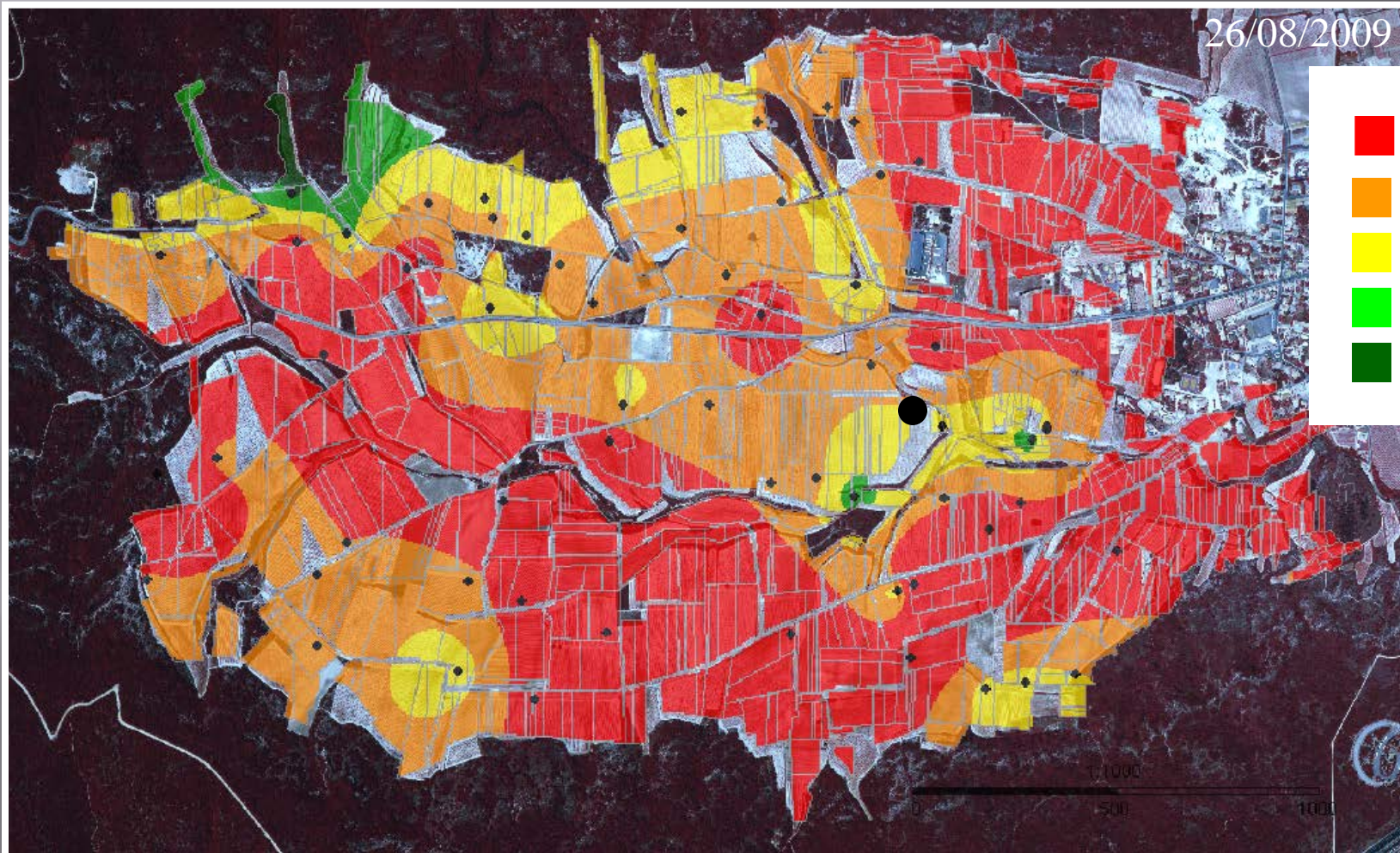


Brix

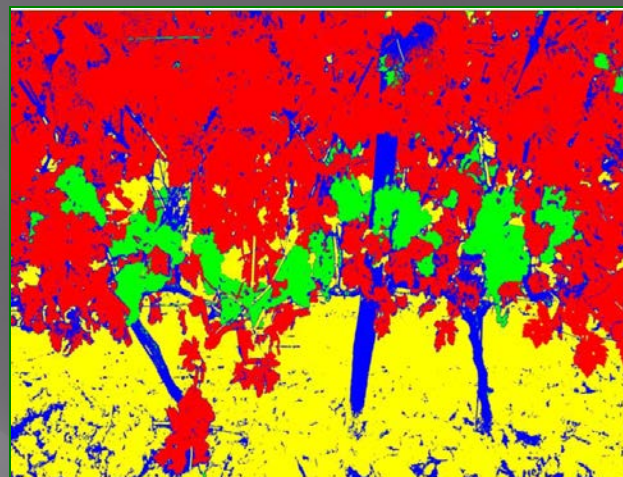


Total monoterpenes

Esempio di estrapolazione dello stato idrico delle viti



Analisi delle immagini per valutare lo stato della chioma



Cluster
exposure

Green
leaves

Yellow-wilted
leaves

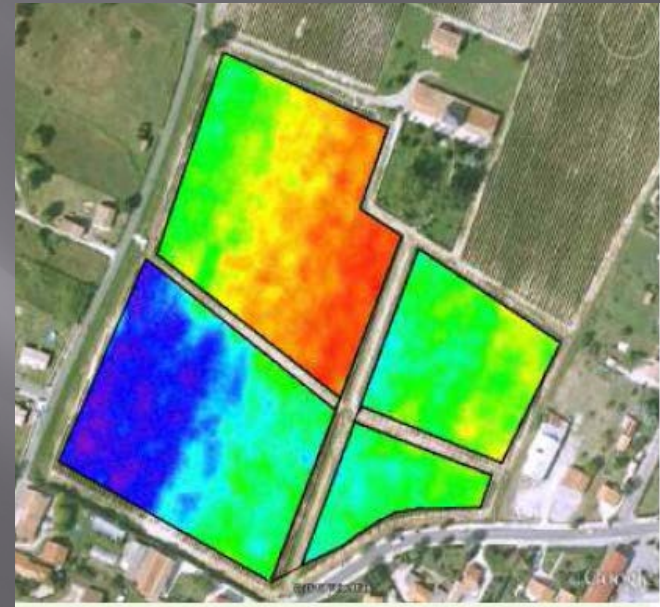
Canopy
porosity

