Framework Partnership Agreement
for Copernicus User Uptake

COPERNICUS PARA SETORES FLORESTAL E AGRÍCOLA EM PORTUGAL

Direção Geral do Território, Lisboa

18 e 19 dezembro 2023

AGÊNCIA ESPACIAL PORTUGUESA

dgTerritório Direção-Geral do Território

AIRCENTRE

ICNF Instituto da Conservação da Natureza e das Florestas

CoLAB forestwise

SMOS Sistema de Monitorização da Ocupação do Solo

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Fotografia Digital para a Agricultura

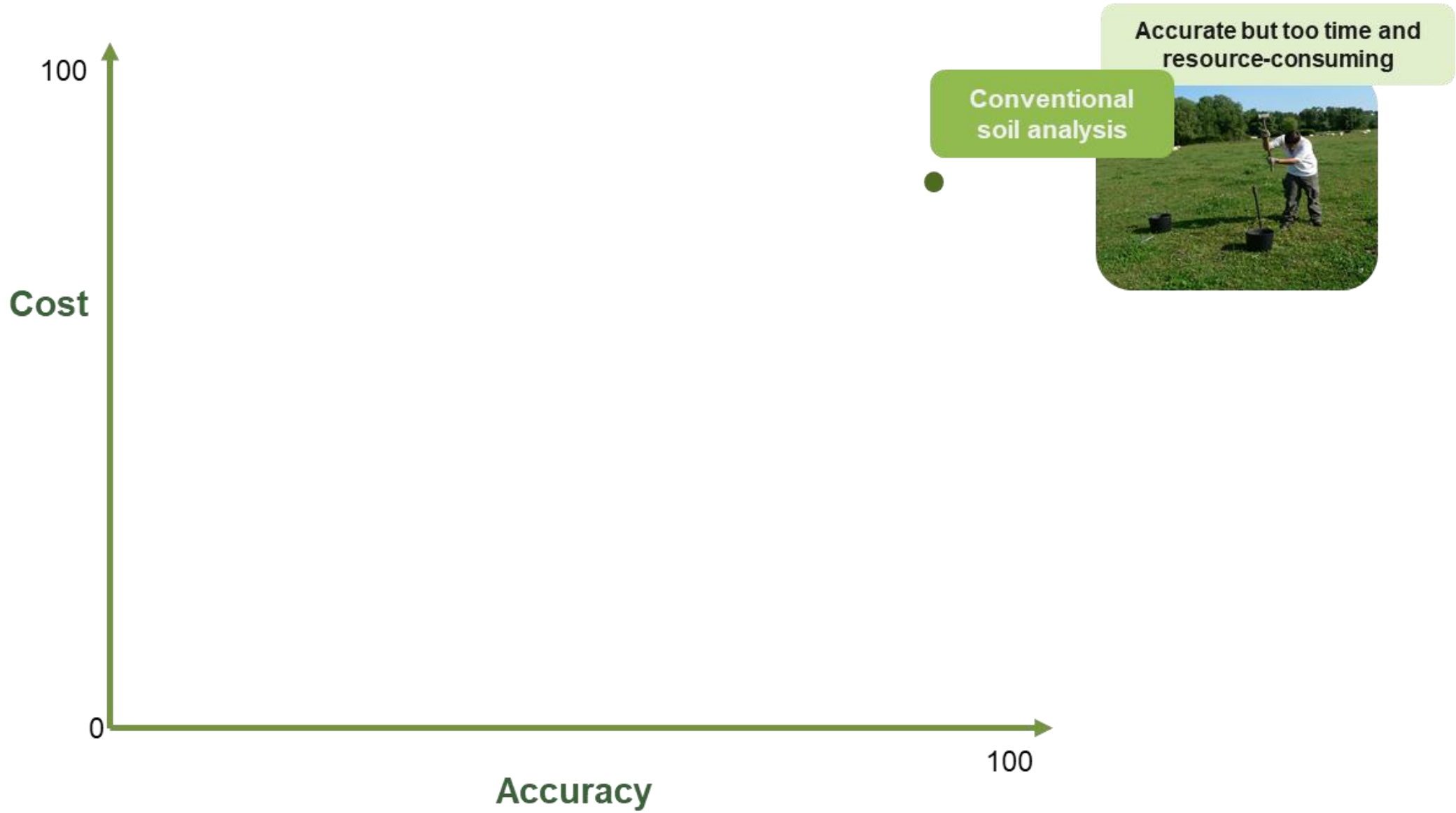
Tiago Morais - CEO

VIRTUACROP

esa BUSINESS INCUBATION CENTRE Portugal

Start up Lisboa


Soil is the basis for all terrestrial life on Earth
Soil nutrition is essential for producing food and supporting multiple ecosystem services
Soils store more carbon (C) than biomass (e.g. forests) or even the atmosphere


