MEF4CAP

# Monitoring and Evaluation Frameworks for the Common Agricultural Policy

## Lessons learned brief

### Demonstration Case 2, Greece: Integrating open-source satellite data with farm level data (Advisors and Farmers' perspectives)

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## Short summary of the Demonstration Case, its rationale and objectives

The concept of "Farm Management Information Systems" (FMIS) is an umbrella term that refers to a set of computer-based information systems operating at a farm level able to receive data streams, store and process them and provide useful output to various stakeholders (individual farmers, farmers' associations, advisors, etc.). FMISs are often offering functionalities for recording applied agricultural activities in a digital registry (also called "Farmer's Calendar", "Farm Log", "Field book"). One of the main objectives of FMISs is to support farmers in data-driven decision-making, combining the "farm calendar" with information from different sources (including IoT sensors, satellite data) towards the optimisation of applied agricultural practices.

Overall, this Demonstration Case 2 (abbreviated DC 2) builds on the fact that digital agricultural technologies (including FMIS) demonstrate the potential to concurrently serve two objectives:

a. The implementation of good and sustainable agricultural practices that provide clear benefits for the farmers and for the climate.
b. The provision of evidence gained through ground truth at farm level of the applied agricultural practices and their impact that can potentially be utilised for the monitoring and evaluation of agricultural related policies (CAP).

However, the second objective is not yet addressed and there is still lack of mechanisms for aggregating and sharing datasets from FMIS for the needs of policy monitoring. To this end, and in the context of DC2 a data aggregation platform was developed capable to exploit datasets from FMIS.

The data aggregation platform offers a user-friendly dashboard that supports the on-demand creation of groups of parcels and the calculation of the respective farming performance indicators. Current implementation provides mechanisms for calculating the following indicators on an individual parcel and/or group of parcels bases, for user provided time frames:

- harvested yields
- applied irrigation quantities
- applied fertilisers (type, quantity, NPK),
- applied pesticides (active substances, quantity).

Calculated outcomes are feasible to be extracted/printed in various formats (csv, pdf) and are also available through an API.

The initial implementation of the data aggregation platform exploits dataset from a commercial FMIS called "gaiasense". The "gaiasense" system operates since 2015 mainly in Greece and currently supports ~60,000 ha and 17 different crops. For the implementation process, testing and demonstration, 40 parcels with olive orchards operated by 8 farmers have been utilised. Further testing is currently conducted with data from 22 parcels with kiwi and 68 parcels with cotton.

The stakeholders to whom the data aggregation platform is addressed are farmers (as well as their organizations, cooperatives) and advisors. In this brief, their different perspectives will be treated together or, when necessary, separately.

Overall, the following design principles drove the implementation of the data aggregation platform:

- Farmers and advisors can be an integral part of the policy monitoring process, through the collection of relevant indicators at farm and/or group of farms level, and at the same time benefit from the reuse of the data collected
- Selected calculated outcomes/aggregates will be shared with individual farmers which consent to share their data, to provide them with data driven support to their management decisions
- This data sharing can act as a reward and incentivisation for farmers to share their data, and in general terms, as an approach for the 'mutualisation' of resources.

### Some reflections on the technologies suggested in the DC, on the data and indicators generated and on the adoption process altogether. What is the "readiness" level (technological, social) of the technologies suggested in this DC? Are they ready to be adopted or do they need more time for this? And if not immediately ready, why is this?

All technologies used in DC2 are available in the market and ready to be adopted. The main requirement for the farmer is to use digital means for recording and sharing the farming activities performed.

### Can the technologies be adopted by all type of farmers or different ones should be used depending on farmer types (small scale, large scale, etc.)?

In general, technologies can be applied by all types of farmers, however, only under certain conditions when it comes to small scale farmers. A minimum initial investment on technologies should be made (such as a digital Farm Calendar provider, Weather station installation), which sometimes is a burden.

### What about the data and indicators generated and used in this DC? Anything missing that needs to be considered?

This DC focuses on the calculation of indicators related to the cultivated crop type, fertilisers applications (type, quantity, time of application), pesticides applications (type, quantity, time of application), irrigation (quantity, time of application), and to a number of other farming activities. The indicators listed in the table are feasible to be calculated for time periods and for group of parcels defined by the user of the data aggregation platform.