Laboratorio mobile multisensore per monitorare lo stato della chioma



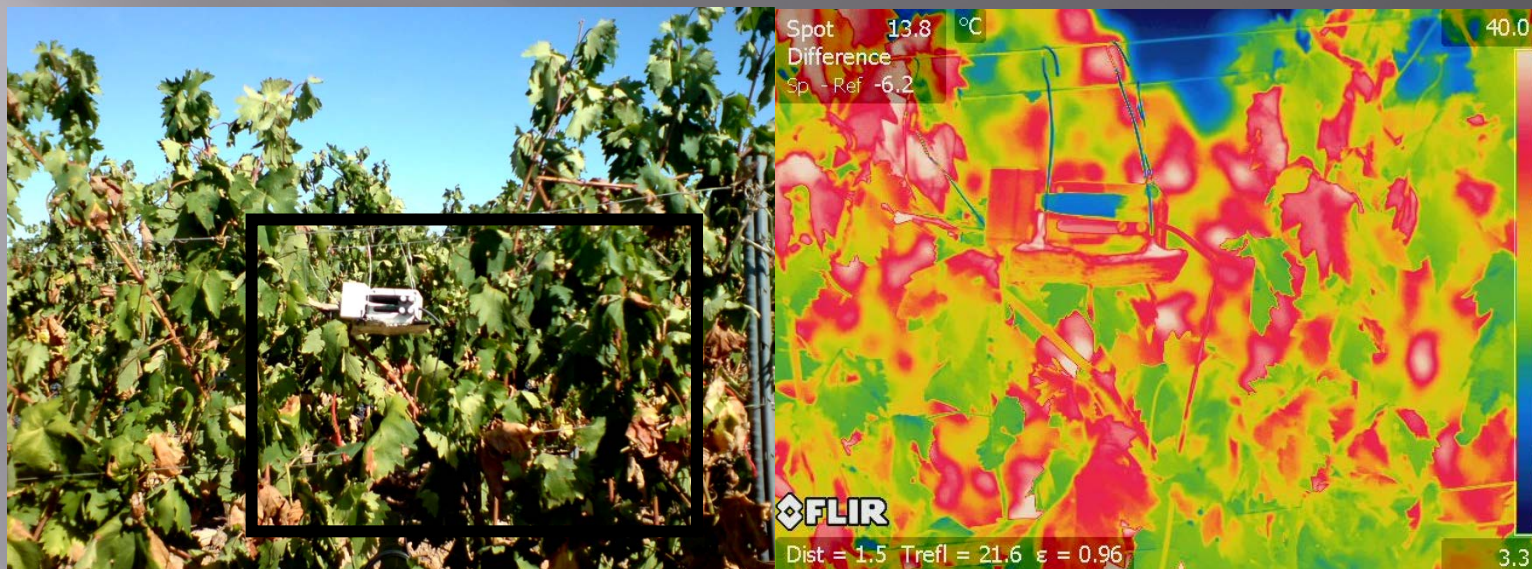
Mappatura dinamica della chioma

Georeferenced data using GPS

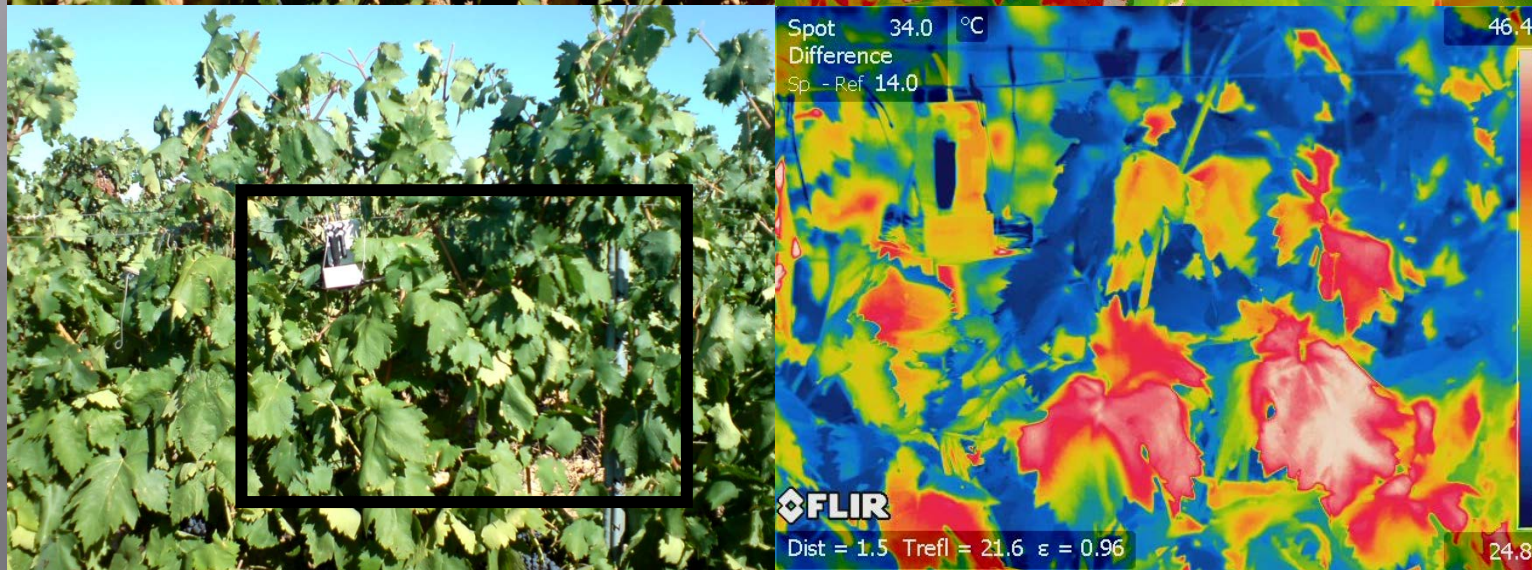


Valutazione dello stress idrico della vite

stressed



non-stressed



Capteur en végétation : Ntech Greenseeker NDVI



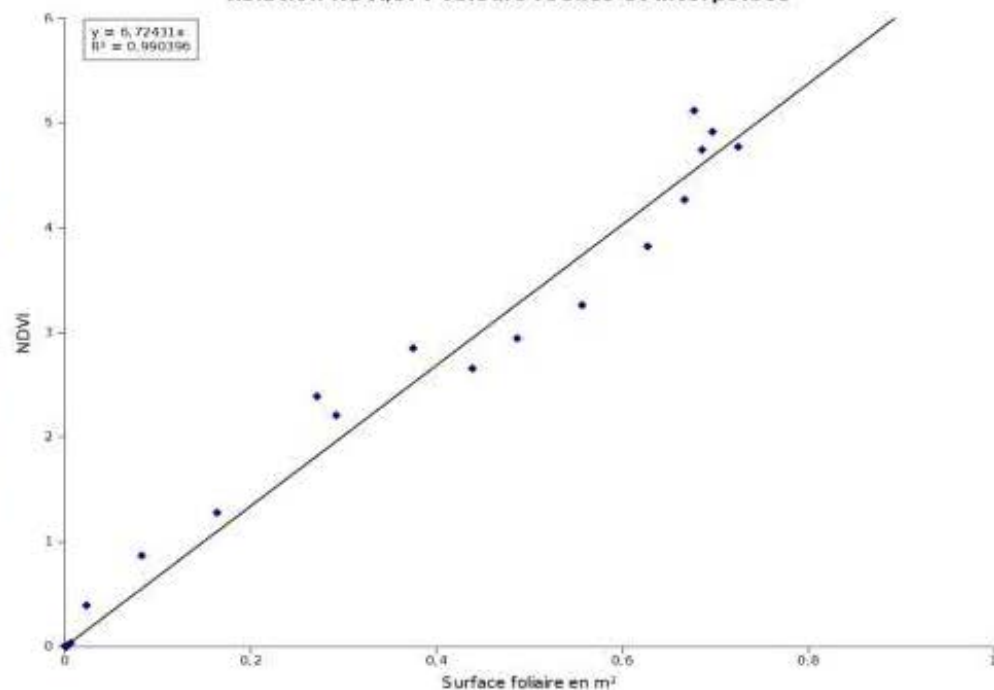
Le Greenseeker Ntech (NDVI)

