



A P O L L O

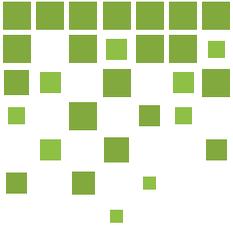
Bringing the benefits of precision  
agriculture to smallholder farmers

<http://apollo-h2020.eu/>



Co-founded by the  
European Union





APOLLO is an EU-funded innovation project aiming to develop a market-ready platform of agricultural advisory services aimed primarily, but not exclusively, at smallholder farmers.

The APOLLO project aims to bring the benefits of **precision agriculture** to farmers through **affordable information services**, making extensive use of free and open Earth Observation data, such as those provided by the **European Union's Copernicus programme**.

These services will help farmers to **make better decisions** by monitoring the growth and health of crops, **providing advice** on when to irrigate and till their fields and **estimating** the size of their harvest. Ultimately, these interventions should lead to the use of less farm (or agricultural) inputs and higher yields – and therefore reduced costs, increased profitability and competitiveness, as well as better environmental sustainability.

APOLLO aims to open up the precision agriculture market by making **affordable, accessible** and **easy-to-use agricultural advisory services** available to **farmers, farmers' associations** and **agricultural consultants**.

**Thanks to free and open data from the Copernicus programme and advanced data processing algorithms, the APOLLO services will be affordable for all farmers.**

The availability of free and open Earth Observation data from the European Union's Copernicus programme (and other open sources, such as Landsat) enables the development of low-cost, tailored services, at an appropriate resolution for applications aimed at smallholder farmers.

The pioneering use of Sentinel-1 data for estimating soil moisture allows the use of costly and cumbersome ground-based sensors and surveys for optimising irrigation and tillage operations to be avoided.

**Monitor your crop and get reports and alerts anywhere, at any time.**

APOLLO services will be available anywhere, at any time, through the web interface and mobile application. The web interface will provide full access to all APOLLO services and data, while the mobile application will be used for basic reporting and alerting.

APOLLO services will be applicable for multiple crop types (e.g. arable crops, field vegetables, etc.), and although tailored for smallholder farmers, will also be available to farms of other sizes.

The APOLLO interfaces and supporting documentation will be available in multiple languages – initially in English, Greek, Serbian and Spanish.

**Developed with farmers for farmers.**

APOLLO's four flagship services place ease-of-use at the forefront, and are designed to minimise the burden on the end-user. To ensure that the development of the services is based on a firm understanding of the needs of the end user, the APOLLO consortium includes two farmers' associations and an SME already active in the field of precision agriculture.

#### Affordable



#### Accessible

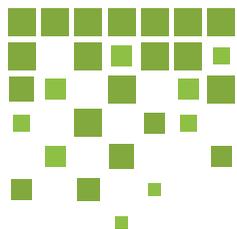


#### Easy to use





# SERVICES



APOLLO's four services support better decision-making and optimised use of agricultural inputs, reducing waste and increasing yields.



## TILLAGE SCHEDULING

### ► When and where it is best to till?

The amount of water in the soil is an important consideration for effective tillage. If soil is tilled when its water content is too high, large clods can be produced and structural damage can occur to the soil, which will impede plant growth and lead to uneven stands. If, on the other hand, the soil water content is too low, tillage requires excessive energy and dust is created, resulting in severe soil degradation. This is a major threat to both environmental and agricultural sustainability, and crop quality. Both sets of problems can be minimised if the soil is tilled at a time when the soil moisture content is in between the accepted soil moisture levels. The APOLLO Tillage Scheduling service can provide information on where and when soil tillage should be performed. The farmer can take advice on whether or not to till, and to identify areas where the soil cannot be treated at sub-parcel level (e.g. mudding spots).



