



Special report

Data in the Common Agricultural Policy

Unrealised potential of big data for policy evaluations





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Executive summary

The Common Agricultural Policy (CAP) represents more than a third of the EU budget. The policy has numerous complex and inter-related objectives, ranging from living standards in the agricultural community to environmental and climate-related aspects and the development of rural areas. Using an evidence-based approach in policy decisions requires various data from different sources and subsequent analysis.

The objective of the audit was to assess whether the Commission is making good use of data and analytics for CAP policy analysis. This assessment is relevant both for the CAP starting in 2023 and for the post-2027 CAP.

First, we examined how the Commission has used the available data for policy analysis in recent years, and whether the available data are sufficient. Then, we examined what the Commission is doing to address data gaps, including the use of big data.

IV We found that the Commission holds large amounts of data for CAP design, monitoring and evaluation. The Commission uses conventional tools such as spreadsheets to analyse the data it collects from the Member States. Current data and tools do not deliver certain significant elements (e.g. details of the environmental practices applied, and off-farm income) that are needed for well-informed policymaking. The Commission has taken several legislative and other initiatives to make better use of existing data, but barriers to making the best use of collected data remain. Obstacles such as a lack of standardisation and limitations due to data aggregation reduce data availability and usability.

V We recommend that the Commission should:

- o establish a framework for using disaggregated data from Member States; and
- o make more use of and develop data sources to meet policy needs.

Introduction

The Common Agricultural Policy is a broad policy area

01 The Common Agricultural Policy (CAP) was launched in 1962 and represents more than a third of the EU budget: for the 2014-2020 period, agricultural expenditure totalled €408 billion. The broad Treaty objectives¹ for the policy are specified further in the CAP regulations (see Figure 1). The policy seeks to impact not only agricultural production and farmers, but also environmental, climate-related and social aspects.

Figure 1 – General objectives of the 2014-2020 and 2023-2027 CAP periods



2014-2020* Article 110(2) of Regulation (EU) No 1306/2013

a focus on agricultural income, agricultural productivity and price stability

(a) viable food production, with (b) sustainable management of natural resources and climate action, with a focus on greenhouse gas emissions, biodiversity, soil and water

(c) balanced territorial development, with a focus on rural employment, growth and poverty in rural areas

2023-2027 Article 5 of Regulation (EU) 2021/2115

(a) to foster a smart, competitive, resilient and diversified agricultural sector ensuring long-term food security

- (b) to support and strengthen environmental protection, including biodiversity, and climate action and to contribute to achieving the environmental and climate-related objectives of the Union, including its commitments under the Paris Agreement
- (c) to strengthen the socioeconomic fabric of rural areas

* The 2014-2020 policy period runs until 2022 due to delays in adopting the new CAP (2023-2027).

Source: ECA, based on Article 110(2) of Regulation (EU) No 1306/2013 and Article 5 of Regulation (EU) No 2021/2115.

¹ Article 39 of the Treaty on the Functioning of the European Union.

02 Under the CAP, beneficiaries receive the largest share of subsidy on the basis of the land at their disposal. A further portion of subsidy may be paid as reimbursement of costs for undertaking specific activities, and to finance investments. EU law sets out the basis for most payments. Data on farms are created and collected through various means (*Figure 2*).

Figure 2 – Examples of data created and collected that are relevant for the CAP



Source: ECA.

Role of data in a policy cycle

03 The Commission's Better Regulation Guidelines call for an evidence-based approach, meaning that policy decisions need to be based on the best available evidence. The Commission's definition of evidence is "data, information, and knowledge from multiple sources, including quantitative data such as statistics and measurements, qualitative data such as opinions, stakeholder input, conclusions of evaluations, as well as scientific and expert advice"². A conventional policy cycle contains the various steps shown in *Figure 3*. An evidence-based policy needs relevant data at every stage of the cycle.

Figure 3 – Data use in a policy cycle



Source: ECA, based on Better Regulation Guidelines.

² Better Regulation Toolbox, 2021, p. 20.

O4 Globally, organisations are making increasing use of 'big data', enabling them to use data that have been captured in diverse ways. In the report, we consider 'big data' as data that are too complex or too large for traditional data-processing systems, and that require advanced tools and computing power.

05 Agriculture is a sector where digital innovations and technologies are increasingly applied; *Figure 4* presents examples of digital technologies in agriculture. The public sector can use many of these technologies. Technological advances can reduce the timeframe for policy formation, and increase the evidence base for policy decisions³. These improvements allow governments to adopt data-driven policies, in particular by making it possible to⁴:

- understand the environmental impacts of agriculture better, and formulate policy objectives that address those impacts holistically;
- design differentiated and targeted policies; and
- apply new data-driven monitoring systems.

³ Höchtl, J., Parycek, P. & Schöllhammer, R., "Big data in the policy cycle: Policy decision making in the digital era", *Journal of Organizational Computing and Electronic Commerce*, 2016, 26(1-2), pp. 147-169.

⁴ OECD: *Digital Opportunities for Better Agricultural Policies*, 2019, OECD Publishing, p. 13.



Figure 4 – Digital technologies for agriculture

Source: ECA, based on Table 2.1 of the OECD's "*Digital Opportunities for Better Agricultural Policies*", OECD Publishing, Paris, 2019.

The EU's data ambitions

06 The European Commission has issued several documents emphasising the need to improve and maximise the use of data for better policy-making, or impacting data sharing or tools in the EU (see *Figure 5*).



Figure 5 – Main Commission data-related initiatives

Source: ECA, based on C(2016) 6626, DataStrategy@EC, C(2018) 7118, COM(2021) 37, COM (2018) 234/Directive (EU) 2019/1024, COM(2020) 66, COM(2020) 767, COM(2021) 118, COM(2021) 205 and COM(2021) 206.

07 The 2016 Communication from the Commission on "Data, information and knowledge management at the Commission" emphasised the need to improve information retrieval and delivery, and to maximise the use of data for better policy-making. It stated that big data "has the potential to significantly increase the Commission's capabilities by allowing early detection of trends and faster feedback in support of Better Regulation and evidence-based policy-making as well as to improve demonstration of results to all stakeholders". The Commission planned to develop the necessary skills, tools and computing infrastructure to support a big data capability. It also highlighted that data needs and knowledge gaps need to be anticipated better to ensure that data are available, usable and useful for impact assessments, monitoring, reporting and evaluation⁵. The Commission's internal data strategy (DataStrategy@EC) is the main tool used to put the Communication into practice.

⁵ C(2016) 6626, Communication "Data, Information and Knowledge Management at the European Commission".

08 In November 2018, the Commission adopted the European Commission Digital Strategy for becoming a digitally transformed, user-focused and data-driven administration by 2022. It affirmed the direction set in the 2016 Communication. Of the nine actions listed in the strategy, we consider the following two to be the most relevant for the scope of our audit:

- integrating new technologies into the Commission's IT environment; and
- facilitating the free flow of data relating to EU-wide policies between European public administrations.

