IMPPeach – Integrated Model and Platform for Harvest Prediction for Canned Peaches

Introduction

The IMPPeach project's primary objective is to **deliver accurate prediction of yields / quantities and harvest dates** for optimum maturity of peach cultivations (canned peaches varieties) using **a large-scale (area vs orchard) data-driven approach**.

The **benefits** from improved harvest and yield prediction accuracy include a) increase in production efficiency, b) added value for the products, c) more efficient and targeted marketing / gains in market share and d) increased profit margins. These benefits affect not only the canning business itself but are shared with all stakeholders including a larger number of smallholder farmers / suppliers.

Methods

Large scale (**100km2**) study of peach orchards, ~**2000 fields** / **>5000Ha** with canned peach varieties, more than **1000 farmers** in the area of Imathia/Central Macedonia/ Greece, cultivated by producers-members of 3 coops and supplying the canning facility of the project partner ALMME.

Development of **Prediction Model** by employing AI/ML and statistical methods based on:

- Historical production (yields) records per field and variety.
- Remote sensing (image time series and vegetation indexes) data
- Climatic, soil and cultivation data through both an IoT sensor network and field scouting.

Prediction model evaluation and refinement over a 3-year period.

Integration of model and data into a distributed **FMIS** between farmers, coops and and the fruit canning business's production planning.

Dissemination, communication and exploitation including a study on how the project results can be transferred to other crops and geographical locations.

Results

- Collection, processing and geo-referencing peach production data (deliveries to facility) from 2017-2022 per farmer, field and variety.
- IoT sensor installation in 40 pilot fields, model prediction slightly better with IoT data.
- 3 Prediction Models LR+ANN+RF developed and evaluated for harvest date and yield. $0.20 < R^2 < 0.53$, very low to be used for prediction.
- IMPPeach platform realized (Remote Sensing and Weather data geospatial platform, FMIS and integration APIs)
- Dissemination: 2 Fairs, 1 journal paper, 1 conference presentation, Web and Social media