Environmental & Economic - On farm level and on group-of-farms level.

| Data | Description |
|---|---|
| *Data* | *Provide an overview of the data used/collected during this activity* |
| Crop type | Olive groves, peach, kiwi |
| Fertilisation application | Date-time, type of chemical, dose and their aggregates. |

| | |
|---|---|
| Pesticides application | Date-time, type of chemical, dose and their aggregates. |
| Irrigation | Date-time, volume and their aggregates. |
| Land management | Date-time-frequency of Pruning and Ploughing |
| Harvests | Date-time, quantity, quality |

All data products are extracted from the Farm Management Information System (farm calendars) which contains the necessary information items. In some cases, datasets (farm calendar entries) were missing or were of low quality resulting in low quality calculated aggregates. Thus, long term recording of applied cultivation practices (e.g., on an annual basis) is necessary.

### What motivates potential users to adopt the proposed technologies?

### For all:

- Data-driven decision making on the farming practices to be applied supports the optimized use of inputs and thus, financial, and environmental profit (mid-long term).

### For the farmer:

- Allow cross-farm information sharing in a protected manner
  (farmer has access on applied practices and conditions in other farms in the area in pseudonymized manner).
- Allow criteria-based benchmarking of farms performance (based on time, area, farming activity type)
- Automate reporting obligations (e.g., subsidies, pesticides use, certifications for Organic, GlobalGAP, traceability for selling fruit/vegetables, etc.)
- Save time – User friendly visualization of farm's status.

### For the advisor:

- Significantly reduce advisors' burden, especially when it provides support to reporting needs for groups of farms e.g., cooperatives, farmers organizations. The presented dashboard automates the extraction of reports (e.g., subsidies, pesticides use, certifications for Organic, GlobalGAP, traceability for selling fruit/vegetables, etc.).
- The advisor uses a single dashboard to view evidence from a group of farms, but also on individual farm bases. For example, this allows to easily identify anomalies in the use of inputs (e.g., when a parcel is overirrigated) and to react in a direct manner.
- The advisor can demonstrate the performance and quality for a group of farms (e.g., farmers association) to new potential customers (e.g., fruit processing factory). Support the faster building of trust even between organizations and people who didn't know each other.

### Which barriers do they face when adopting the technologies?

### For the farmer:

- Lack of training/trust on the potential benefits – farmers are not fully familiar with data-driven decision making. They still follow an empirical-based decision-making approach.
- Administrative burden/workload – especially with the manual importing of farming practices to digital calendars. Farmers are not providing any or inaccurate data to farm calendar.
- Reluctance to share data. The core benefit of the demonstrated approach is when data are aggregated and shared. Reluctance caused due to the fear of penalties or competition.
- Initial technological investment cost.

### For the advisor:

- Data sharing issues (farmers' refusal to share data). The farmer is the owner of the data referring to his/her farm and might be reluctant to share.
- Administrative burden/workload – especially with the manual importing of farming practices to digital calendars. Farmers are not providing any or inaccurate data for the farm calendar. In many cases the advisor is supporting the farmer in providing entries to the digital farm calendar which increases advisors' burden.
- Lack of training and technical capabilities for advisors to use such a tool.

## Given these barriers, which measures do you think should be in place to overcome them? By whom?

In the following table we have summarised the barriers above, possible measures to prevent or minimize them and taken by whom. These are presented for the farmer first and then for the advisor.

**Farmer**

| BARRIER | MEASURE | WHO SHOULD TAKE THIS MEASURE? |
|---|---|---|
| Lack of training | Training and real cases | Advisory services / Government / regional administration |
| Administrative burden/workload especially on manual data input. | Technical means to make data entry easier. Provide incentives to farmers that provide rich and accurate data | Advisory services / Government / regional administration |
| Reluctance to share data | Provide incentives for data sharing (e.g., access to regional data | Government / regional administration |

| | | |
|---|---|---|
| | outcomes)<br>Reassure farmers that sharing of their data will not cause penalties | |
| Investment Cost | Market competition/forces will lower the cost eventually | Government should provide incentives |

**Advisor**

| BARRIER | MEASURE | WHO SHOULD TAKE THIS MEASURE? |
|---|---|---|
| Data sharing issues | Give incentives/reward for sharing | Advisory services / Government / regional administration |
| Administrative burden/workload | Support end users | Advisory services |
| Lack of training | Training and real cases | Advisory services / Government / regional administration |

## Feedback from the national workshop

The National Workshop took place on the 28th of February 2023; it was held online in Greek language and lasted about an hour and half. The invited stakeholders comprised farmers, farmer organizations and mostly farmer advisors. More than 50 persons participated at the workshop and contributed to the discussions and evaluation of the data aggregation platform.