09 In February 2020, the Commission issued a Communication entitled "A European strategy for data"⁶ for the 2021-2027 period, the scope of which went far beyond the Commission itself. The strategy aims to realise the "vision for a genuine single market for data" through actions such as setting a governance framework for data access and use, and investing in data infrastructure and skills. The issues to be tackled include data availability, data interoperability and quality, data governance, data infrastructure and technologies (e.g. data-processing capacity and cloud infrastructure), and cybersecurity.

10 The Commission 2020 proposal for a Data Governance Act⁷ aimed to facilitate the re-use of certain categories of protected public-sector data, increase trust in data intermediation services, and promote data altruism in the EU.

⁶ COM(2020) 66.

⁷ COM(2020) 767.

Audit scope and approach

11 Our audit aimed to assess whether the Commission makes good use of data and data analytics for policy analysis of the CAP. First, we examined how the Commission used the available data for policy analysis, and whether the data are sufficient. Then, we examined whether the Commission is addressing the data gaps, including the use of big data, and whether there were recent or ongoing EU research projects that could help to address those gaps and improve CAP policy analysis.

12 Our audit scope encompassed policy design, monitoring during implementation, and evaluation. The audit covered the period from 2015 until February 2022. Assessment of CAP data governance is relevant, as our report could impact both the CAP starting in 2023 and the post-2027 CAP. Primary responsibility for the CAP lies with the Commission's Directorate-General for Agriculture and Rural Development (DG AGRI).

13 As part of our audit work, we:

- reviewed relevant data and documents, including scientific, strategic, legislative, policy and project documents;
- interviewed the staff of four Commission directorates-general (Agriculture and Rural Development, Eurostat, the Joint Research Centre (JRC), and Communications Networks, Content and Technology);
- held interviews with the agricultural umbrella organisation COPA-COGECA on the EU code of conduct on agricultural data sharing by contractual agreement, and with representatives of the Sen4CAP project;
- consulted all 27 EU Member States through a survey addressed to the ministry/department responsible for the CAP, and, based on the survey replies, had follow-up discussions with authorities in Belgium, Estonia, Germany, Ireland, the Netherlands, and Spain;
- conducted a desk review of three non-EU countries (the US, Australia and Japan) for benchmarking purposes. The audit team chose these countries based on a significant agricultural economy, innovative or digital initiatives for agricultural management, and the availability of public data; and
- organised a panel discussion with scientific, policy and administrative experts.

Observations

Current data and tools partly deliver the information needed for well-informed policy-making at EU level

14 The Commission is required to assess the performance of the CAP in relation to its three general objectives⁸ (see *Figure 1*). The evidence the Commission gathers for policymaking should be proportionate and appropriate for informing policy options and addressing evaluation questions⁹. According to the Better Regulation Guidelines, the evaluations should also ensure that relevant evidence is available to support the preparation of new initiatives (the 'evaluate first' principle).

15 We examined whether DG AGRI uses a sufficient range of data sources and data for CAP policy analysis, and whether it applies relevant analytical tools. We explored what type of data, IT systems and data analytics the Commission possesses and uses. To determine whether the data and tools are sufficient, we reviewed evaluations and policy preparation documents.

DG AGRI collects mostly administrative data, and mainly uses conventional tools for data analysis

16 To design, monitor and evaluate the CAP, DG AGRI possesses large volumes of mainly administrative data (e.g. market prices and payments, and farm accountancy data) that it mostly receives from the Member States, which collect the data in order to carry out the policy. EU agricultural statistics collected by Eurostat come from a variety of sources: surveys, administrative data, data from farms and other businesses, as well as farm-level data from agricultural censuses and samples¹⁰.

17 DG AGRI follows the Commission's internal data strategy. The Commission has a data inventory that indicates the ownership, accessibility, storage and re-usability of each data asset. This stock-taking exercise did not mention information on gaps or overlaps.

⁸ Article 110 of the Regulation (EU) No 1306/2013.

⁹ Better Regulation Toolbox, p. 20.

¹⁰ Explanatory Memorandum of COM(2016) 786.

18 DG AGRI's data inventory as of February 2022 consisted of 57 data assets stored in various IT systems and databases (for examples, see *Figure 6*). The databases mainly contain structured administrative data, and DG AGRI uses essentially statistical tools to process them. A number of documents that DG AGRI collects from Member States (e.g. annual implementation reports) include unstructured data, for which DG AGRI has no automated or semi-automated processing tools.



Figure 6 – Examples of main IT systems and databases for CAP data

Source: ECA.

19 DG AGRI has an agreement with the JRC for data analysis and to explore ways of making better use of existing data. On this basis, it uses some advanced methods in its CAP policy analysis (such as the IFM-CAP model, econometric models, and predictive analytics). The IFM-CAP model is the Individual Farm Model for Common Agricultural Policy Analysis, which aims to assess the impacts of the CAP on farm economics and its environmental effects.

20 Our review of the four IT systems (ISAMM, CATS/COMBO, AGRIVIEW, and SFC) and the FADN database feeding into the Agri-Food data portal (see *Figure 6*) established that DG AGRI mainly collects aggregated data. Of these, only CATS/COMBO contains disaggregated, farm-level, data.

21 DG AGRI publishes consolidated data on the Agri-Food Data Portal, which offers information from many DG AGRI data assets and from Eurostat agricultural statistics, interactive visualisations, and dashboards. Users can consult time series, interactive maps, charts and tables, as well as download raw data for re-use and offline analysis. DG AGRI updates the portal continuously. We consider the portal to be a good practice for publicly available data, as it offers a single point of access to a large set of data about agri-food markets, analysis, CAP indicators, and EU financing.

22 The key IT systems that the Commission and Member States use for the CAP focus on descriptive and diagnostic analytics; very few are predictive or prescriptive (see *Figure 7*).





Source: ECA, based on Gartner and Commission documents.

23 Based on interviews and Member States' replies to our survey, we found several obstacles to the Commission and Member States using big data (see paragraph *04*) and advanced analytics for CAP policy analysis, such as:

- (i) differences in quality standards or requirements between different data sources;
- (ii) confidentiality rules limiting the use of farm-level data;
- (iii) limited data availability and data not being in the same or the right format; and
- (iv) low data literacy and a lack of qualified staff.

24 A lack of common references such as a unique identifier makes it difficult to combine farm-level data from different data sources for CAP analysis. A unique identifier or alternative data combination techniques would make it possible to link data from different data sources that relate to the same farm (see *Box 1*).

Box 1 – An example where data combination techniques would be useful

A unique identifier or other data combination technique could be useful for linking and combining farm-level data gathered in surveys by the FADN and soil samples from the Land Use and Coverage Area frame Survey (LUCAS). This would provide more information on the link between farming practices and the biophysical status of a land parcel, especially for the potential future collection of data, e.g. on cropspecific soil management or crop rotation.

25 Usually, DG AGRI manually assesses the textual information the Member States provide in their annual reports, and does not use big data techniques such as textual analytics or automated extractions. Our analysis shows that further automation is possible (see *Box 2* for an example).