Accurate but too time and resource-consuming
Conventional soil analysis
100
Cost
0
100
Accuracy

Extremely expensive and require expertise to use

High-tech sensors

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Cheap but limited – soils are typically covered with vegetation

Remote sensing

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Remote sensing

VIRTUACROP

Cost-effective and accurate soil monitoring

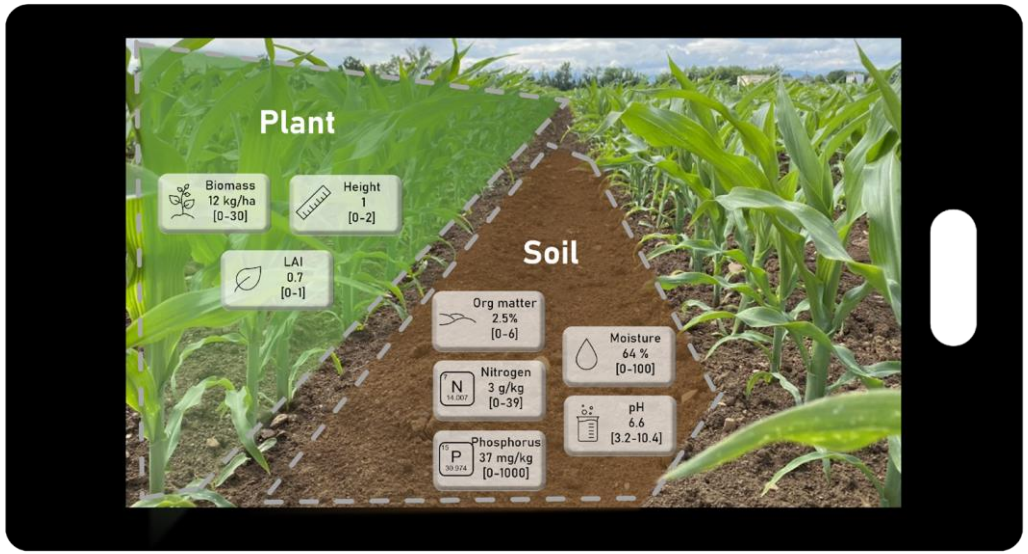
0

100

Accuracy

From concept to prototype

Concept: an application that uses Earth observation (remote) + simple field sensors (common digital cameras in smartphones) to provide information to farmers



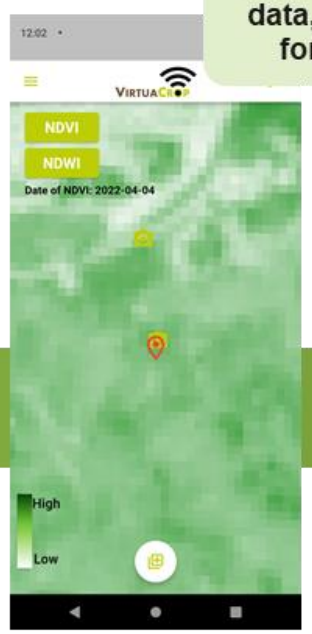
The concept was introduced in December 2021 by VirtuaCrop founders and was then turned into a fully working prototype in June 2022 as an Android app

How the prototype works

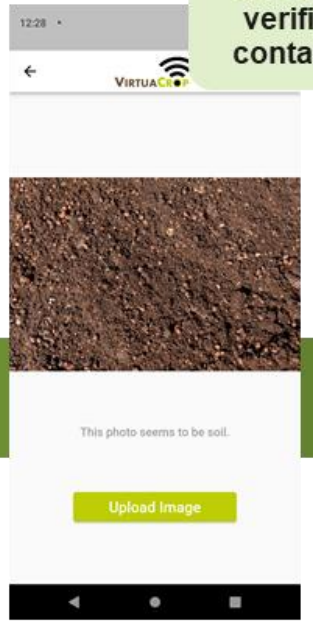
Users register and login, having access to all data prior to that point

Access can be granted to third parties (e.g. for certification)

