Modernising the CAP to help deliver the European Green Deal

The European Green Deal adopted by the European Commission in December 2019 announced a new green transformation agenda for Europe. The agriculture sector has an important contribution to make, supported by the Common Agricultural Policy (CAP). This briefing presents how:

- using new data sources, automation and machine learning enables the EU and Member States to reward and monitor better environmental performance in the CAP;
- technology also helps to reduce administrative burden by making more use of already collected data, from satellites, sensors, machinery and other sources;
- modernising the IACS by absorbing new technologies, improves the robustness and granularity of the monitoring of the CAP's environmental performance. This will open the door to move to a truly performance-based policy.

A green transition for the CAP?

Agriculture is at a crossroads and it is common understanding that it cannot continue in the way it has developed in the past decades: the agricultural sector is the single largest driver of biodiversity loss[1] and contributes around 15% of the EU's total greenhouse gas emissions[2] but it is also itself starting to feel the negative impacts of degraded agro-ecosystems[3] and a changing climate[4]. In response to these challenges, the European Commission published 'A **Farm to Fork Strategy** for a fair, healthy and environmentally-friendly food system' and an updated **Biodiversity Strategy**, two 'cornerstones' of its flagship European Green Deal.

The Farm to Fork (F2F) Strategy lays out how the European Commission intends to promote a transition towards sustainable food systems, as part of the move towards a circular and climate-neutral economy. To that effect, the F2F and Biodiversity Strategies set five concrete targets to be achieved in the farming sector by 2030:

1. 50% reduction of the overall use and risk of chemical **pesticides**;
2. 50% reduction of nutrient losses, with a corresponding 20% reduction in the use of **fertilisers**;
3. 50% reduction of EU sales of **antimicrobials** for farmed animals and aquaculture;
4. and 25% of farmland in the EU to be under **organic farming**;
5. 10% of agricultural area under high-diversity **landscape features**.

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[1] https://www.eea.europa.eu/publications/state-of-nature-in-the-eu-2020
[2] IEEP, Net-zero agriculture in 2050: how to get there? (2019)
[3] Dainese et al, A global synthesis reveals biodiversity-mediated benefits for crop production (2019)
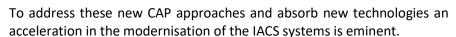[4] EEA, Climate change adaptation in the agriculture sector in Europe (2019)

The Common Agricultural Policy (CAP), which is currently being reformed, is the main instrument put forward by the Commission to achieve these objectives. In the future CAP Member States are expected to design measures in National Strategic Plans (NSP) to support farmers to adopt more sustainable practices in line with the F2F Strategy. These NSPs provide a national adaptation of the EU-level rules, to make room for tailor made incentives responding to local needs or issues.

Another change in the future CAP is a shift towards 'strategic planning' or 'programming,' whereby measures are defined based on an assessment of needs, instead of focusing on compliance with detailed EU rules. Abandoning the 'one size fits all' approach should contribute to a better performance, and lead to tailormade approaches at different spatial scales: national, regional and local. This means that when Member States are given more freedom to decide on the best way to achieve the objectives, the reporting on the performance on these objectives becomes crucial to account for the policy implementation choices they make in their NSPs.

Overcoming administrative hurdles

A challenge faced by Member States in delivering the Green Deal objectives is the need for high quality data and smart management systems. To evaluate the results and impacts of the CAP interventions, a monitoring framework will be provided. This framework monitors the annual expenditure based on output indicators, the progress towards the targets with result indicators and assesses the performance towards the objectives with impact indicators.

Since 1992, the Integrated Administration and Control System (IACS) is the management system of the CAP operated by Paying Agencies in the EU Member States. The IACS needs to be adapted to meet the needs of the new CAP, as it has been adapted to earlier CAP reforms too. In addition, trends in digitalisation in the farming sector and the emergence of new technologies are offering new possibilities and demands to the current IACS. One significant change in the new CAP, will be that Member States are required to move to a monitoring approach. In this approach farmers are made aware of what is expected from them and then their compliance is monitored remotely throughout the year. This new approach is most visible in the so-called on-the-spot checks, were practices change from controlling a 5% risk-based sample of the farms, to monitoring 100% of the farms through a new Area Monitoring System.

To address these new CAP approaches and absorb new technologies an acceleration in the modernisation of the IACS systems is eminent.

Innovative solutions developed by NIVA

The NIVA project brings together Paying Agencies from 9 Member States, research institutes, farmers and NGOs to tackle this challenge. The project promotes a collaborative approach towards development and validation of new technologies and introduces new digital tools and solutions to modernise the IACS systems. These modernisations also focus on reducing the administrative burden of farmers and improve the environmental performance of the CAP.