Box 2 – Automation of data extraction for reporting

Member States submit annual implementation reports to the Commission via a fund management system known as the SFC. These reports contain numerical and textual information, mainly in the national languages.

DG AGRI staff manually enter data from around 115 reports into an Excel table to analyse the information. We tested whether it was possible to use an automated tool for some of this work. For this purpose, we developed a robotic solution that logs into the SFC, and then navigates to and automatically extracts relevant data fields. This software performed automated data extraction from the SFC and an automated compilation of an Excel screening tool, which DG AGRI had previously produced manually.

Certain features of existing data and systems limit their use for policy analysis

26 We assessed the use and limitations of three very different data sources that the Commission and Member States use widely (see *Table 1*).

	IACS Administrative farm-level data and spatial data	Copernicus Satellite data	FADN Survey data
Policy planning/design	Member States: some use, e.g. to estimate potential number of applicants for specific measures	Member States and Commission: limited use, except re-using monitoring and evaluation data	Commission: various economic and some environmental analysis and modelling
Control and management	Member States: for checking area- and animal- related aid applications, and for checking and storing information. Data that Member States send to the Commission via CATS/COMBO are mostly based on information in IACS	Member States: 'Checks by Monitoring' to replace on-the-spot checks	Not used
Monitoring for performance reporting	Member States: output and result indicators, e.g. number of hectares under a specific support scheme	Commission: context and impact indicators, e.g. land cover	Commission: context and impact indicators, e.g. farm net value added
Evaluation	Member States and Commission: the indicators from monitoring are used as one data source for evaluation	Commission : when using monitoring data for evaluations	Commission: various economic and some environmental analysis and modelling

Table 1 – Example of current use of data sources in various policy phases

Source: ECA.

Integrated Administration and Control System

27 The Commission has limited access to the Member States' Integrated Administration and Control System (IACS), which is the main building block of the management of CAP payments in the Member States. For the 2014-2020 CAP, IACS consists of a number of digital and interconnected databases, in particular¹¹:

- (i) a system for identifying all agricultural plots in EU countries, known as the land parcel identification system (LPIS);
- (ii) a system allowing farmers to indicate graphically the agricultural areas for which they are applying for aid (the geospatial aid application, or GSAA);
- (iii) a system to record the identity of each beneficiary who submits an aid application or a payment claim;
- (iv) an integrated control system to check aid applications, based on computerised cross-checks and physical on-farm controls.

28 Member States use IACS for receiving aid applications, for administrative checks and other controls (e.g. on-the-spot-checks and checks by monitoring), and for making payments¹². Member States can use different technical solutions for their IACS. A lack of standardisation, different data owners (i.e. not always the same type of authority), and independent IT developments create fragmentation, make it difficult to compare data, and limit how data can be shared or re-used. This reduces the possibilities for using advanced analytics or other big data techniques to assess the impact of EU funds¹³. The Commission has limited access to the 42 different Member State (national or regional) systems, which include detailed data on farms and businesses¹⁴. This makes it difficult, for example, to have detailed information on the distribution of EU funds.

¹¹ Article 68 of Regulation (EU) No 1306/2013.

¹² Articles 67-78 of Regulation (EU) No 1306/2013.

¹³ Digitalisation of European reporting, monitoring and audit, EPRS. September 2021.

¹⁴ NIVA roadmap for IACS transformation, p. 24.

29 Based on our review of various EU-financed research projects¹⁵, we found that the decentralised approach of IACS limits further integration and crosslinking of these data sources with other Commission data sources, mainly because of:

- (i) compatibility problems (different technical solutions) and a lack of interoperability between data systems;
- (ii) confidentiality rules not allowing farm data to be linked from various data sources (e.g. IACS and the FADN); and
- (iii) low granularity of other databases, i.e. data with an insufficient level of detail, and a lack of common identifiers to match IACS data.

30 To improve data sharing and availability, DG AGRI is encouraging the Member States to share their geospatial non-personal IACS data through the common INSPIRE geoportal (see *Figure 8*), with the technical support of the JRC. The portal provides access to the download and view services for environmental geospatial data compiled by the Member States.

Figure 8 – INSPIRE geoportal



¹⁵ Deliverables of NIVA and IoF2020 projects, documents of ATLAS and DEMETER projects; Digitalisation of European reporting, monitoring and audit, EPRS. September 2021.

31 The extent to which data are shared via the INSPIRE geoportal varies by Member State. Examples of the number of metadata records for three selected themes are presented in *Figure 9*. Member States also publish some geospatial data through their independent national (or regional) geoportals.

Figure 9 – Metadata records shared on the INSPIRE geoportal on three themes (by number and share of total records per topic)



Source: ECA, based on INSPIRE geoportal (as of 17.2.2022).

Copernicus satellite data

32 Copernicus satellite data meet the definition of big data (see paragraph *04*). The Commission coordinates the 'Checks by Monitoring' (based on Copernicus data) approach, which is an example of automated monitoring of the CAP in the Member States.

33 Under 'Checks by Monitoring', continuous Copernicus satellite data streams are analysed in order to check whether specific land parcels comply with eligibility criteria. Since 2018, national authorities have been able to use Copernicus data to replace traditional field inspections. According to the Commission, in 2021 'Checks by Monitoring' applied to 13.1 % of the area receiving direct payments. The target for 2024 is 50 %¹⁶. In 2021, 10 Member States applied the process to at least one aid scheme on at least part of their territory, while in 2020, when we issued a special report covering 'Checks by Monitoring'¹⁷ (see *Box 3*), the number was five.

Box 3 – A recommendation from special report 04/2020

In our special report 04/2020 on the use of new imaging technologies¹⁸, we recommended that the Commission should make better use of new technologies for monitoring environmental and climate requirements with a deadline of December 2021. The Commission accepted the recommendation.

More specifically, we recommended using information from new technologies to provide better insights into the policy performance of the post-2020 CAP. By replacing the optional 'Checks by Monitoring' with a mandatory Area Monitoring System, the Commission encourages greater use of Copernicus satellite data for area-related interventions in the post-2020 CAP. The new system provides for automated processing of data from the Copernicus satellites and on-site photos.

Farm Accountancy Data Network

34 The main source of economic data is the FADN. The Commission and the Member States use the FADN widely for modelling, evaluations, and reporting.

¹⁶ DG AGRI annual activity report, Annex 2, p. 25.

¹⁷ Special report 04/2020 – Using new imaging technologies to monitor the Common Agricultural Policy: steady progress overall, but slower for climate and environment monitoring.

¹⁸ Ibid., recommendation 2.

35 Since 1965, the FADN has aimed to provide "objective and relevant information on incomes [...] and on the business operation of holdings" for the CAP¹⁹. The FADN is the source of harmonised microeconomic data available to measure the impact of the CAP. It is based on national surveys, is voluntary for agricultural holdings, and covers EU agricultural holdings which are large enough to be considered commercial²⁰.