-> porosité du feuillage

Capteur d'expression végétative

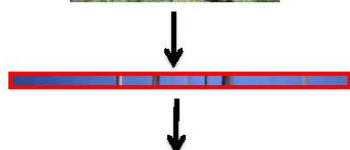
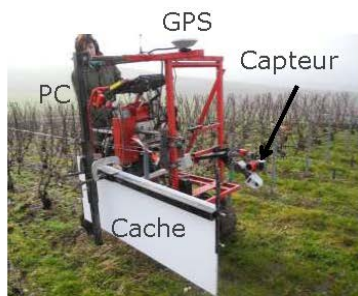
Relation avec la surface foliaire totale

Relation NDVI/SFT valeurs réelles et interpolées



L. Panerai

Version preuve de concept 2011



3 paramètres obtenus

- Nombre de sarments
- Surface totale des sarments (biomasse)
- Diamètre moyen d'un sarment → **Vigueur**

} **Expression végétative**



2012 Version prototype Physiocap fonctionnel



Viticoltura rateo variabile



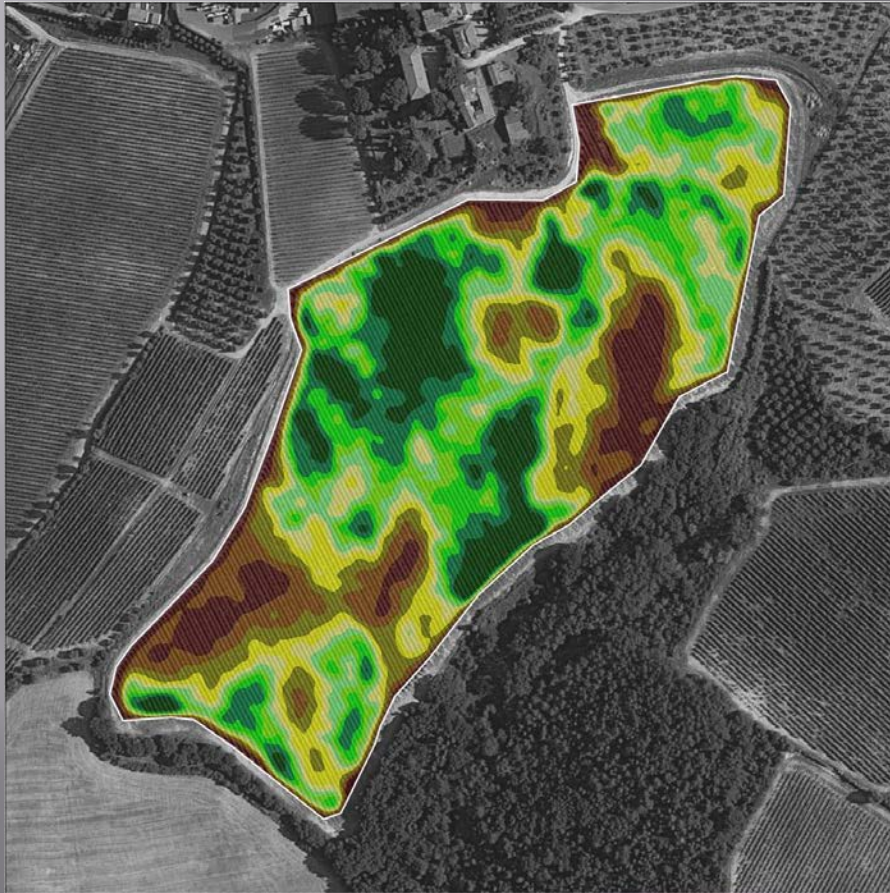
Per gentile concessione di Andrea LONARDI
Coordinamento Viticolo GRUPPO ITALIANO VINI