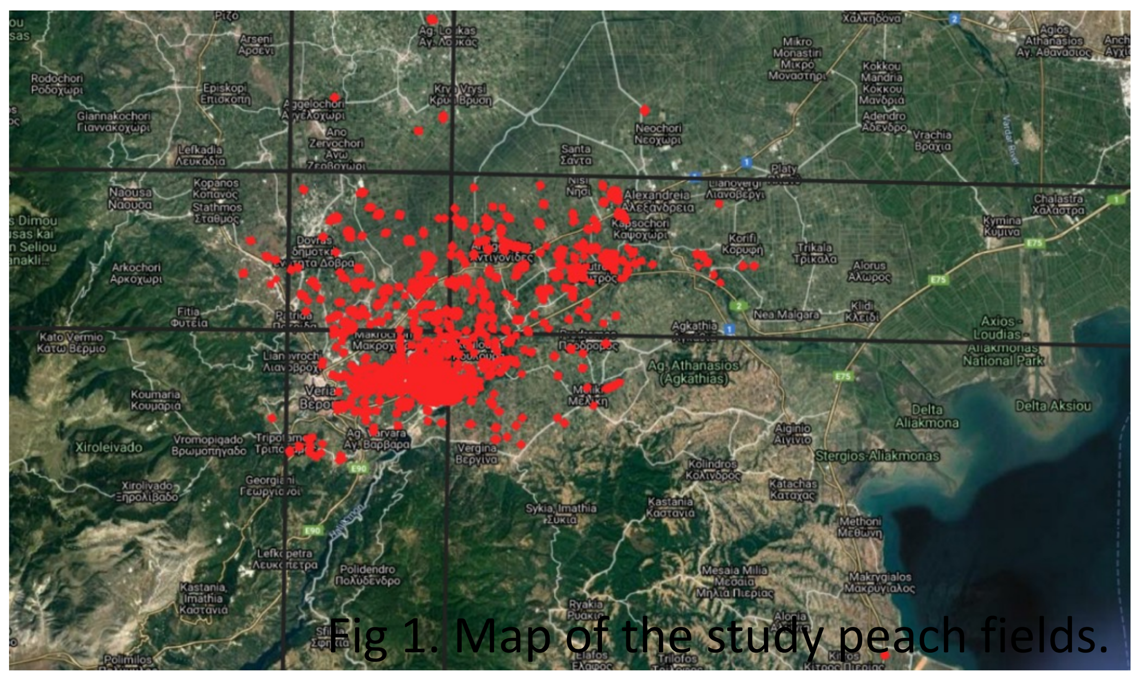

Fig 1. Peach fields in the study area

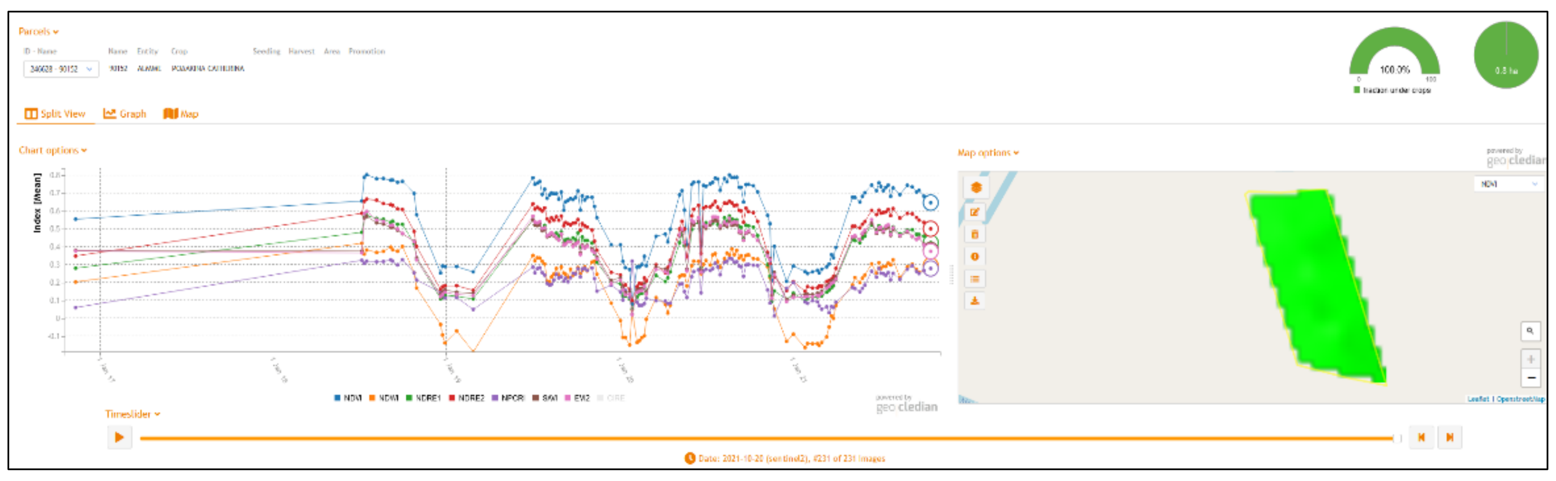

Fig 2. Multiyear time series showing several vegetation indexes for a parcel

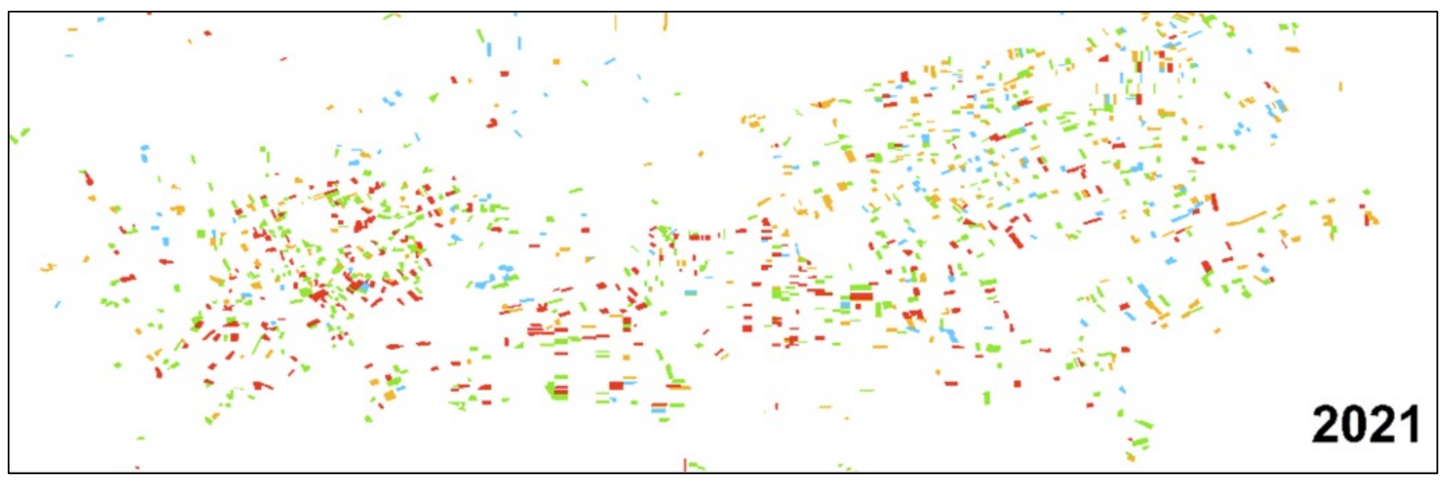

Fig 3. Color-coded yield ranges from fields in the study area

Conclusions

- Analysis of historical production / harvesting records show that harvest start dates correlate with year across varieties confirming that climate and crop variety are the most important parameters that affect harvest time and yield.
- Use of locally installed sensors/weather stations yield better results than using data from weather services.