The workshop started with a quick introduction before an expert on CAP issues began a presentation about the changes introduced by the new CAP with an emphasis on the need and the importance to collect data from the field. Then a live demonstration of the data aggregation platform followed.

Then, an experienced farm advisor presented the position and needs from the agricultural advisors' perspective. After the presentations, participants had the opportunity to discuss, comment and exchange ideas before proceeding in filling a web-based questionnaire.

The questions and the discussion that followed were on:

- The position and needs of the agricultural advisors and farmers
- What are the incentives for an individual farmer in order to share data and which are the barriers

- What are the incentives for an individual farmer to adopt new technologies and which are the barriers
- What kind of data should be shared and to whom.

The main outcomes can be summarized to the following:

Overall farmers and advisors are motivated to **adopt digital technologies for their every-day tasks** mainly focusing on:

a) data-driven advice for farming practices (e.g. when to spray, irrigate, apply fertilizers)

b) improving their farms' overall sustainability performance

c) using aggregated benchmarking data-products towards their farm improvement (e.g. comparing their farming practices with aggregates from neighboring farms).

With regards to which **of the data** which will be **monitored in their farm (e.g. farm-book records, weather data) they are willing to share with other producers in the area** (e.g. members of the same cooperative) the following types were indicated:

Weather measurements, damage to cultivation caused by extreme weather, pest infestation prediction and actual pest scouting outcomes.

Regarding **farm book data sharing with governmental organisations** (e.g., Paying Agency, Statistical Authority) or environmental protection organisations (e.g., to protect biodiversity, combat climate change, monitor water quality), the opinions of the respondents appeared to be more diverse. About 45% stated that a possible incentive for sharing their data would be to get similar data from other parties, and about 15% would like to get financial benefits (Sale of data).

## Final reflections including on the applicability of the DC results to other contexts (other users, other member states, other indicators).

Among the core reflections is that there is great and yet unexplored potential in the use of agricultural aggregates and their sharing which is not limited to the indicators and farm types covered in the Greek DC. Using aggregates to benchmark on a farm and/or group of farms will assist not only decision making for farming practices but can also be considered as a preparatory step of the policy monitoring process.

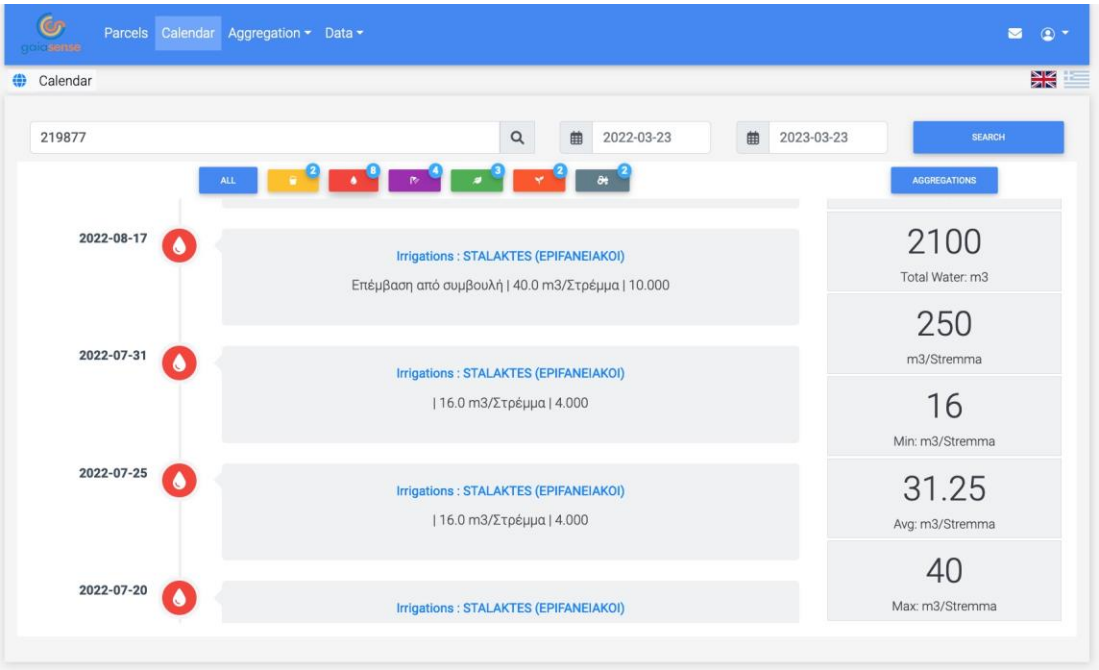
With regards to policy monitoring there are various limitations, especially related to the accuracy of the recorded data. Although FMISs are offering the necessary mechanisms for storing various farm activity data item, there are still many issues regarding the validity and accuracy of these entries. In most of the cases data import is a manual process which is prone to intentional and unintentional errors. In many cases, farmers are still not well familiar with the use of such systems. Moreover, it is often not among their priorities to do a timely and accurate data entry of the implemented farming activities in the digital farm calendar. Integration of various sensing technologies can act as supporting evidence on the various farm calendar entries, which will increase the accuracy of the data recorded.