36 The exclusion of non-commercial and small farms makes the FADN less representative of CAP beneficiaries. In 2015, the survey included around 83 000 holdings. While this is representative of around 90 % of the total utilised agricultural area and of total agricultural production²¹, it represents 4.7 million out of a total of 10.8 million holdings in the EU²². The FADN is not designed to be representative of CAP beneficiaries. According to the Commission, in 2019 the share of unrepresented beneficiaries of CAP direct payments varied from 5 % in the Netherlands to 78 % in Slovakia.

A lack of adequate data limits evaluation of CAP performance

37 Evaluations should use the best available evidence, drawn from a diverse and appropriate range of methods and sources (triangulation)²³. Granular data make it easier to link policy objectives and results/impact²⁴. According to the legislation, the information used to evaluate CAP performance should be based, as far as possible, on established data sources such as the FADN and Eurostat²⁵. Good monitoring should generate factual time series data to improve the quality of future evaluation and impact assessment²⁶.

- ²² Commission, EU Farm Economics Overview based on 2015 (and 2016) FADN data, 2018, p. 5.
- ²³ Better Regulation Guidelines, pp. 6 and 26.
- ²⁴ Better Regulation Toolbox, p. 572.
- ²⁵ Article 110 of Regulation (EU) No 1306/2013.
- ²⁶ Better Regulation Guidelines, p. 45.

¹⁹ Council Regulation 79/65/EEC.

²⁰ Farm accountancy data network.

²¹ Evaluation Helpdesk, "Best Use of FADN for the Assessment of RDP Effects on Fostering the Competitiveness in Agriculture", 2021, p. 9.

38 We reviewed five Commission evaluations or evaluation support studies, covering at least one evaluation for each of the three general CAP objectives in *Figure 1*. We found that the evaluations made use of a variety of data collected for managing or monitoring the policy, e.g. the CAP indicators²⁷, the FADN, CATS/COMBO, Eurostat statistics, and the Information System for Agricultural Market Management (ISAMM). These data are often complemented by external data (e.g. from the Organisation for Economic Co-operation and Development, the United Nations, and the Food and Agriculture Organisation), case studies, questionnaires, and interviews.

39 For all three CAP objectives, the Commission and evaluators use counterfactual impact evaluation²⁸. This requires data on control groups, i.e. entities that do not apply the policy. The FADN provides data on both groups, and can be useful for such analysis. A lack of counterfactual data limits estimates of the CAP's contribution to climate mitigation, for example. According to the Commission, the CAP has been applied for too long and covers too large an area to allow for comparative data²⁹, i.e. there is no scope for comparing the situation before and after, or with and without the policy. It is also difficult to use counterfactual methods for territorial development, as most regions receive CAP support. To address this issue, the JRC developed a quantitative analytical framework based on counterfactual impact evaluation methods to provide insight into the causal link between the policy and its results, taking into account the diverse range of measures deployed in rural areas³⁰.

²⁷ For rural development, Annex IV of <u>Implementing Regulation (EU) No 808/2014</u>.

²⁸ Better Regulation Toolbox, Chapter VIII – Tool 68.

²⁹ SWD(2021) 115, p. 20.

³⁰ Dumangane, M. et al., An Evaluation of the CAP impact: a discrete policy mix analysis, 2021.

Viable food production

40 The main data sources for evaluating the viable food production objective are the FADN and the Economic Accounts for Agriculture (EAA) (see *Table 2*). The Commission established both specifically to provide data for CAP assessment. For example, to evaluate how CAP support impacts farmers' incomes, the Commission uses Eurostat's statistics on factor income (i.e. income derived from land, capital and labour), and the FADN³¹.

Ke	y sources of evidence used	E	evaluators or the Commission
0	FADN Eurostat: EAA and	0	The FADN database does not represent non- commercial and very small farms.
labour input statistics		0	FADN and CATS/COMBO data become available gradually within a period of two years since the base or claim year.
0	Payment data from CATS/COMBOAGRIVIEW	0	Data organised by product at EU level on quantities marketed by producer organisations for fruit and vegetables are not available.
		0	The aggregation of data makes it impossible to identify farmers producing peaches and nectarines, for example, from among farmers specialising in fruit.

Table 2 – Data for the 'viable food production' objective

Source: ECA, based on evaluation and the evaluation support study on 'viable food production'.

41 It takes a year for Member States to collect and validate the FADN data, and a year for the Commission to verify and validate the FADN data from Member States. As a result, it takes at least two years before the data are available in the FADN database. When the Commission presented the legislative proposal for the post-2020 CAP in 2018, only data from one year of the current CAP (those from the 2015 FADN survey) were available. This means that the Commission made its proposal before it had the latest FADN data about the performance and impacts of the current policy.

³¹ Evaluation support study on 'viable food production', pp. 30-32.

Sustainable management of natural resources and climate action

42 For the CAP objective on natural resources and climate, a long period can elapse between applying a policy measure and witnessing its impact. In order to determine a causal link between a CAP measure and its results, various data have to be combined and external factors considered. Of the four components of the objective (see *Figure 1*), we examined biodiversity. Neither the Member States nor the Commission were able to provide good evidence of a causal link between standards of good agricultural and environmental conditions³² and biodiversity status³³. Examples of evidence used and the limitations on assessing the biodiversity component are presented in *Table 3*.

Table 3 – Data on the biodiversity component of the 'sustainablemanagement of natural resources' objective

	Key sources of evidence used	Examples of data gaps and limitations identified by the evaluators or the Commission
ο	CAP context, output, result and impact indicators	 Data on the uptake of landscape features under the agri-
ο	Streamlining European Biodiversity Indicators (SEBI)	environment-climate measures are not available.
ο	Indicators of Sustainable Forest Management reported by Member States to Forest Europe	 Monitoring data on the actual impacts of individual CAP measures are insufficient.
ο	The Commission's agri- environmental indicators	 No recent data for many of the statistical indicators.
0	FADN data at farm level on production, profitability, location (inside or outside a Natura 2000 area) and uptake of CAP measures	 Data on the quantities of fertilisers and pesticides used on agricultural land in the EU are not available.

Source: ECA, based on Evaluation support study of the impact of the CAP on habitats, landscapes, biodiversity.

³² Annex II of Regulation (EU) No 1306/2013.

³³ Special report 13/2020 – Biodiversity on farmland: CAP contribution has not halted the decline, paragraphs 48-50.

43 A 2019 evaluation concluded that an overall assessment of the policy impact on biodiversity was not possible due to the absence of suitable monitoring data³⁴. Several of the Commission's monitoring indicators are not regularly fed with data. For example, not all Member States collect and report data on the impact indicator for water abstraction in agriculture.

44 Another limitation on evaluating the environmental objective is that no comprehensive data were available on the quantities of fertilisers and pesticides used in the EU on agricultural land. Since 2021, data on the quantities of pesticides used on agricultural land have been available, but for less than half of the Member States. The Commission and evaluators have used FADN data on spending on fertilisers and plant protection products per hectare as a proxy.