Remotely sensed data, of interest for farming



An AI algorithm verifies that the contain clear soil



Initial screen displays the current location

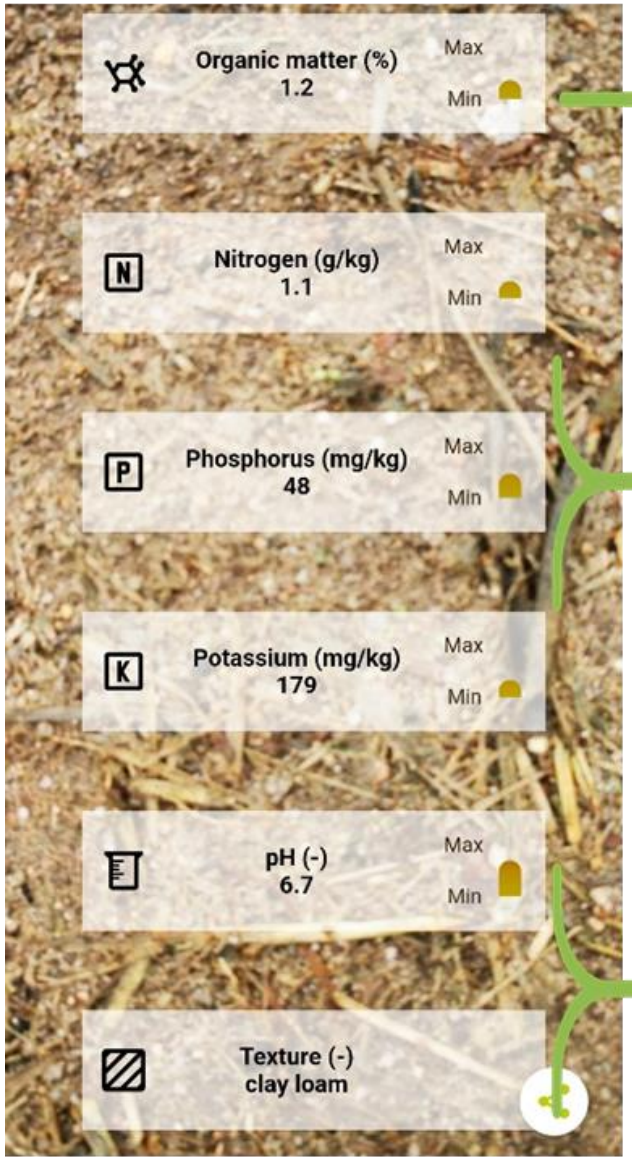
Can be moved to other places of interest

Access to prior taken photos

Take a photo at the moment

Soil analysis bulletin Equal to conventional soil analysis

VirtuaCrop added value



Variation in organic carbon is the biogenic mechanism for soil carbon sequestration

VirtuaCrop can estimate the Carbon Sequestration in the soil between two photos taken from the same location

Nitrogen, phosphorus and potassium are the three main nutrients required by plants to grow

Fertilization of soils typically involves "NPK fertilizers", which include these three nutrients

