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

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2019 cofunded Call
End-term Project Seminar
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grand agreement no 862665 ICT-AGRI-FOOD.

Involved countries and partners:

agrostis	geocledian	Agricultural University of Athens	sigrow	Almme
Greece, Coordinator	**Germany**	**Greece**	**Netherlands**	**Greece**

Duration	February 2021 – October 2023 (34 Months – 4 month extension from original July 2023)
Overall budget	666.2 K

Objective

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 – optimize production planning
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.

Selected research approach, methodology

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.

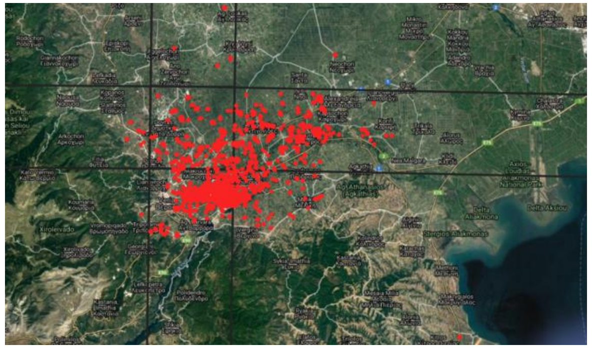
Development of **Prediction Model** by employing AI/ML and statistical methods based on:

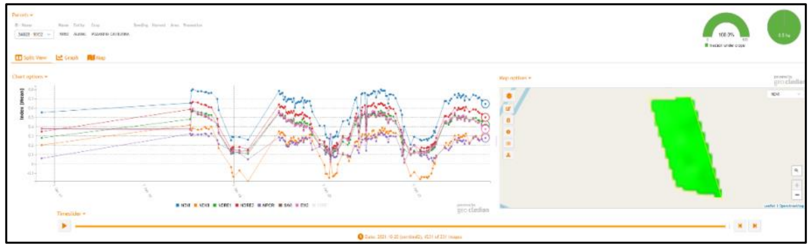
- Historical production (yields) records per field and variety.
- Remote sensing (image time series and vegetation indexes) data
- Climatic, soil and cultivation data through both an IoT sensor network and field scouting.

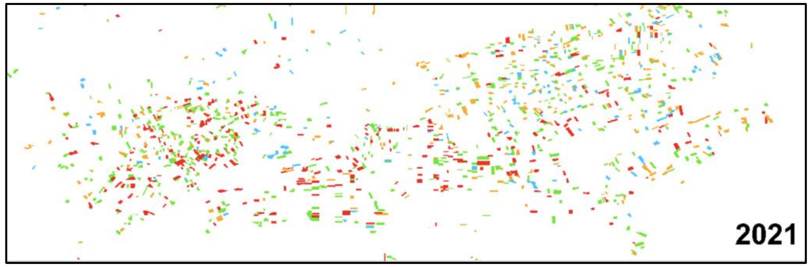
Prediction model evaluation and refinement over a 3-year period.

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.

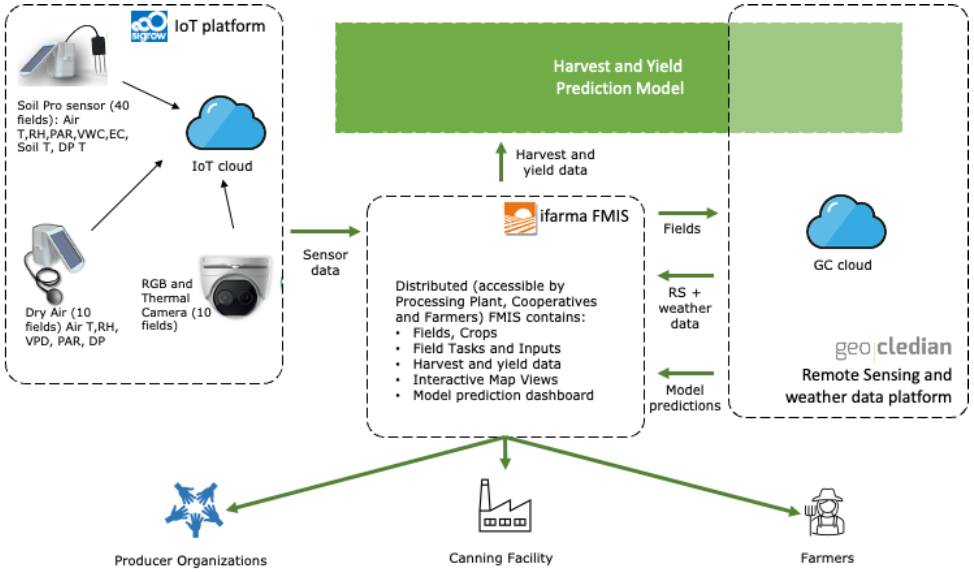






Major results:Key accomplishments and challenges faced

- **Collection**, processing and geo-referencing peach production data (deliveries to facility) from 2017-2022 per farmer, field and variety.
  Incomplete and/or inaccurate production records
- IoT sensor installation in 40 pilot fields, model prediction slightly better with IoT data.
  Installation delayed; sensor data used only for 1 season i.s.o. 2 seasons
- 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



Cooperation with stakeholders, industry partners and/or public and private sector (if applicable)

- Already an industry-oriented project with 1 industry partner and 3 participating SMEs.
- Project presented in Industry fairs in Germany (Agritechnica – Nov 2023) and Greece (Agrotica Oct 2022).
- A working platform integrates partner’s component systems to a complete solution.
- Prediction results not satisfactory for commercial exploitation.

Opportunities and next steps for innovation

- The project demonstrated that a large-scale approach could deliver a prediction model based on:
  - Publicly available and coarse remote sensing, weather and soil data
  - Historical production (harvest) records
  - Minimum equipment for ground truthing
- But …
  - Prediction accuracy must be improved in order for the approach to be commercially viable.
  - Improved data processing is needed to validate production records and remove ‘noise’ : incomplete and/or inaccurate records.
  - Targeted data collection to validate complimentary approaches (e.g. GDH-models) should be exploited.

Summary and Conclusion
takeaways and lessons learned

- 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**.

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Thank you for your attention!