45 Publicly available EU statistics on plant protection products relate to the amounts (kg) of active substances contained in plant protection products sold³⁵. In special report 5/2020³⁶, we reported that grouping these active substances in the way required by EU legislation limits the information Eurostat can publish or even share with other Commission Directorates-General. Statistics compiled on the agricultural use of plant protection products under current EU legislation are not comparable, and Eurostat has not yet been able to publish EU-wide usage statistics.

³⁴ Evaluation of the impact of the CAP on habitats, landscapes, biodiversity, Executive summary, 2019.

³⁵ Special report 05/2020 – Sustainable use of plant protection products: limited progress in measuring and reducing risks.

³⁶ Ibid.

Balanced territorial development

46 In a 2021 evaluation³⁷, the Commission and evaluators used CAP output indicators, payment data from CATS/COMBO, DG REGIO's ARDECO database, and Eurostat's regional database for the CAP's third objective. The limited availability of complete, detailed and updated data on the socio-economic status of rural areas affected the robustness of the evaluation³⁸. The contractors claimed that data were scarce for some of the core societal aspects, and, if available, were often not regularly updated, but produced on an ad hoc basis from specific research projects³⁹. In some cases, the evaluators had applied proxy indicators. Overall, they cited the availability and quality of indicators and a lack of data on small regions as the main limitations on quantitative analyses.

47 With the exception of the payment data in CATS/COMBO and the individual farms data in FADN, most of the data that the Commission collects from Member States are aggregated, yielding a single figure for an entire Member State or region. This limits the potential for the data to be re-used for further evaluation or policy design purposes. For some socio-economic aspects (e.g. social inclusion), data were only available at national level or at a low geographic resolution, which is not sufficient for analyses of territorial differentiation⁴⁰. CAP monitoring data also lack details for more targeted analyses, e.g. information about the age or gender of beneficiaries⁴¹. These data are usually available in Member States' databases, but are not accessible to the Commission.

- ⁴⁰ Evaluation support study on the impact of the CAP on territorial development of rural areas, 2020.
- ⁴¹ SWD(2021) 394 and Evaluation support study on the impact of the CAP on territorial development of rural areas: socioeconomic aspects; special report 10/2021 – Gender mainstreaming in the EU budget: time to turn words into action, paragraph 90.

³⁷ Evaluation on impact of the CAP on territorial development of rural areas.

³⁸ SWD(2021) 394.

³⁹ Evaluation support study on the impact of the CAP on territorial development of rural areas, **2020**.

The Commission does not have enough evidence for its CAP policy needs assessment

48 Under the Better Regulation Guidelines, the impact assessment accompanying a legislative proposal should start by verifying the existence of a problem⁴². It must set out the logical reasoning that links the problem with its underlying causes and the related objectives, as well as offer a range of policy options for tackling the problem.

49 To examine data use at the policy design or planning stages, we reviewed the impact assessment accompanying the post-2020 CAP legislative proposal⁴³ and various Commission documents supporting it. We identified weaknesses in the way relevant data were provided to support the description of the problem the policy addresses under the specific objective of 'viable farm income'. We stated in our opinion on the post-2020 CAP legislative proposals that the data and arguments the Commission used to support the needs assessment for farmers' incomes are insufficient⁴⁴. The Commission does not have information on farmers' or farming households' incomes outside farming, and the averages mask a great variation in the income situation. In addition, in our 2021 report on gender mainstreaming, we highlighted that the unavailability of statistics on farmers' household incomes and on disposable farm income broken down by sex is also a major data gap when looking at the effects of direct payments on gender equality⁴⁵.

⁴² Better Regulation Guidelines, p. 10.

⁴³ SWD(2018) 301.

⁴⁴ Opinion 07/2018, paragraph 2.

⁴⁵ Special report 10/2021 – Gender mainstreaming in the EU budget: time to turn words into action, paragraphs 89 and 90.

50 In 2018, we recommended that "before making any proposal for the future design of the CAP, the Commission should assess the income position for all groups of farmers and analyse their income support need", taking into account aspects such as income from food and other agricultural production, as well as from non-agricultural sources⁴⁶. The Commission partially accepted the recommendation, adding that the policy is targeted at those farmers who are actively farming to earn their living. A 2015 study⁴⁷ on farm household incomes showed a major gap in information on CAP performance, as there was no EU statistical or monitoring system for assessing farmers' total household incomes and comparing them with other groups in society. As of February 2022, the Commission has not made any progress in this area.

51 Every three to four years, Eurostat receives from Member States 'Farm Structure Survey' data on other gainful activities on farms. The survey data indicate whether the other gainful activities are a main or a secondary activity of the holder-manager, but not the share or range of income from it. The latest data published on the Eurostat website are for 2016⁴⁸.

52 The current standard list of FADN variables does not include information on offfarm income, as the survey is about farms and not about farmers. Income tax data in the national tax authorities' registries alone are insufficient to provide those data, because they do not contain information on farm characteristics and contain agricultural incomes of also those persons whose main activity is not farming⁴⁹.

⁴⁶ Special report 10/2018 – Basic Payment Scheme for farmers – operationally on track, but limited impact on simplification, targeting and the convergence of aid levels, recommendation 3.

 ⁴⁷ Hill, B. & Dylan Bradley, B. (2015), "Comparison of farmers' incomes in the EU Member States". Study prepared for the European Parliament.

⁴⁸ Dataset on other gainful activities (ef_oga_main).

⁴⁹ Hansen, H. and Forstner, B. (2021), "A differentiated look at the economic situation of German farmers", presentation at 27th meeting of the OECD Network for Farm Level Analysis.

53 Some Member States (e.g. Ireland and the Netherlands) collect data on off-farm income using national FADN surveys, which could fill one of the data gaps relating to farmers' real incomes. The Irish authorities regularly publish data indirectly on off-farm income, including 'the presence of off-farm employment', 'the days and hours worked off-farm' and 'the sector worked in'.

The Commission has various initiatives to make better use of existing data, but barriers remain

54 The Commission should take further initiatives to address existing weaknesses and improve data collection and processing in order to evaluate the CAP and to support the development of future policy. These initiatives should be put into practice in line with the defined timetable and outputs. The Commission needs to adapt and strengthen existing data sources for the new CAP. It should also explore and mobilise new data sources to reduce the burden on farmers and administrations, while at the same time improving the policy evidence base⁵⁰.

55 In its internal data strategy action plan, the Commission has set itself objectives to guarantee access to data that are relevant for decision-making and functioning across the organisation, and to foster the use of modern data analytics technologies to identify patterns and trends more quickly and more effectively.

56 We examined which initiatives the Commission has taken to make better use of available data and new technologies in order to address the data gaps and challenges identified above. In addition, we looked at EU-financed research projects and Member States' initiatives that could contribute to CAP policy analysis and fill some of the gaps.

⁵⁰ SWD(2018) 301, p. 51.