- Remote sensing does not have adequate temporal and spatial resolution to be reliably used for Blossom date detection.
- Prediction Model accuracy, both for harvest date and yield, is not sufficient for commercial exploitation of the developed approach and platform.
- Data-driven approaches to digital agriculture require the availability of high-quality data sets. Farmers, cooperatives and Ag businesses must invest in the collection and curation of data from the farms.

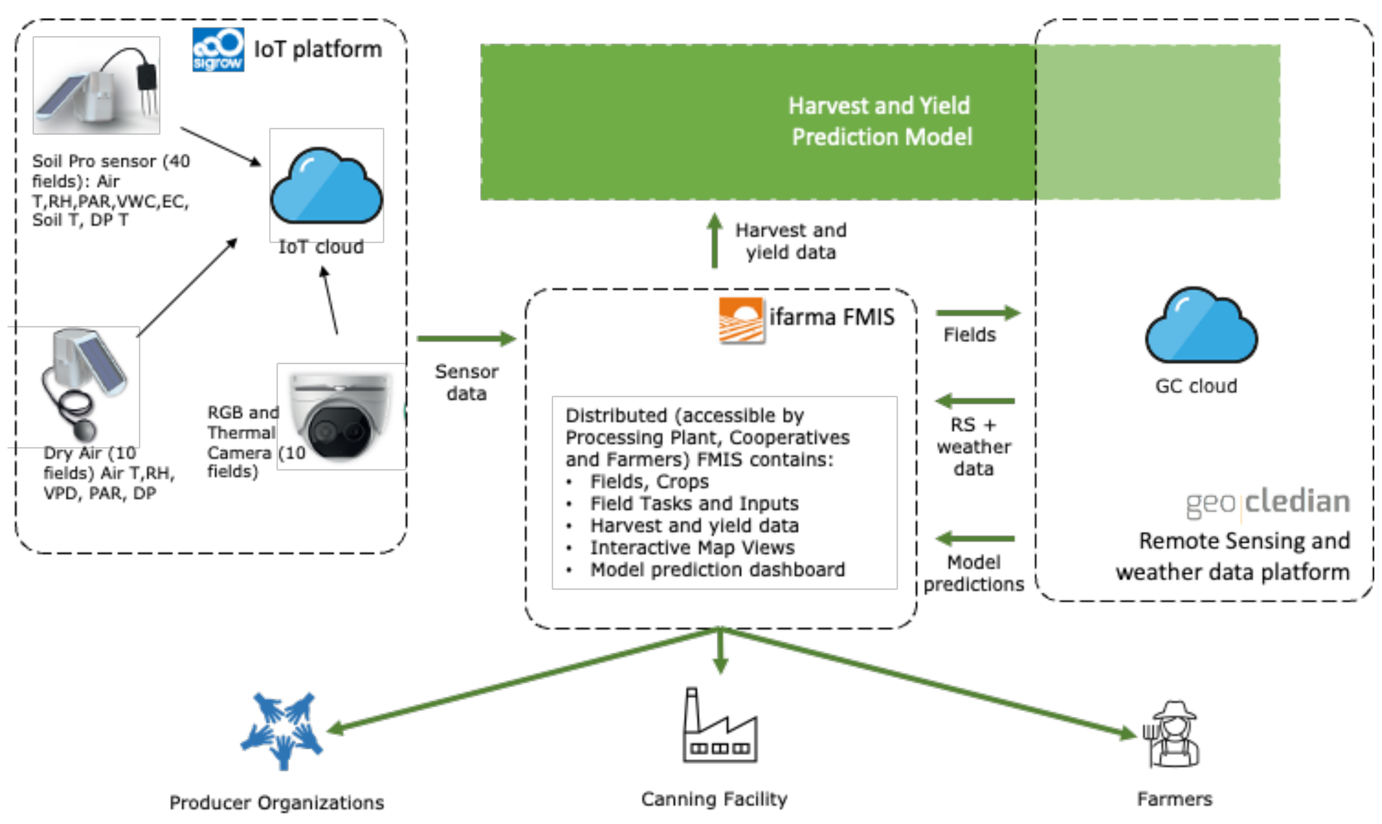

Fig 4. IMPPeach system architecture

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