Viticoltura rateo variabile acquisizione dati



Viticoltura rateo variabile

Mappe del suolo - da 10 a 2 zone

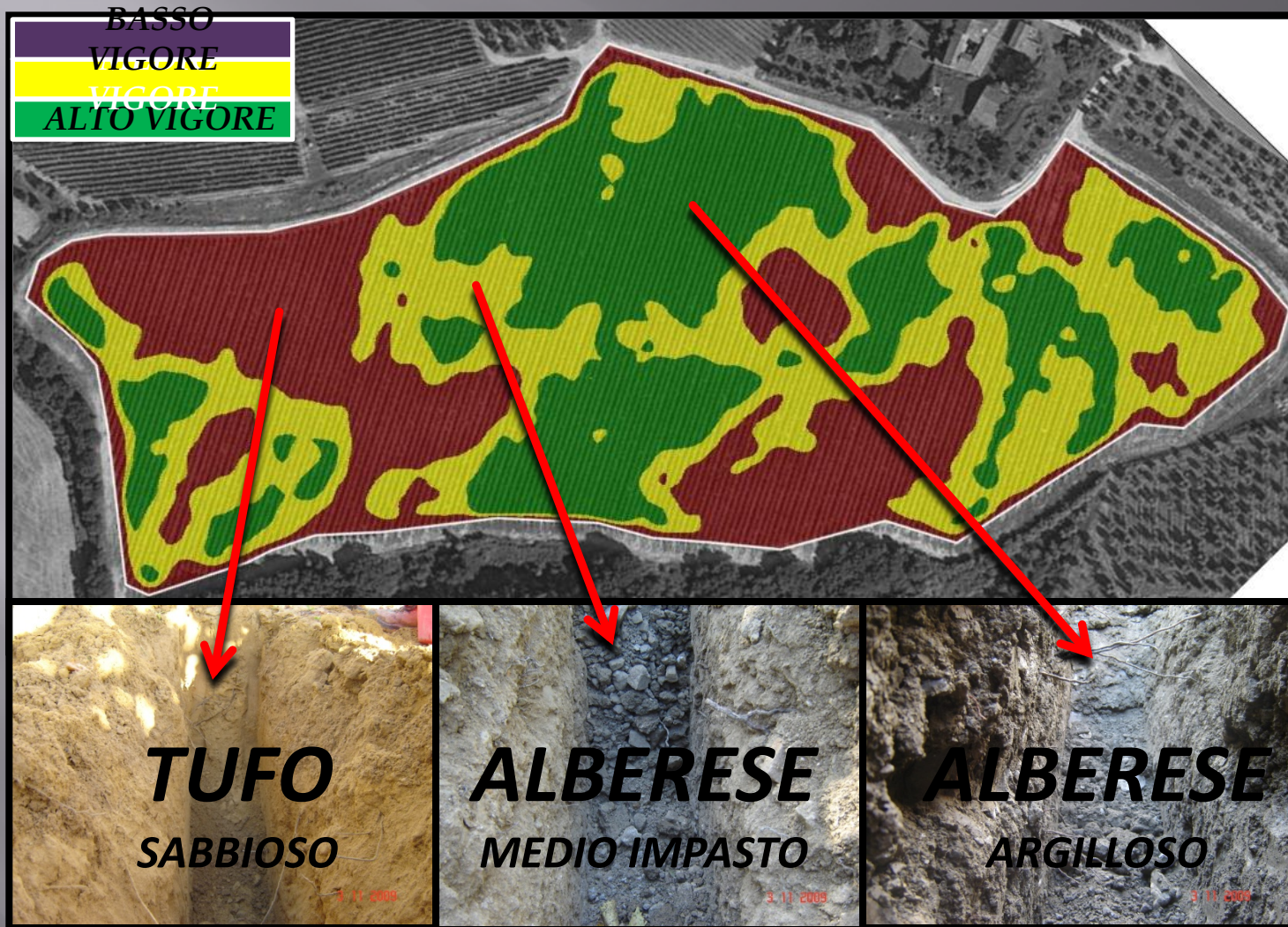


Viticoltura rateo variabile

Mappe del suolo - da 10 a 2 zone



Viticoltura rateo variabile



Applicazioni rateo variabile

- **IMPIANTO BARBATELLE RT**
- **IRRIGAZIONE RT**
- **SEMINE RT**
- **CONCIMAZIONI RT**
- **VENDEMMIA RT**
- **TRATTAMENTI RT**
- **DISERBI RT**
- **POTATURA MECCANICA RT**
- **GESTIONE DEL VERDE RT (def. e cim.)**

Trattamento con macchina a due file con recupero



Misure indirette dello stato di maturazione delle uve



OenoFoss™ & Winescan™ ([FOSS](#), [France](#))



Dualux® and Multiplex® ([Force-A](#), [France](#))

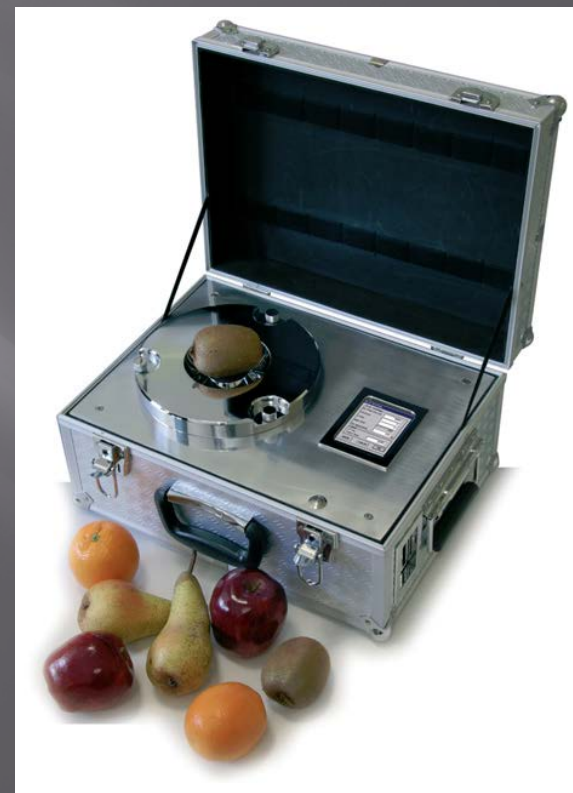


Misure indirette dello stato di maturazione delle uve

Polyphenolic Meter Alcyone PM-03 ([Caeleno, Italy](#))

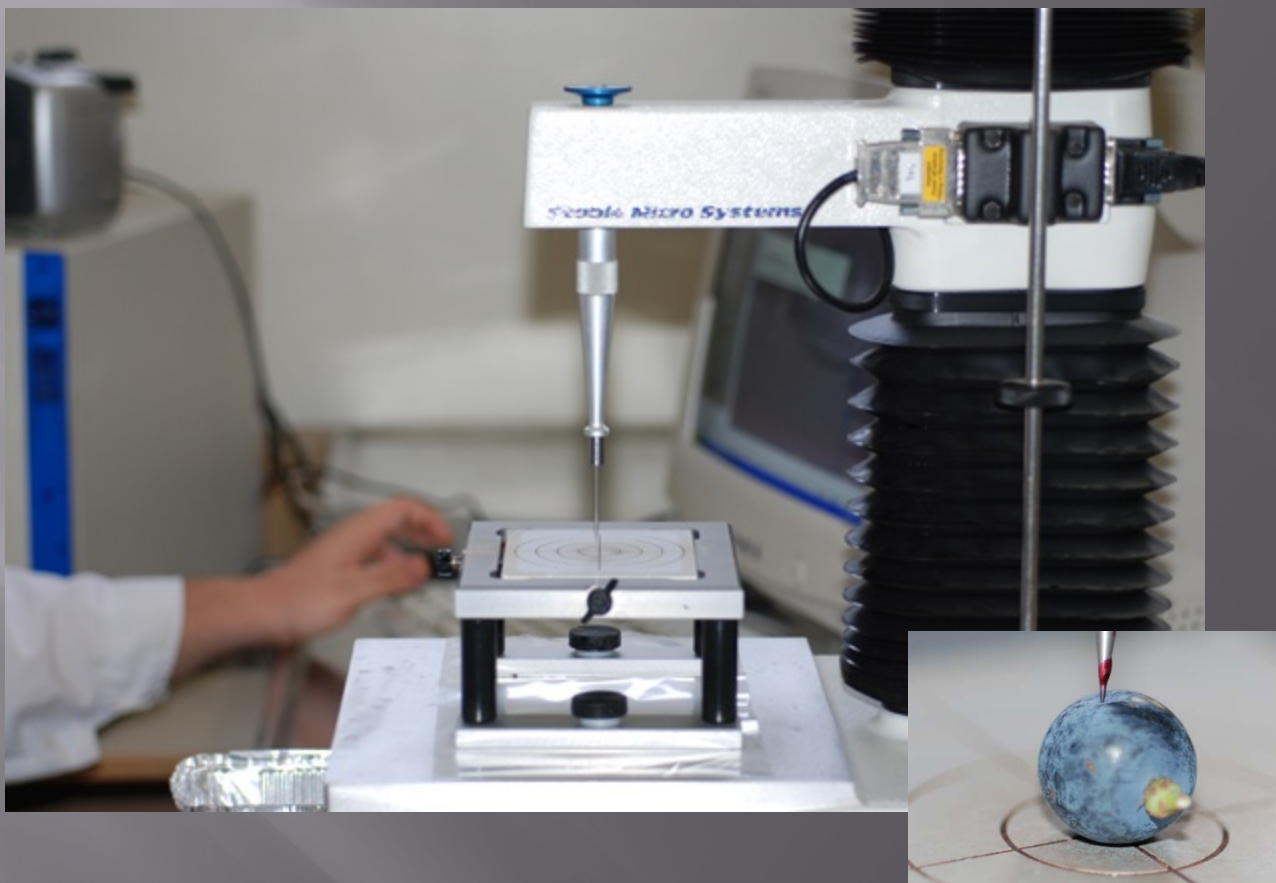


NIR-CASE ([SACMI, Italy](#))



Misure indirette dello stato di maturazione delle uve

Texture Analyzer ([Stable Micro Systems, UK](#))



