EGNOS Success Story

# EGNOS In Sinergy With Copernicus Helps Improving Drainage Systems And Variable Rate Fertilization

July 2021


Figure 1. Veris 3100 Soil EC Surveyor of the University of Lleida with GNSS and EGNOS receiver

Using in situ sensors and satellite remote sensing, it is possible to obtain information on the existence of anomalies in the soils, enabling farmers to take corrective actions in the field. This information is given through a pre-set field map which allows farmers, in a friendly way, to identify in which areas, need a specific treatment.

Measuring apparent soil electrical conductivity (ECa) with sensors in the field is a very useful means used in precision agriculture to obtain a pre-set field map, since ECa reflects the spatial variability of soil properties.

The Research Group in AgroICT & Precision Agriculture (GRAP) of the University of Lleida/ Agrotecnio-CERCA Center, is applying a technology that measures soil ECa using a device that georeference the measurements using EGNOS, together with Sentinel-2 images (Copernicus Programme) to identify drainage problems in some parts of the field, and therefore to understand the causes of crop development and yield variability.

To measure ECa in the field, it has been used the sensor named Veris 3100 Soil EC Surveyor (Veris Technologies Inc.). The system is connected to an EGNOS compatible GNSS receiver and performs continuous on-the-go measurements which allow obtaining an accurate ECa map, relating soil properties and yield.

EGNOS contributes to georeference ECa measurements, allowing to obtain an improved ECa map thanks to the submetric geolocation of sampled points. Therefore, ECa map is very useful information to identify saline soils and the areas to extend the drainage network to improve soil conditions.

The information derived from the satellite was taken with Sentinel-2 (Copernicus), providing indicators of the state of the soils and crops, such as the Normalized Difference Vegetation Index (NDVI).

Next figure shows apparent soil electrical conductivity (ECa) map taken, using EGNOS for georeferencing those points and the NDVI derived by Sentinel-2 image in an agricultural field crops (maize):

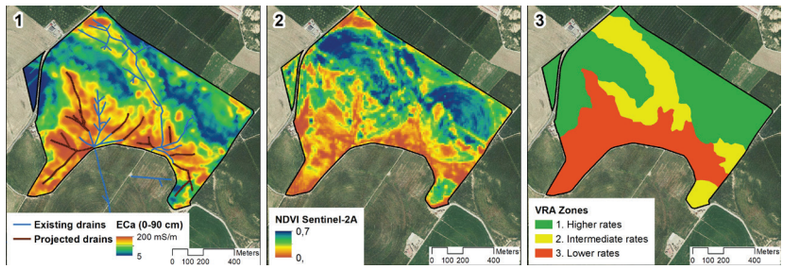


Figure 2. 1: ECa map and existing drainage network. 2: NDVI map from Sentinel-2 shows the stage of development of fields at the middle of the previous campaign crop. 3: Variable-Rate-Application zones derived from 1 and 2 for variable seeding and fertilizing of the next campaign

On one hand, from ECa map (Fig. 2.1), it is interpreted that high ECa values (higher than 100 mS/m) corresponded to saline soils and to limited drainage, while low ECa values corresponded to soils with loam sand texture and with frequent gravel content.

On the other hand, NDVI map (Fig. 2.2) confirmed the findings of the ECa survey: the crop in saline soils and with bad drainage developed much less than in the areas with moderate to low ECa.

José Antonio Martínez-Casasnovas from GRAP says: “If the drainage systems had not been improved and organic modifications had been made, crop development and yields in the high ECa value areas would not have improved. Thanks to the ECa map improved with EGNOS and the information derived from Sentinel-2 it has been possible to increase the cost-benefit ratio of agricultural crops”.

In this particular case, this site-specific management, possible thanks to the use of both European programs, EGNOS as a georreference source, and Copernicus images for NDVI, allowed the farmer to increase the cost-benefit ratio by 11% with respect to the traditional uniform management.