See below some concrete solutions developed by NIVA which will modernise the CAP and facilitate the implementation of the EU Green Deal.

Using satellite data and Artificial Intelligence to monitor agri-environmental indicators

The availability of satellite data with increasing spatial and temporal resolution, enables administrations to take up wall-to-wall monitoring of agricultural land. Not only the type of crop and the area can be measured with this high temporal resolution also some cultivation actions can be discovered, such as the time of ploughing, crop emergence and harvest, and the cultivation of a winter catch crop after harvest.

Also, NIVA partners are elaborating a set of agri-environmental indicators (see table) which will allow farmers, public institutions, and other stakeholders to quantify the impact of agricultural practices, at field, farm, country or EU-scale on a yearly basis. The calculation of these indicator will allow the analysis of agricultural activities over several years and on a large scale.

Carbon budget	Estimating net plot CO_2 sequestration based on the percentage of time soil is covered throughout the year.
Nitrate leaching	Calculating the effect of the previous and current crop on mineralisation vs. absorption of nitrogen.
Biodiversity conservation	Assessing biodiversity at the landscape scale based on the spatial diversity of crops, the quantity and diversity of semi-natural habitats and the average size of parcels.

These agri-environmental indicators can help monitor progress against several EU Green Deal objectives:
- Estimating carbon sequestration on farmland will give a better idea of farmers' contribution to climate mitigation;
- Monitoring nitrates leaching will help achieve zero pollution of water and the nutrients loss and fertilisers reduction target of the F2F Strategy;
- And the biodiversity indicator can provide a science-based method to assess the biodiversity impacts of different farming and landscape management practices.

This innovation makes use of Earth Observation data and Area Monitoring System methodologies, and uses models and algorithms to calculate the indicator, at several levels of complexity (TIERs 1 to 3). The algorithms will be open source under the [EU Public Licence](#).

The NIVA partners also investigate how this information can flow back to farmers into what is called the Fieldbook, a farmer's registry of events on and condition of fields. In this way, the monitoring approach is best served, not only using the data and technology to control and measure progress, but actually providing farmers with the means to follow their crop performance. At the same time, farmers can enrich these data by adding data that cannot be measured through satellites, such as the variety of the crop, the amount of fertiliser provided etc. This will also help farmers to benchmark their farm against others in the region, to see not only how they perform economically but also ecologically.

Automatic update of parcel data

Every Member State has a Land Parcel Information System (LPIS) in place, which maps out the agricultural area eligible for CAP payments down to the plot level. To reduce the time-consuming manual processes needed to keep the LPIS up to date, the NIVA project is developing solutions to update LPIS automatically. More precisely, NIVA is developing algorithms to detect changes in parcel boundaries and land cover and automatically update LPIS accordingly, using machine learning based on orthophotos and other relevant data.

The quality of the LPIS is crucial, as where parcel information is known, satellite imagery can be used more effectively in monitoring. A smart LPIS will enable Member States to better monitor agricultural practices such as no-till, cover crops or fallow land, as well as changes in landscape features – key aspects of the EU Green Deal and the green architecture of the new CAP. A robust monitoring system will, in turn, remove barriers for the design of a more performance-oriented policy.

New data sources: geotagged photos & machine data

Not every relevant aspect can be monitored with satellites. To improve the quality and quantity of farm data, while reducing the administrative burden for farmers and administrations, NIVA partners are developing innovative solutions anchored in the 'Internet of Things' and artificial intelligence.

One such innovation is the development of a secure smartphone application allowing farmers or advisors to make and upload geotagged photographs. These photos can serve as supporting evidence to scheme applications or to answer queries from Paying Agencies, as the mobile app will enable a two-way exchange with the administration.

Another innovation developed by NIVA is to integrate data from farm machines as a new data source for the IACS. Careful attention is given to ensure data integrity, so that the direct capture of data from farm machinery can become a building block in performance monitoring. As this data will be much more precise than satellite imagery, it will allow to monitor new farming practices such as strip farming or intercropping.

These innovations are important steps in simplifying the implementation of the CAP and improving its performance monitoring. It will allow the IACS to adapt to more sustainable farming practices such as precision farming or agroecology, contributing to the F2F Strategy's targets for pesticides and fertiliser use reduction.

To sum up, the CAP can deliver on the EU Green Deal, while simplifying the administrative burden of Member States and farmers.

With these examples of new technologies and e-solutions, partners in the NIVA project are innovating to create a simple and robust system to administer and control the implementation of the CAP and monitor progress on the objectives of the European Green Deal.