Multiparametric Optical Sensor

Multiplex3 ®

FORCE-A

*Sequential
irradiation of
samples with*

UV 365 nm,

blue 450 nm,

green 515 nm,

orange 630 nm

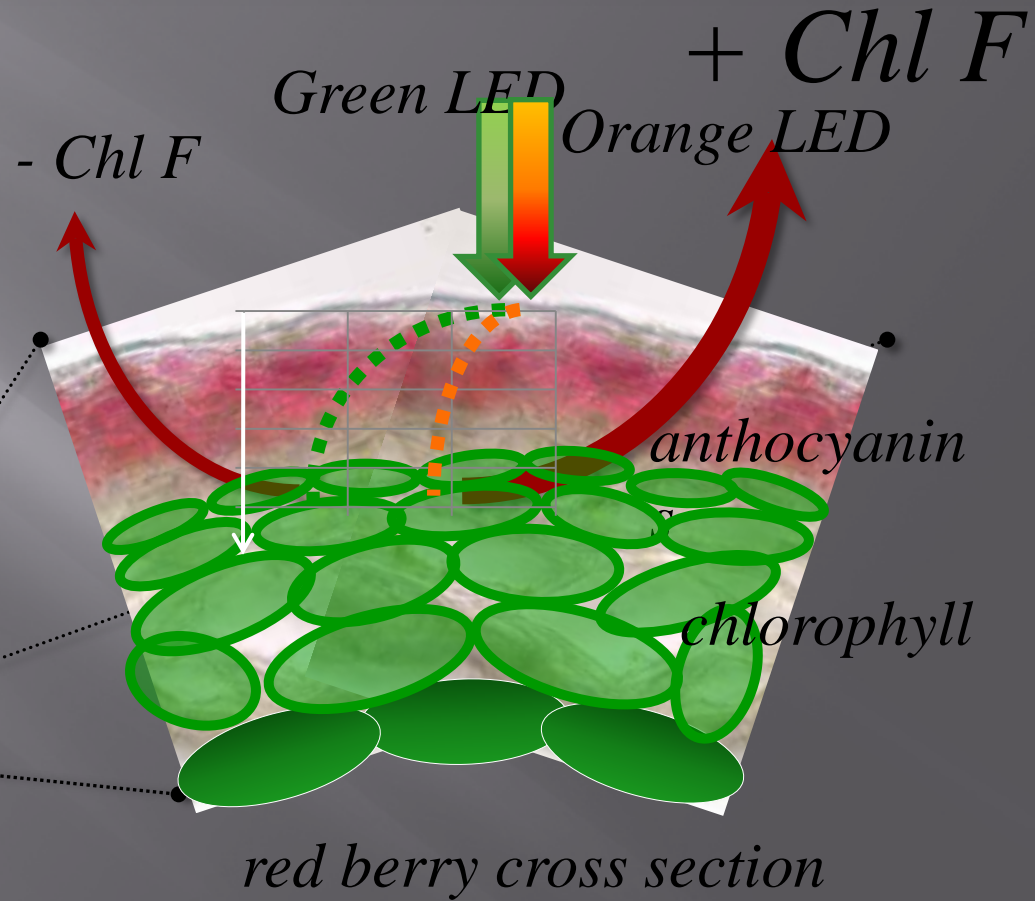
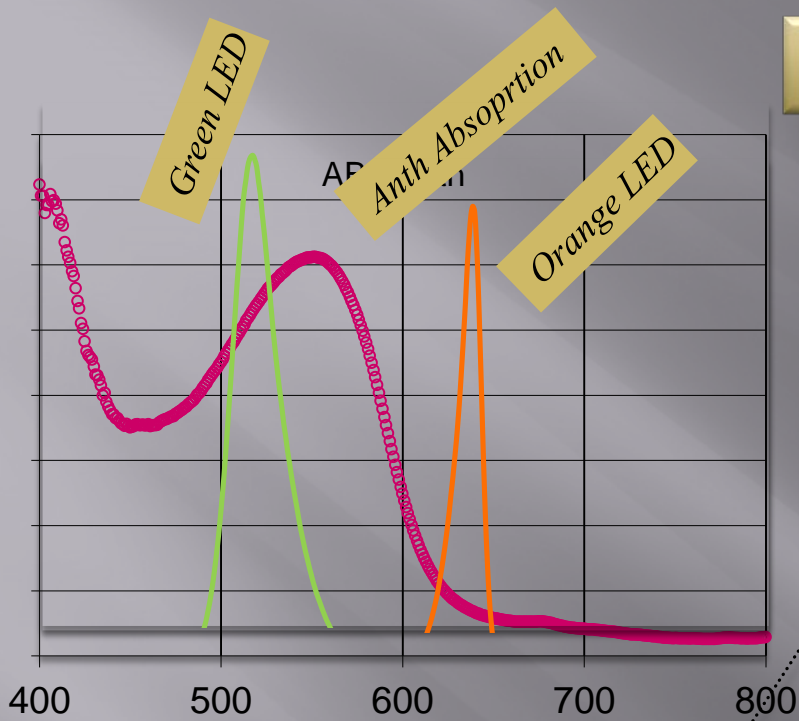
LED radiation

*It measures the
re-emitted red
and*

*far-red light
(fluorescence)
of the bunch*



Chlorophyll Fluorescence-based Method



Comparison of the 2 fluorescence signals provides an index of the Anthocyanin content

Agati et al., 2011

Type of Multiplex measurements

GPS inside -> geo-localized -> maps



grapes on vine

(leaves)

hand-held

harvested grapes



vehicle-mounted



harvested grapes



(leaves)

grapes on vines

removed leaves



Tuccio et al., Australian Journal of Grape and Wine Research , 17, 181–189, 2011

*Bramley et al., Australian Journal of Grape and Wine Research , online: 21 JUL 2011,
DOI: 10.1111/j.1755-0238.2011.00158.x*

Agati et al., 2011

In-situ grape analysis, quality zone delineation

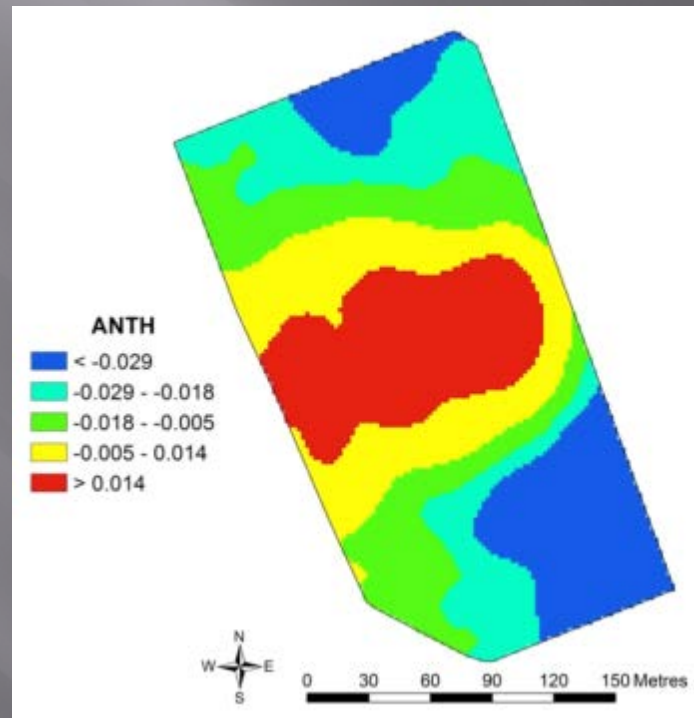


Hand-held measurement



Map generation

Vehicle-mounted Multiplex
leaves removed



intra-plot action:

