

## PRECISION FARMING BY MEANS OF REMOTE SENSING.

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### ABSTRACT

In order to improve the wine quality a study has been carried out on a vineyard. From two different types of satellite images, 5 products have been obtained and represented in maps. DMC-UK images, with a resolution of 32 meters and QUICK-BIRD images, with a resolution of 0.6 meters have been used. Through the bands of these images, the following products were obtained: the NDVI, with which users find out which zones in their estates have the worst condition; Mean Vegetation State, which is a comparative map resulting from the comparison between the NDVI of each pixel and the average NDVI in the area of study; LAI, which provides information on the foliar area of plants (this is very important in the case of grapes since it is directly related to the number of clusters the plant will give); BIOMASS, which provides information on the quantity of living organic matter in the plant and a representative NITROGEN map useful in fertilizing and nitrogened tasks. In spite of their different resolutions, the comparison between the images obtained through both types of images provides very similar data.

**Keywords:** vineyard, precision farming, remote sensing, NDVI, LAI, Biomass, Nitrogen.

### MATERIAL AND METHODS

The vineyard, named “Pago del Cardenal”, has 123 ha and is located at Ciudad Real (Spain). The variety of grape that is cultivated is the Cabernet Sauvignon



Quick Bird image of “Pago del Cardenal”

QUICK BIRD image was taken on 21st July 2007. DMC image was taken on 30<sup>th</sup> July 2007. Geometrical and atmospheric corrections were applied to both images. From them, five different products (maps) were obtained: NDVI, Mean State, LAI, Nitrogen and Biomass.

### **NDVI MAP**

The NDVI is defined as:  $NDVI = (NIR-RED) / (NIR+RED)$ . Higher NDVI values shows better and stronger vegetation whereas the lowest values show a less active vegetation

### **MEAN STATE MAP**

It is the ratio between the individual NDVI values and the mean NDVI value.  $MS = NDVI / \text{mean value}$

### **NITROGEN:**

The Nitrogen Assimilation Index (NAI) is defined as  $NAI = (NIR-GREEN) / (NIR+GREEN)$ .

### **LAI**

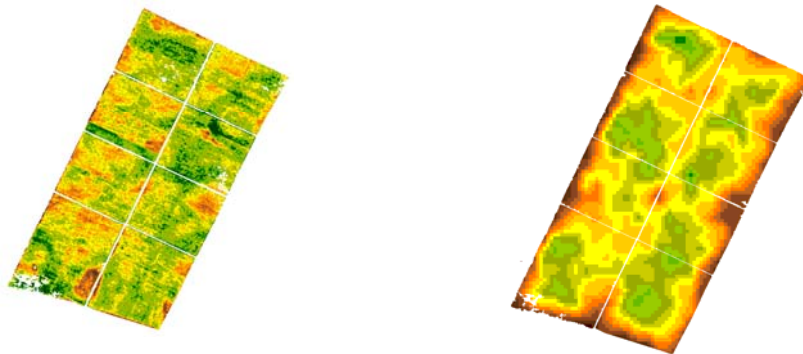
In studies in vineyards, this index is related to the index of ripeness of the fruit, to diseases and plagues and the quality of the grape and the wine, of there the interest to determine this index.

### **BIOMASS**

Biomass is obtained from the expression:

$$BIOMASS = \text{SQRT} ((NIR^2+RED^2+GREEN^2) / 3)$$

This map reports of the zones in the sub-plot where the volume of matter / grapevine is superior to the average re-normalized existing volume / grapevine in the sub-plot.



Quick Bird BIOMASS vs. DMC BIOMASS

### **CONCLUSIONS**

The first conclusion that is obtained observing the images, is that there are similar the results obtained with the images QUICK BIRD and DMC.

The complementarity of the maps helps to delimit better the zones where the different types of treatments must be applied and allows to the manager to decide the zones to observing and determining the characteristics of each one.