APOLLO helps to avoid soil degradation



## IRRIGATION SCHEDULING

### ► When and where is irrigation needed?

Agricultural irrigation uses more fresh water globally than any other activity. Therefore, improving the efficiency of water usage remains a global priority. Irrigation scheduling means using just enough water at the right time, taking into account the state of the crop, the soil moisture content and the weather. Current irrigation scheduling practices involve a range of costly and time-consuming methods and equipment for determining the soil moisture and the crops' water needs, including the "hand-feel" method, capacitance probe tensiometers, meteorological stations, electrical resistance blocks, pressure chambers and infrared thermometers. APOLLO offers a cost-effective alternative to these practices. The APOLLO Irrigation Scheduling service determines the correct frequency and duration of watering for avoiding problems caused to crops by the over- or under-application of water.



APOLLO helps to avoid under-irrigating



## CROP GROWTH MONITORING

### ► What is the current condition of my crop?

The APOLLO Crop Growth Monitoring service gathers essential crop condition information (status, growth trends) during the biological cycle. Indirectly, crop growth monitoring can help in delineating management zones at sub-parcel level for variable rate application of fertilisers and plant protection products. Current methods for monitoring crop growth include costly and time-consuming aerial or field surveys which involve many different sensing instruments, such as hyperspectral cameras. The APOLLO Crop Growth Monitoring service will enable farmers to keep an eye on their crops' status from emergence through to harvest, and provide early alerts in case of infestations and nutrient deficiencies.



APOLLO helps to keep a close eye on the health of crops



## CROP YIELD ESTIMATION

### ► Forecast the crop yield before harvest

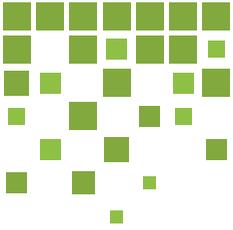
Crop yield estimation is important for the analysis and comparison of field productivity. It also allows farmers to decide at farm level whether to sell or store the product, and for enabling effective transfer from farm to the industry. Currently, crop yield estimation is mainly performed through time-consuming and expensive field sampling which includes the measurement of biomass weight and grain size. The APOLLO Crop Yield Estimation service forecasts crop yield before harvest, allowing an assessment of the farmer's expected income, as well as enabling the adaptability of crops and/or varieties to be evaluated, in combination with Crop Growth Monitoring service.



APOLLO helps to estimate crop yield

# PILOTS

APOLLO services will be piloted during the project in three countries of continental Europe: Greece, Serbia and Spain. The pilots will provide an opportunity for farmers to contribute to the creation of the services and their validation.



Sunflower crops in the Giannitsa region (Credits: ACP).

## PELLA, GREECE

**Pilot user:** Agricultural Cooperative of Pella (ACP), Agricultural University of Athens (AUA)

**Climate:** Humid subtropical (Cfa\*) **Soil type:** Fertile, argilo-calcareous\*, high in organic matter

**Crops:** Irrigated cotton, rain-fed durum wheat **Crop area:** 13.000 ha, 8.500 ha

**APOLLO services piloted:** All (except Irrigation Scheduling for durum wheat)

The Agricultural Cooperative of Pella has over 10.000 active members growing a variety of crops, including cotton, cereals and orchards, over a total area of 60.000 hectares. Being the first Greek cooperative to use satellite data for crop identification and area estimation, the cooperative has an active history in using Geographic Information Systems and Earth Observation tools.

APOLLO services will be tested on irrigated cotton and rain-fed durum wheat fields in the pilot area. For cotton cultivation, services will be tested and validated during the whole production process, from soil preparation to harvest. The total arable land dedicated to cotton-growing in the ACP pilot is 13.000 hectares. For durum wheat, all APOLLO services except the Irrigation Scheduling service will be used, as it is a rain-fed crop. The total arable land dedicated to durum wheat production in ACP is 8.500 hectares. Agricultural consultants collaborating with the ACP will also take part in the pilot.