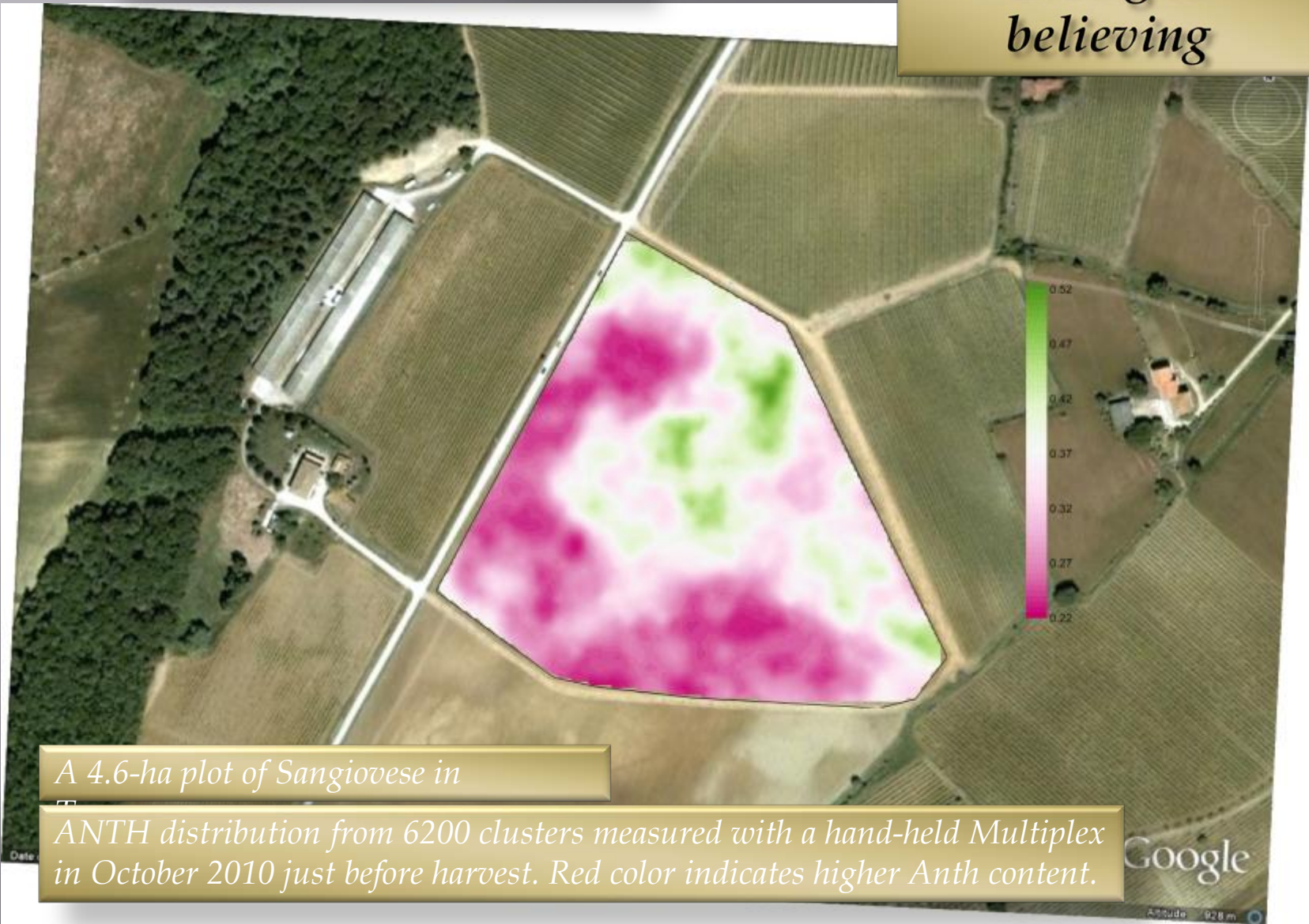
- zones delineation
- plot fractioning
- subplot allocation
- selective harvesting

quality forecast & selective harvesting forecast

Agati *et al.*, 2011

Quality zone delineation

Seeing is believing



A 4.6-ha plot of Sangiovese in

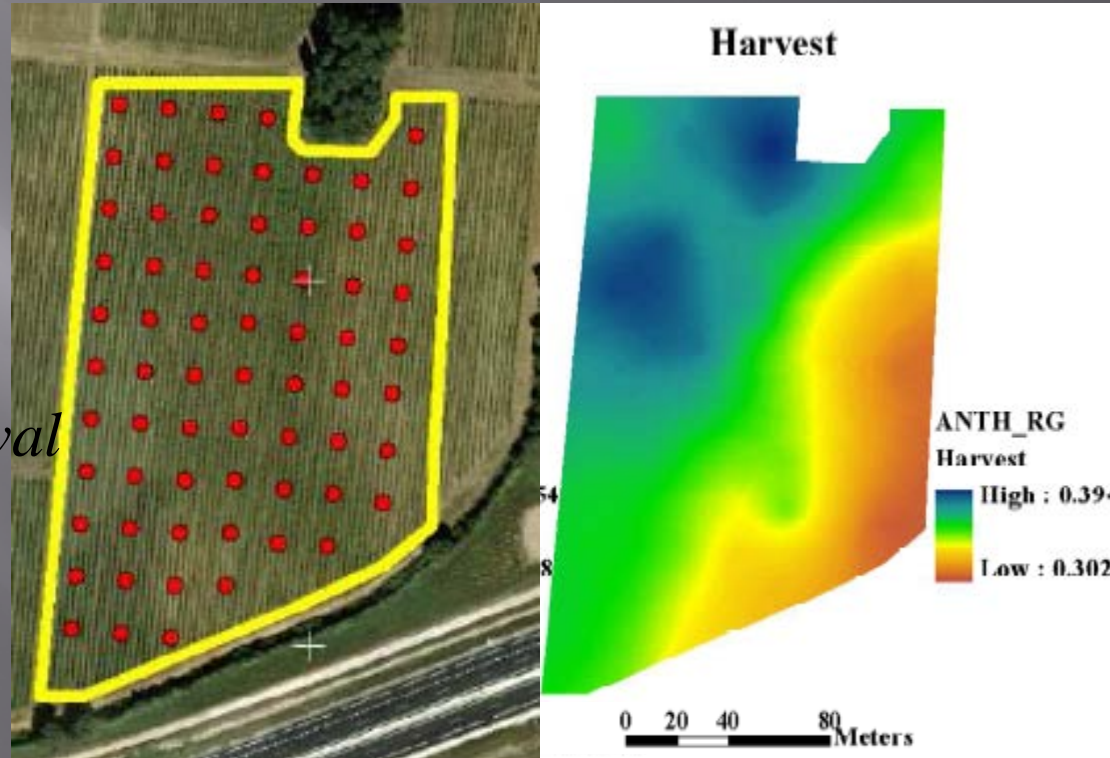
ANTH distribution from 6200 clusters measured with a hand-held Multiplex in October 2010 just before harvest. Red color indicates higher Anth content.