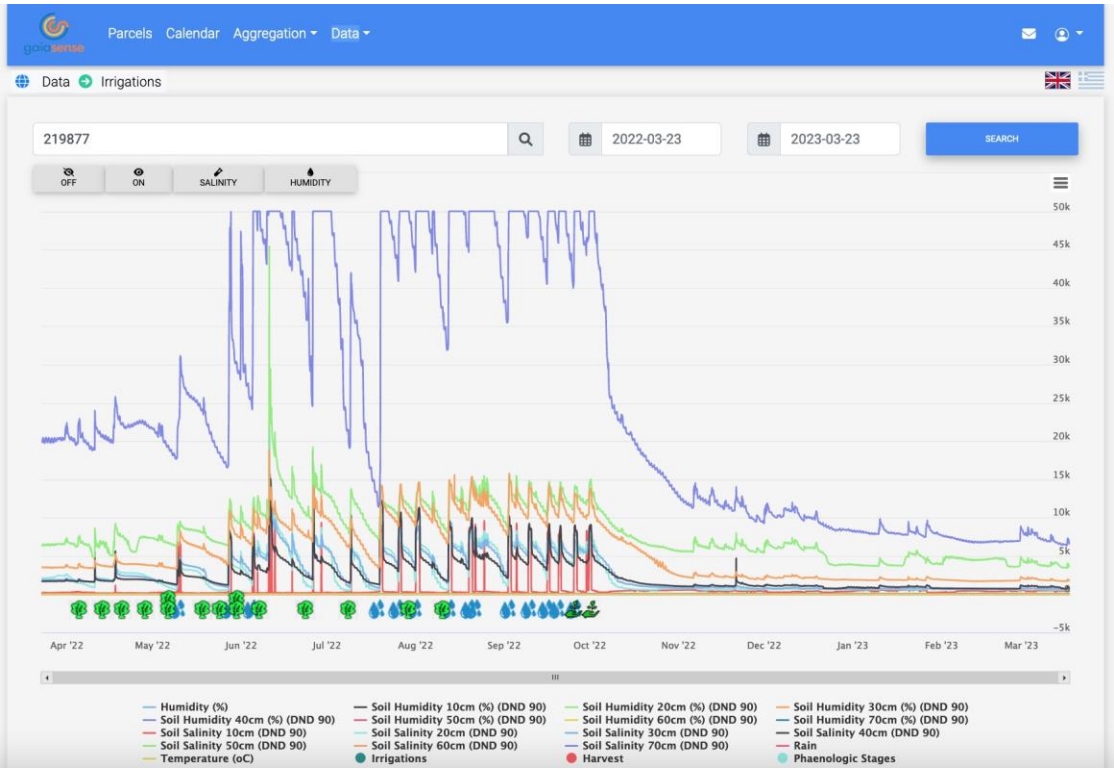
Overall, the development of the **data aggregation platform** will continue, aiming to identify better and more useful data products for farmers and advisors. Significant work is necessary for improving the user interface to become more attractive and intuitive.

Some screenshots of the **data aggregation platform:**

Pages on individual parcel data:






## Pages on Aggregates