The Commission is expanding data sources and encouraging data sharing in order to tackle data gaps and meet data needs for the CAP

57 The Commission's internal data strategy states that "internal and external data sources need to be exploited as much as possible to generate evidence supporting decisions". The costs and administrative burden of additional data collection for policy monitoring have to be commensurate with data needs. According to the Better Regulation Toolbox⁵¹, not all data gaps have to be filled.

58 The Commission started to put its data strategy into practice in 2018. Activities range from creating a data inventory (see paragraphs **17-18**) to data governance rules, data analytics, and training and skills. At the end of 2020, DG AGRI set up a board and a working group to implement the strategy. Since January 2022, it has had a specific 'Data Governance' unit to improve coordination of data management.

59 The Commission has initiated several actions that could contribute to better policy analysis by improving data infrastructure and data use for the CAP (e.g. digital solutions, e-tools, algorithms, and good practices). See *Annex* for examples.

60 A 2016 Eurostat evaluation of agricultural statistics⁵² concluded that agricultural, forestry, land use and environmental statistics are not sufficiently harmonised and coherent. The reasons for this include the fact that legislation has been developed in silos, but also that different definitions and concepts exist in various agricultural areas. To address this issue, the Commission introduced two new regulations and amended one existing regulation (see *Figure 10*).

⁵¹ Better Regulation Toolbox, p. 363.

⁵² SWD(2017) 96, Evaluation accompanying the document "Strategy for Agricultural Statistics 2020 and beyond and subsequent potential legislative scenarios".

Figure 10 – Legal framework of the European agricultural statistics system

Integrated farm statistics (IFS) regulation	Framework regulation on statistics on agricultural input and output (SAIO)	Regulation on economic accounts for agriculture (EAA)
 Covers data on farm structure, orchards and vineyards Involves farm micro-data transmission to Eurostat Adopted as Regulation (EU) No 2018/1091 	 Covers data on agricultural inputs (e.g. plant protection products, nutrients, price of fertilisers) and outputs (crop and animal production, and agricultural prices) Data are collected from farms, administrative sources, intermediaries (e.g. dairies), wholesale entities and market organisations, and often take account of expert estimates Only aggregated data Commission proposal COM(2021) 37 Target: to be in place by 2022 Current status: not yet adopted 	 Includes data on the value of output, intermediate consumption, subsidies and taxes, rent and interest, capital formation, etc. Aggregated data at national (compulsory under Regulation) and NUTS2 level (voluntary transmission) Existing regulation was amended to include regional economic accounts at NUTS2 level Adopted as Regulation (EU) 2022/590

Source: ECA, based on Regulation (EU) 2018/1091, COM(2021) 37, Regulation (EU) 2022/590.

61 In 2019, Eurostat issued a call for proposals to set up a network of national statistical institutes interested in developing methods to modernise agricultural statistics. One of the two priorities concerned activities that "exploit the use of new data sources for agricultural statistics (e.g. big data, satellite imagery, geo-referenced information, precision farming), including access, confidentiality and quality assessment aspects". The call did not receive any applications. According to the Commission, Member States said one reason for this was that national statistical offices had insufficient resources to set up and co-ordinate such a network.

62 Other initiatives to tackle data gaps fall into two broad categories: data sharing from Member States or stakeholders, and adding new variables to existing data sources.

63 Under the 'DG AGRI process for IACS data sharing under INSPIRE' project, DG AGRI, in collaboration with the JRC, the Directorate-General for Environment and the Directorate-General for Climate Action, is building a framework and support procedures for sharing non-personal IACS spatial data across the EU. The objective is to ensure that spatial IACS data are easily locatable, efficiently accessible (via a single entry point), and effectively re-usable in a coherent policy environment (see *Figure 11*).

Figure 11 – Three interlinked goals addressed in the IACS data exploration procedure



Source: ECA, based on Joint Technical Report: IACS data exploration and integration, EC, 2021, p. 7.

64 In the European Strategy for Data⁵³, the Commission acknowledges the importance of data sharing for improving the availability of data. In the strategy, the Commission announced its plan to establish nine EU-wide sectoral common data spaces, including a "Common European Green Deal data space" and a "Common European agricultural data space". The latter aims to make it easier to share, process and analyse production data, open data, and possibly other public data (e.g. soil data)⁵⁴.

65 The strategy lists two specific preparatory activities for the agricultural data space: to take stock of experiences with the 'stakeholder code of conduct on agricultural data sharing'⁵⁵, and to take stock of existing agricultural data spaces in 2020 and early 2021. The Commission currently plans to carry out these activities as part of the Digital Europe Work Programme for 2021-2022, which it approved in November 2021. According to the Commission, the data space will be included in the 2023-2024 work programme, with a possible prototype in 2024 and a further roll-out of the data space in the following years.

66 Under the Farm to Fork strategy⁵⁶, the Commission intends to convert the FADN into a Farm Sustainability Data Network (FSDN), with a view to collecting farm-level data on the Farm to Fork and Biodiversity Strategy targets, and other sustainability indicators. The Commission published a roadmap in June 2021, and plans to present a proposal for a regulation in the second quarter of 2022⁵⁷.

⁵³ COM(2020) 66.

⁵⁴ C(2021) 7914, Annex to the Commission Implementing Decision on the financing of the Digital Europe Programme and the adoption of the multiannual work programme for 2021-2022, p. 54.

⁵⁵ EU Code of conduct on agricultural data sharing by contractual agreement.

⁵⁶ COM(2020) 381.

⁵⁷ Roadmap: Conversion of the FADN to a Farm Sustainability Data Network (FSDN).

Specific actions in the context of CAP 2023-2027 focus on improving monitoring data

67 Except for the change from the FADN to the FSDN, the Commission plans no significant changes in the core IT systems presented in *Figure 6*. However, it is working to increase the functionality of ARACHNE, which is a data-mining tool that Member States use on a voluntary basis in their administrative controls. The tool is useful, for example, for identifying projects or beneficiaries that might be susceptible to risks of fraud or conflicts of interest, although non-compulsory use might limit its benefits. The effectiveness of the tool's data analytics depends on data input. This means that the more quality data are uploaded, the more accurate, comprehensive and informative the system's outputs are.

68 DG AGRI uses new technologies and satellite data to improve monitoring indicators. For example, it introduced a new impact indicator for monitoring landscape features for the 2023-2027 period. The 2014-2020 CAP did not include an impact indicator on landscapes; this weakened assessment of the impact of the CAP on habitats, landscapes and biodiversity (see *Table 3*). For the new indicator (the share of agricultural land covered with landscape features), the Commission will use data from the Copernicus Land Monitoring Service, which contains information on linear hedgerows and scrubs, tree rows, and isolated patches of trees.

69 For the 2023-2027 CAP, the Commission will define a new framework, including an implementing act, to receive data on individual transactions for monitoring, evaluation, and policy-design. According to the Commission, by collecting the individual data on the application/claim, and information on the beneficiary and its farm/business, it will try to solve the issue of data disaggregation.