VirtuaCrop can be used to provide Fertilization Recommendations to farmers

Fertilization needs are given by soil analyses of NPK

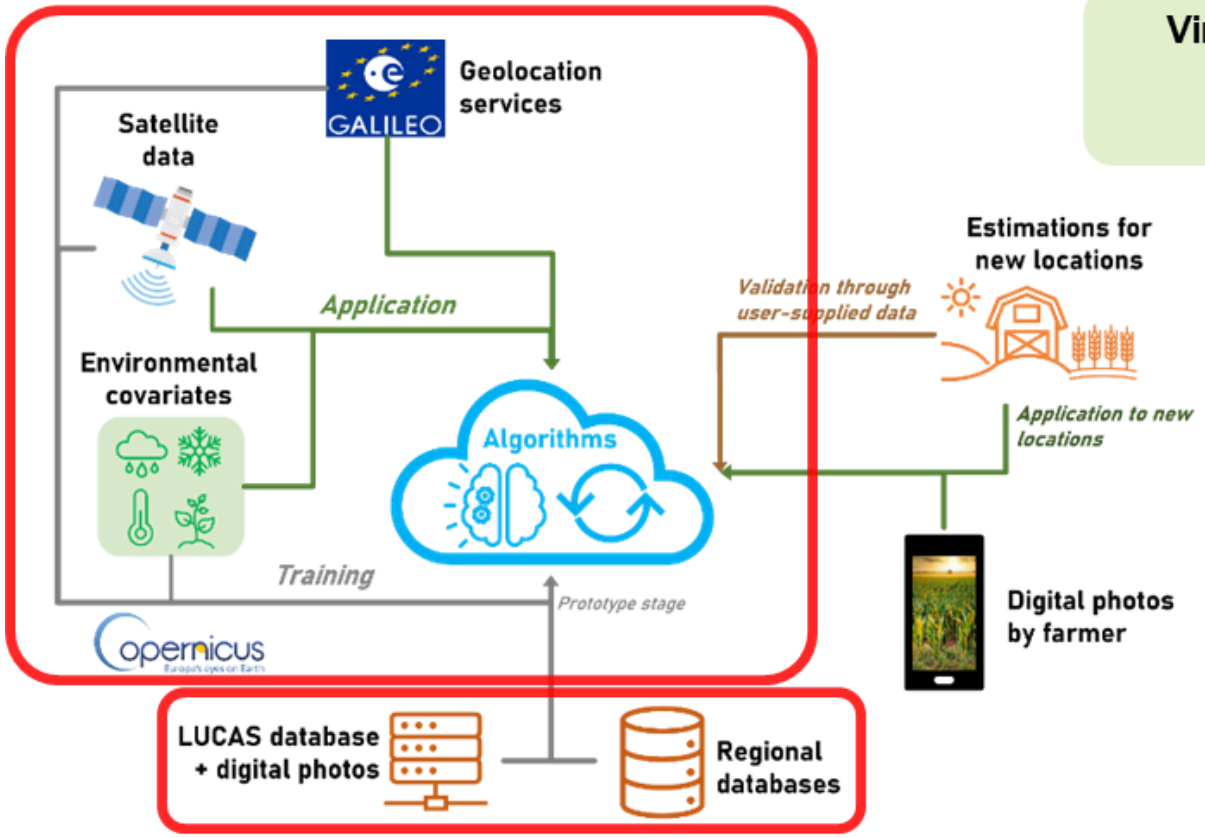
pH indicates the acidity of soils

Very acidic soils, as common in Southern Europe, often require pH correction through the application of limestone

Texture is an important auxiliary indicator for the corrections/fertilizer application

VirtuaCrop can Recommend Corrections for improving soil

How VirtuaCrop works

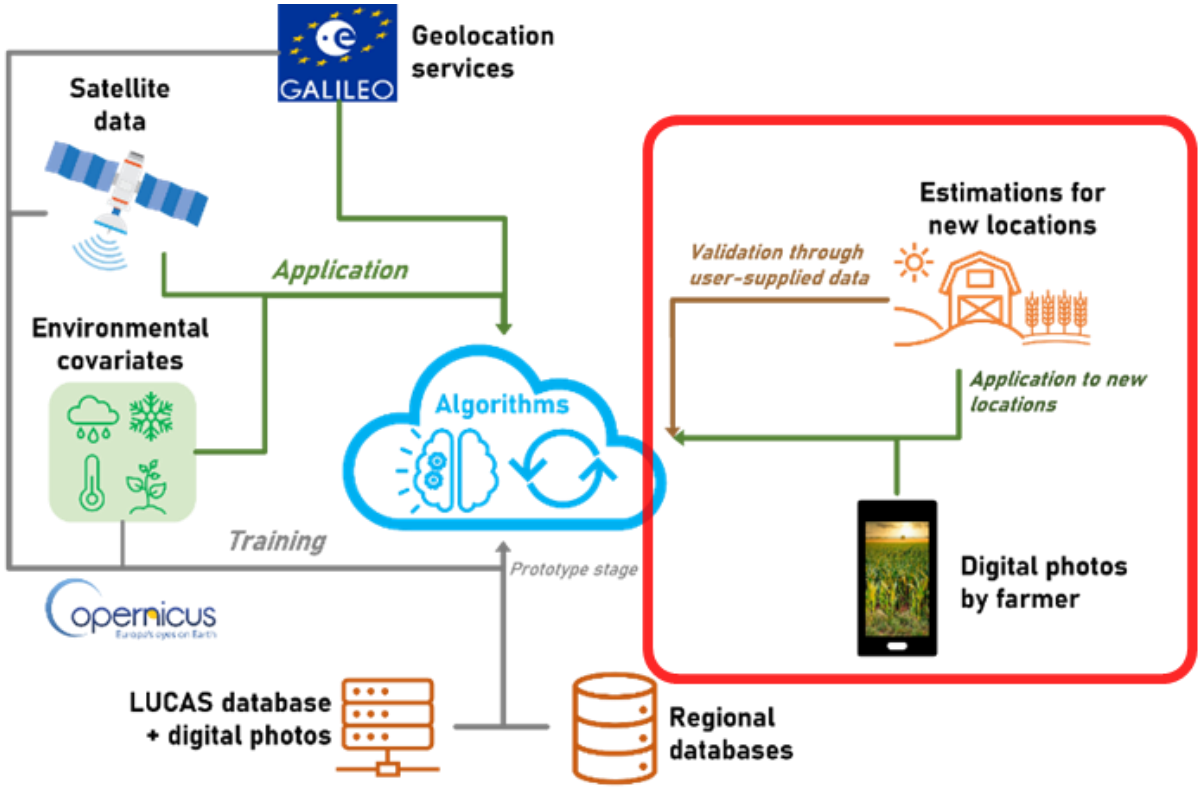


VirtuaCrop combines Earth observation data and geoposition with…

… digital photography, and estimates soil properties through our proprietary algorithms