\* Köppen climate classification. Composed of clay and limestone



Soyabean crops, Donji Petrovci village, Municipality of Ruma (Credits: Uglješa Trkulja)

## RUMA, SERBIA

**Pilot user:** The Association of farmers of the Municipality of Ruma, Vojvodina

**Climate:** Continental (Cfb) **Soil type:** Limestone chernozem\* **Crops:** Maize, wheat,

soya, vegetables, and fodder crops **Crop area:** 330 ha **APOLLO services piloted:** All except irrigation scheduling

The Association of farmers of the Municipality of Ruma represents a significant number of small farmers (330) who are willing to improve their agricultural practices and adopt new technologies. Despite Ruma's thriving agricultural sector, neither small farmers nor local agricultural consultants have access to, or make use of advanced agricultural information. Small farmers and agricultural consultants (members or affiliates of the Association) will be directly involved in the pilot testing and implementation.

The Serbian APOLLO pilot in Ruma will cover the entire crop production cycle for a variety of different crops namely maize, wheat, soya, vegetables, and fodder crops. The consultants involved in the pilot will incorporate the information provided on the test parcels into their advisory practice.

\* Chernozem is a black-coloured soil containing a high percentage of humus (7% to 15%), and high percentages of phosphoric acids, phosphorus and ammonia.



Eddy covariance system consisting of an ultrasonic anemometer and infrared gas analyser (IRGA) (Credits: Agrisat).

## LA MANCHA ORIENTAL, SPAIN

**Pilot user:** AgriSat as a facilitator between APOLLO and Spanish farmers **Climate:** Mostly continental (Cfb) and Mediterranean (Csa) **Soil type:** Very heterogenous, shallow with a limestone bedrock, poor in organic material, and rich in lime and chalk **Crops:** Various **Crop area:** 100.000 ha **APOLLO services piloted:** All

The area features mainly medium to large farms, with 70% of the farms being larger than 100 ha. Dominant crops in the region are: herbaceous crops (75%: wheat, barley, corn, alfalfa, onion, garlic, poppy and legumes) and trees (25%: vines, almonds).

The water for irrigation is mainly supplied by groundwater (93%). Agriculture is the largest water consumer amounting to 95% of the water demand, with 89% of the supplied water being used by individual farmers and 6% by water user associations.

Around 10% of the farms practice organic agriculture and 7,5% conservation agriculture. The pilot in Spain is carried out in selected irrigated farmlands, where the main crops are growing.

# TARGET MARKETS

APOLLO services are aimed at (primarily) small farmers, farmers' associations and agricultural consultants.

## SMALL FARMERS



The majority of European farms are considered small, with an average area of 12 hectares. 70% of EU farms are less than five hectares in size, and almost 97% of all farms are family-run businesses. Small farmers, in particular, have limited financial resources and proportionally larger investment risks. APOLLO targets (primarily) small farmers as direct customers allowing them to easily adopt inexpensive innovative services that provide a significant return in relation to their input costs.



## AGRICULTURAL COOPERATIVES

Since agricultural cooperatives or associations federate the interests of a group of farms, they are an important actor to be addressed either as a direct customer in and of themselves, or as a channel through which individual farms could be targeted.



## AGRICULTURAL CONSULTANTS

The APOLLO services can also be offered to agricultural consultants who provide advisory services to farmers. As a "tool-purchasing" community, agricultural consultants can use the APOLLO services to enhance their own individual service offering.

# HOW TO GET INVOLVED



## SIGN UP TO BECOME A TRIAL USER

APOLLO will launch initial services in April 2017.

Sign up to be amongst the first to try out the new services!

Go to <http://apollo-h2020.eu/contact/#trial>



## SUBSCRIBE TO OUR NEWSLETTER

The APOLLO project publishes a trimonthly newsletter to announce events and report on progress. Subscribe here to stay informed!

<http://apollo-h2020.eu/contact/#newsletter>



## CONTACT US

<http://apollo-h2020.eu/contact>

[info@apollo-h2020.com](mailto:info@apollo-h2020.com)

 @APOLLO\_Agri

 APOLLO H2020 project



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The APOLLO project brings together **nine partners from five European countries:**

Austria, Belgium, Greece, Serbia, and Spain, and combines expertise in agronomy, agricultural services, soil science, remote sensing and Earth Observation.

COORDINATED BY

**DRAXIS**

PARTNERS INVOLVED



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