Research initiatives explore the scope for modernising data and tools

70 Under Horizon 2020 (H2020), the Commission finances research and innovation projects. We identified a number of recent or ongoing H2020 and other research projects that could contribute to improving the data infrastructure and data use (e.g. digital solutions, e-tools, and algorithms) that are needed to provide better data for the CAP (see *Figure 12*). Some projects (such as NIVA and Sen4CAP) have already produced relevant results, which could be useful for future developments.



Figure 12 – Examples of research projects with a policy analysis element

Source: ECA, based on data in the European Commission's CORDIS database.

71 The NIVA (New IACS Vision in Action) project tackles some of IACS's limitations (see paragraphs *28-29*), especially by reducing the administrative burden and using the potential of data. The project's objective is to modernise IACS by making efficient use of digital solutions and e-tools, thereby creating reliable methodologies and harmonised data sets for monitoring agricultural performance.

72 Another EU-financed project, FLINT (Farm-Level Indicators for New Topics in policy evaluation), addressed the gap between data needs for policy evaluation and available agricultural statistics⁵⁸. This project is potentially relevant for the planned revision of the FADN, because the project covered sustainability indicators and used the FADN as a framework. The project proposed 33 topics or indicators relating to environmental, social, economic and innovation aspects to be collected in the future⁵⁹. In its roadmap⁶⁰, the Commission stated that the conversion to the FSDN will build on the FLINT project. However, in February 2022, it was too early to assess this claim.

Member States have their own data initiatives for the CAP

73 Our survey of all 27 Member States found that a majority of them recognise the added value of advanced analytics, with most selecting faster decision-making, predictive and cross domain analysis, cost reduction, and more effective communication with farmers and stakeholders, from a provided list of possible elements.

74 In their replies to our survey, more than half of the Member States suggested the following measures as priorities to support their use of big data: more Commission funding for IT tools and data analytics projects (67 %), additional guidelines/manuals (56 %), and support for the development of new methodologies or standardisation (52 %). Fewer Member States chose support for analytical technologies (48 %), data access solutions (41 %), and research support and common research projects (48 %).

75 Our survey and follow-up interviews showed differences between Member States on how they incorporate new data sources and advanced data analytics techniques. *Box 4* and *Box 5* include examples of Member State actions.

⁵⁸ Poppe, K., Vrolijk, H., Dolman, M., and Silvis, H., 2016, FLINT – Farm-level Indicators for New Topics in policy evaluation: an introduction. *Studies in Agricultural Economics*, 118, pp. 116-122.

⁵⁹ Final report summary of FLINT project.

⁶⁰ Roadmap: Conversion of the FADN to a Farm Sustainability Data Network (FSDN).

Box 4 – Examples of combining data sources with modern analytics

Spain

- One Spanish region (Castile and Leon) has been an advanced user of the 'Checks by Monitoring' approach since 2019. Its monitoring methodology is based on processing and analysis by artificial intelligence of the images provided by the Copernicus Sentinel satellites. Using specific indexes and markers, and subsequently applying a series of rules, allows the authorities to reach a conclusion about the eligibility of declared areas.
- The Spanish authorities apply automatic photo-interpretation using 'Deep Learning' classification techniques, for example a Random Forest algorithm for crop classification. They also use it to assess the indicative risk of land abandonment.
- Advanced analytical tools for forecasting harvests by means of machine learning allow the authorities to assess the presence of agricultural activity and to predict market behaviour.

Source: ECA and the Spanish authorities.

Box 5 – An attempt to link various databases

The **Estonian** authorities initiated an agricultural big data programme, aiming "to create more value-added in the agricultural sector by providing data-driven tools for farmers". The intention is to establish an electronic system (tool) for agricultural big data, which should link existing data to relevant analytical models and practical applications.

For policy analysis, the big data system could facilitate data collection on farmlevel agronomic performance.

A feasibility study concluded that:

- no extensive changes are needed in the legal system, but the regulations on agricultural data processing should be modified, and a common framework established;
- it is relevant and possible to include 83 % of the 41 databases analysed in the Big Data System, but only 10 % of the databases could be included without further development;

- potential services to the Ministry of Rural Affairs could include:
 - o monitoring trends in the economic performance of agricultural holdings;
 - providing an overview of the use of fertilisers and plant protection products (a digital fieldbook is a prerequisite).

As of February 2022, the system had not yet started to be developed. The plan is to develop an electronic system, including an electronic field book and possibly some other e-tools, e.g. a humus balance calculator, and plant protection recommendations.

Source: ECA, Long-Term Knowledge Transfer Program on Agricultural Big Data, and the Estonia authorities.

Some notable data gaps and challenges are yet to be addressed

76 The Commission acknowledges that cross-linking existing data sources is a key challenge in ensuring there are appropriate data to evaluate the CAP⁶¹. It is working on re-using IACS data and expanding the FADN, but has not initiated specific actions to fill the data gap regarding farmers' incomes outside farming ('off-farm income'), or to combine various data sources of disaggregated data to increase the value of data that have already been collected.

77 The Commission has expressed the need for a common unique identifier for agricultural holdings (farms) that would make it possible to link farm-level data from various data sources (e.g. administrative registers, and surveys)⁶². The identifier would have to take account of different Member State systems and complex farm structures with different combinations and locations. This requires a common definition of a farm, and such a definition has an impact on financial indicators like farm income⁶³. A unique identifier could help to increase data accessibility and provide more reliable information on policy impact. As of February 2022, there has been no progress on such an identifier.

⁶¹ SWD(2018) 301, Part I, p. 51.

⁶² See, for example, Strategy for agricultural statistics for 2020 and beyond, pp. 8, 12 and 16-17.

⁶³ Poppe, K. J. and Vrolijk, H.C.J. (2019), How to measure farm income in the era of complex farms, Paper prepared for presentation at the 171st EAAE Seminar.

78 Farm-level data from management applications and systems are a new and rich source of information. There are many commercial solutions offering a variety of services for digital record keeping, field monitoring and labour tracking, and many aspects of farm operations can be enhanced by such applications (see example in *Box 6*). The Commission does not know how many farmers use farm management software, but the Integrated Farm Statistics campaign⁶⁴ planned for 2023 could help to provide knowledge of the use of management information systems and precision farming equipment.

Box 6 – An example of collecting data at farm level

Akkerweb in **the Netherlands** is a good example of an application for collecting data from farms. The structure of the platform supports several applications, and uses data from individual farms and production. Farmers can choose which applications to use, and have the opportunity to link to other systems.

Currently, Akkerweb helps farmers to take decisions based on public information and their own farm data. In the future, the Dutch authorities plan to improve data sharing between public administration data sources and private data platforms.

Source: ECA and the Dutch authorities.