In-situ grape analysis, quality zone delineation

ANTH spatial distribution

*2.2 ha Tempranillo
sampling grid with 20 m interval*

Ayegui (Navarra, Spain)



J. Baluja et al.

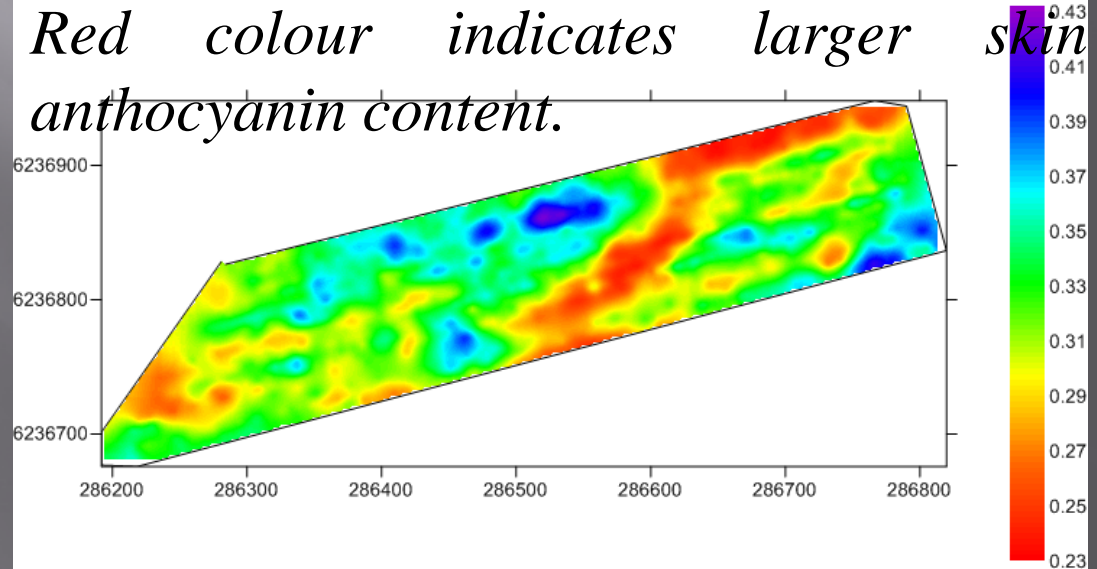
*Using a fluorescence proximal sensor to study the spatial variability of grape phenols
in a Tempranillo vineyard*

8th European Conference on Precision Agriculture, 11th - 14th July 2011, Prague

Agati et al., 2011

In-situ grape analysis, quality zone delineation

Spatial variation of the ANTH Multiplex index for the Syrah cv in Australia, 2010 season. On-the-go sensing during harvesting of a 8.2 ha plot with a Multiplex mounted on the discharge conveyor of a Gregoir G65 harvester.



Bramley et al., Australian Journal of Grape and Wine Research , online: 21 JUL 2011, DOI: 10.1111/j.1755-0238.2011.00158.x