In the prototype the algorithms were trained with photos and data at European level from the LUCAS soil database

How VirtuaCrop works



The app can be used by farmers in other locations, as many times during the year as they want with a simple smarthphone

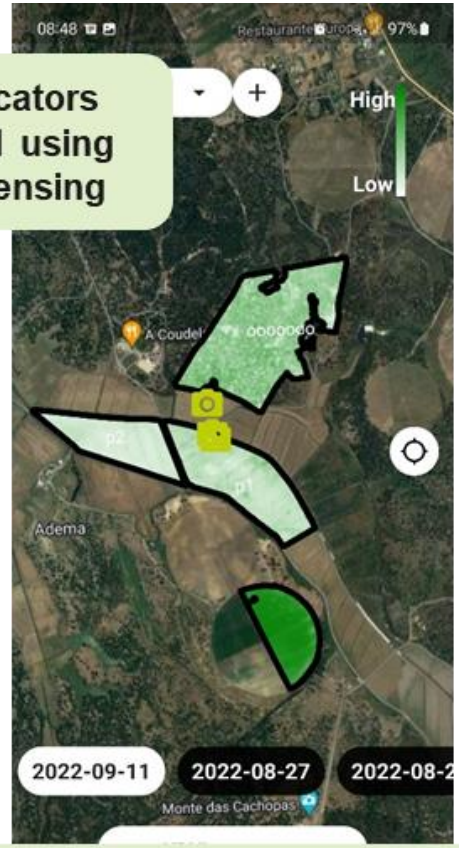
(more than 80% of European farmers own one)

To avoid the need of technical expertise and ensure that the app can be fully operated by the farmers themselves, the app was built using an intuitive user interface that does not require reading manuals or technical guidance

Undergoing work

Surveys of test users showed that most wanted also plant indicators, and were interested in fertilization recommendations and customization

New indicators calculated using remote sensing

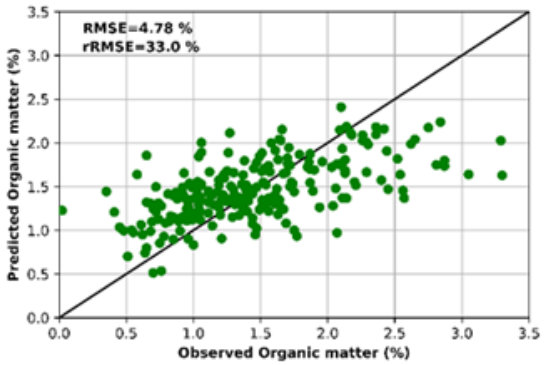


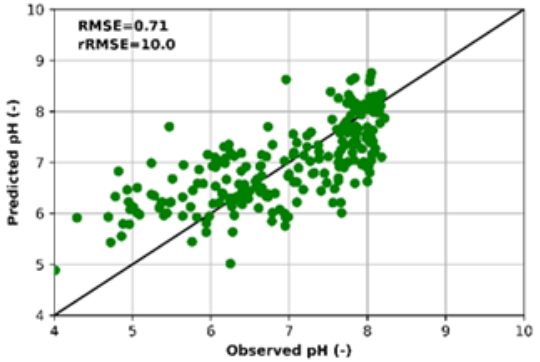
Meteorological information
Including soil temperature and humidity (important for scheduling farming operations)

Algorithm for identification of plant diseases and nutrient deficiencies

Undergoing work

Testers are worried about only one thing in the app: the reliability of the algorithms for estimating soil properties
(Current accuracies 60-90%)





Ongoing

Soil sampling

Vineyards

Maize

Olive

Improvement of the models

Increase the accuracy of all algorithms to 80-90%

Launch

~3 months for use by farmers

Potential uses of the app

App for general farmer use

Farmers can use the app to see maps of NDVI (correlated with yield), meteorological data, etc

Replacement of conventional soil analysis

The app can replace soil analysis for their main purposes

Carbon market certification

The app would solve monitoring problems for carbon sequestration projects

Mandatory for subsidies

All farmers who receive EU support have to do one soil analysis per year

Fertilization and correction recommendations

The app can produce recommendations from analysis reports

MUITO OBRIGADA

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O projeto FPCUP é financiado pela Comissão Europeia sob o FPA no.: 275/G/GRO/COPE/17/10042