FLAV flavonol Multiplex index

White grapes

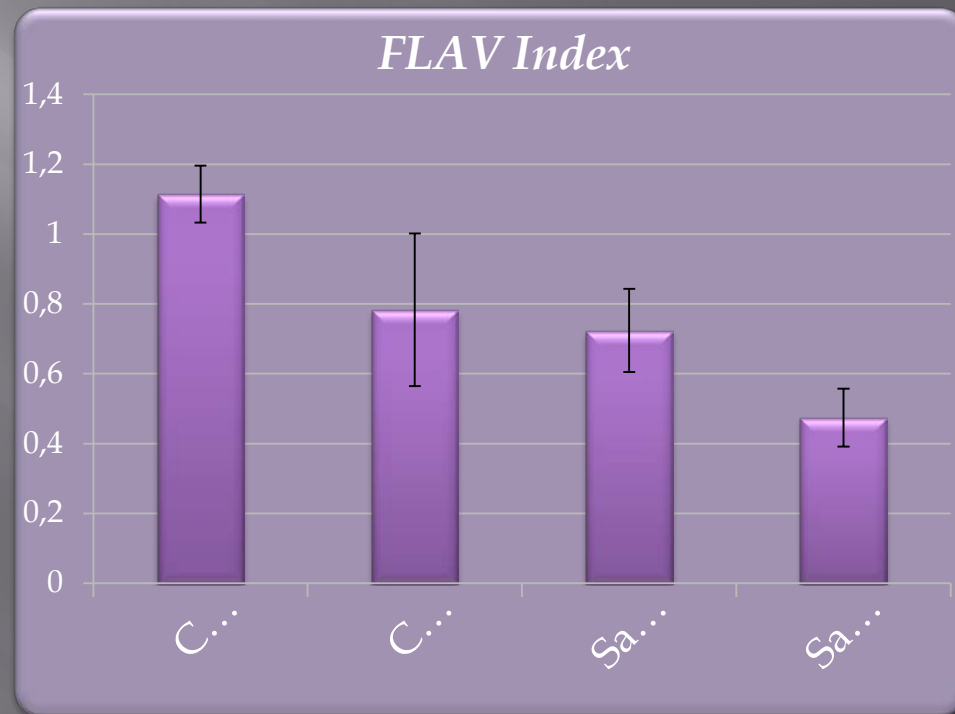
Latina, Roma
07 August 2009



Chardonnay



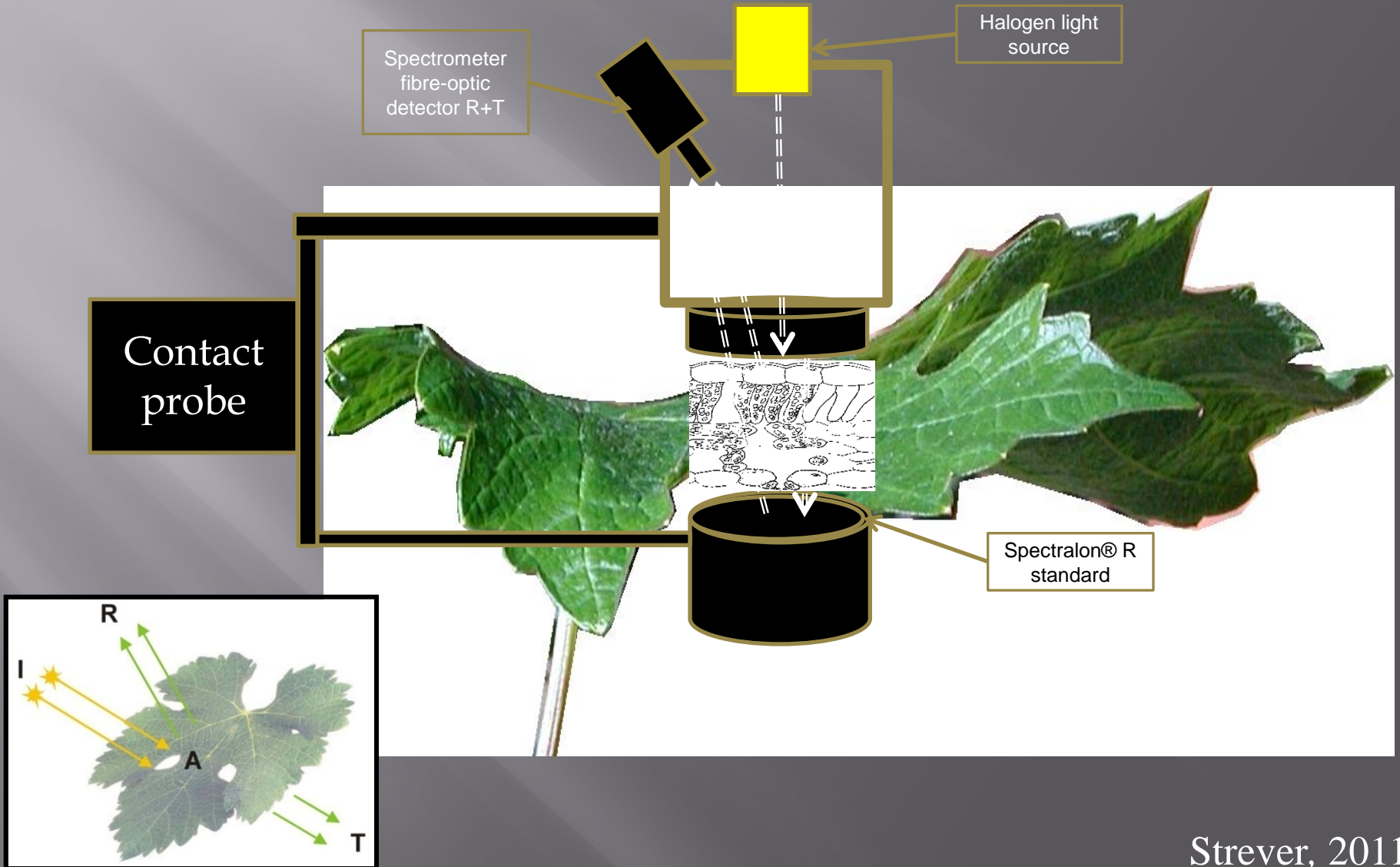
Sauvignon



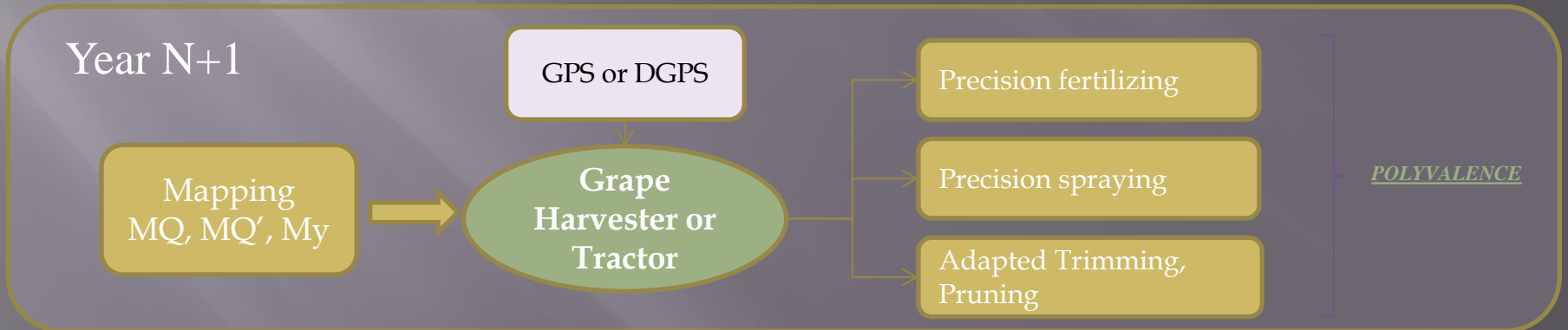
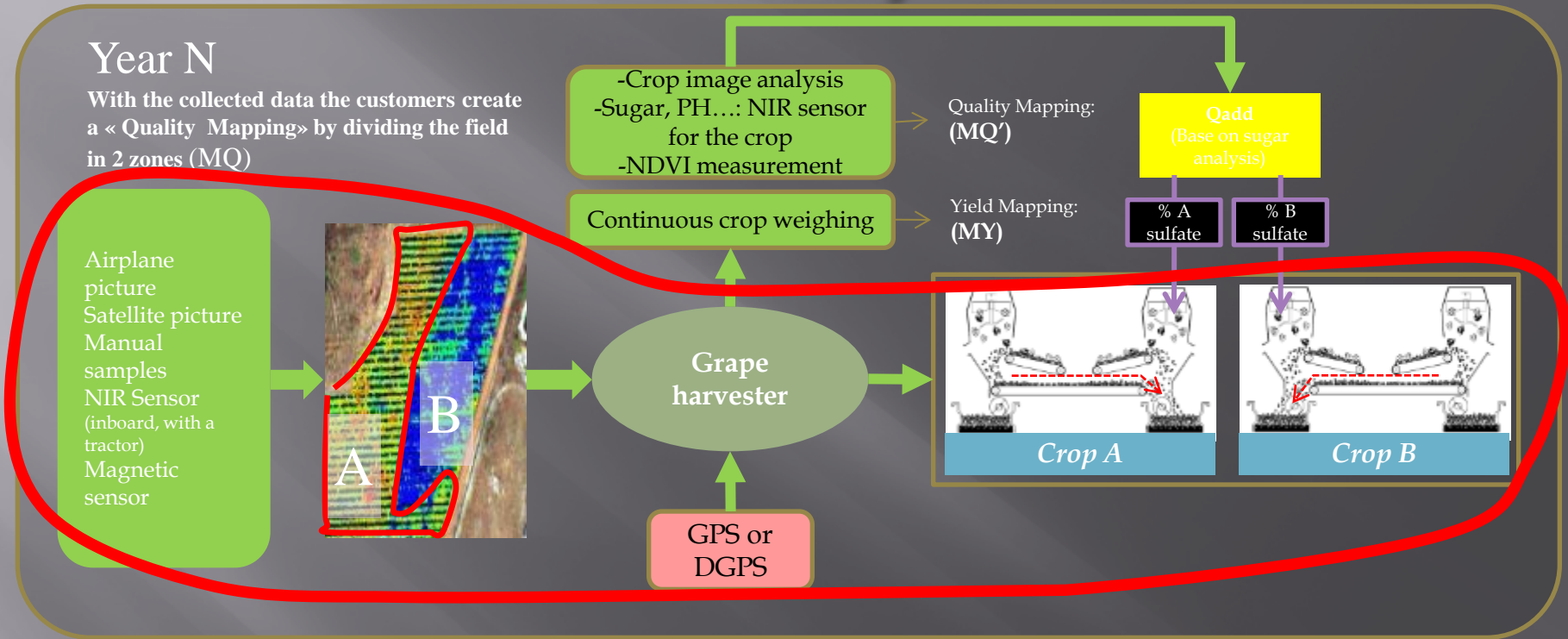
More and less sun-exposed sides of bunches
same plot, same date

Leaf Composition

Spectral measurements

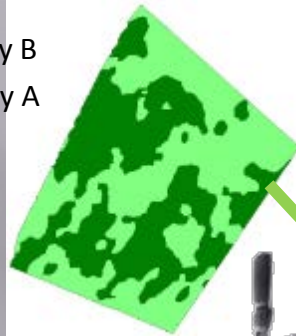


The full system



Program contents : Details

Quality B
Quality A



PFS

Precision farming system



Antenna NH162



Transversal conveyor
Carry over from GE

The map is loaded on USB flash drive for use in the HQS machine. Equipped with the GPS technology, the grape harvester knows its position and reads the map to determine A and B quality grape areas. Automatically, the harvester moves its conveyor to the right or to the left according to the map information.