79 Using a digital field book, where farmers register their activities, would be a step forward for digitising farms and improving the monitoring of consumption and impact as regards pesticides, fertilisers, water and soil. The Commission's proposed FaST (Farm Sustainability Tool for Nutrients) platform is a tool with flexible architecture that provides modern analytics and interoperability with many data sources. FaST builds on several data sources, which are either connected (live sources) or imported (static sources) on the platform. In order to provide farmers with access to their own data, FaST connects to the regional/national IACS (or equivalent farm registry), where the farmers' data are stored.

⁶⁴ Commission Implementing Regulation (EU) 2021/2286.

80 Precision farming data can be a valuable data source⁶⁵. Examples of such data include sensor and machinery data on soil humidity and nutrients, and location-specific data on the use of pesticides. The above-mentioned NIVA project explores the possibilities for an electronic farm registry that can be linked to IACS. It also aims to integrate machine/precision farming data into IACS. However, there are obstacles to doing so, such as the diverse nature of farm machines and a lack of standardisation.

81 Accessing individual data for policy analysis can be difficult, and there is no legal or technical framework for using commercial information for policy analysis. According to one study⁶⁶, farmers are reluctant to share data for reasons such as the risk of data being shared for other purposes, a lack of clarity about what 'personal data' means, and general 'resistance to modern data platform technologies'. Under the 2023-2027 CAP, farm advisory services for farmers are required to cover digital technologies⁶⁷.

82 *Figure 13* below summarises the main data-related challenges the Commission is facing, and our assessment of the extent to which these have been addressed.

⁶⁵ Punt, T. and Snijkers, G., Exploring precision farming data: a valuable new data source? A first orientation, 2020. Paper presented at the 2019 UNECE Workshop on Statistical Data Collection 'New sources and New technologies'.

⁶⁶ Internet of Food and Farm 2020: Policy Recommendations from IoF2020.

⁶⁷ Article 15 of Regulation (EU) 2021/2115.

Figure 13 – Assessment of the extent to which the initiatives address the challenges

Assessment:

Challenges:	Assessment:
Data not collected: Insufficient data to support evaluations and impact assessment (<i>Table 2</i> and <i>Table 3</i> , paragraph 49)	Positive moves on setting a framework for more open, available and adequate data (paragraphs <i>60, 64, 66</i>). More is left to be done in areas such as farmers' incomes, territorial development and environmental indicators. Assessment: Significant progress required
Data not accessible: The Commission has limited access to Member States' IACS (paragraph 28)	Under the INSPIRE initiative, the Member States share some non-personal spatial data. This is expected to increase data sharing (paragraphs 30 , 63) Assessment: It is too early to assess whether the actions will address the challenge
Excessive aggregation: The Commission does not have enough disaggregated monitoring data (paragraph 47)	The Commission plans to specify in an implementing act the beneficiary- level data that Member States have to report for the CAP (paragraph 69) Additionally, H2020 projects are exploring the needs for farm-level data (Figure 12). Assessment: It is too early to assess whether the actions will address the challenge
Restrictions on combining data: Data from different datasets cannot be easily combined (paragraphs 23, 24, 29)	The data portal is the main tool for publishing consolidated data on the CAP. It is continuously upgraded with new datasets (paragraph 21). However, there has been no progress on introducing a common identifier or similar technique to link different datasets (paragraph 77). Assessment: Not yet addressed
Exploring big data use: Limited use of big data and big data analytics (paragraphs 22, 25)	With AMS, the Commission will encourage the use of Copernicus Sentine satellite data for area-related interventions (<i>Box 3</i>). Sen4CAP produced open-source algorithms and advanced tools to make easier for Member States to use Copernicus data for CAP monitoring and analysis (<i>Figure 12</i>). Assessment: Significant progress required

Source: ECA.

83 In our desk review of comparable practices outside the EU, we looked at three non-EU countries: Australia, Japan and the US. These countries present information in the public domain on integrating modern data techniques into agriculture; Box 7 presents some of their initiatives.

Box 7 – Examples of practices outside the EU

Australia

The FLAD-BLADE database⁶⁸ predicts agricultural production at farm level, based on prevailing climate conditions (e.g. rainfall and temperature), commodity prices and farm characteristics (e.g. location and size). The database can generate farmlevel information on production and financial outcomes for essentially every farm in Australia⁶⁹.

In addition, Australia's Commonwealth Scientific and Industrial Research Organisation has explored the use of confidential computing to improve access to farm-level data for policy or research, while maintaining data confidentiality and security. Confidential Computing enables a new, low-friction method for exploratory linkage and analysis of data sources. This approach may allow the discovery of new connections between data sources, while maintaining data confidentiality⁷⁰.

Japan

The Japanese authorities have set up an Agricultural Data Collaboration Platform (WAGRI)⁷¹. The platform co-ordinates, shares and supplies agriculture-related data. It includes public data, such as the position and size of agricultural land, and meteorological information. Future development plans include consolidating data held by farmers, agricultural machinery manufacturers, ICT vendors and others, and using big data to optimise agricultural production management.

US

Crop-CASMA (Crop Condition and Soil Moisture Analytics) is a web-based geospatial application where remotely-sensed geospatial index data can be used to assess US crop vegetation conditions and soil moisture condition⁷².

⁷² Crop-CASMA User's Guide.

⁶⁸ Agricultural Data Integration Project.

⁶⁹ Hughes, N. et al. (2020), The Agricultural Data Integration Project, ABARES research report, Canberra.

⁷⁰ Digital Opportunities for Better Agricultural Policies, 2019, OECD.

⁷¹ WAGRI webpage.

Conclusions and recommendations

84 We examined whether the Commission makes good use of data and data analytics for analysis of the Common Agricultural Policy (CAP). The CAP has many complex, inter-related objectives. Determining whether policy instruments are relevant, and whether they efficiently address those objectives, requires data and information from a range of sources, both internal and external.

85 We found that although the Commission is using a significant amount of data on economic, environmental, climate and social aspects, in some areas current data and tools do not deliver certain significant elements of the information that are needed for well-informed policy-making (paragraphs *16-53*). The Commission has taken several initiatives to make better use of existing data (paragraphs *57-69*), but in addition to delays in the availability of data (paragraph *41*), barriers remain (paragraphs *76-81*).

86 The main data barriers, by stages of data gathering and processing, are:

- data not being collected: for example on farming inputs (e.g. the quantity of chemical and non-chemical pesticide applied, the quantity of mineral/organic fertiliser applied and to which crop), and farming practices with an environmental impact (see *Table 3*, paragraphs 42-45);
- data not being accessible: farm-level information is owned, managed and stored in Member States' local Integrated Administration and Control System (IACS) to which the Commission has limited access (see paragraphs 27-29);
- excessive aggregation: the Commission receives mostly aggregated data from the Member States, thus limiting the extent to which it can extract value from them (see *Table 2*, paragraph 47);
- restrictions on combining data sources, e.g. due to the lack of a common identifier (see paragraph 24).

87 As a result, the Commission has partial knowledge of the baseline or policy impact in areas such as farmers' off-farm incomes, environmental information/practices, and socio-economic development. These gaps in data availability affect evidence quality in some evaluations (see paragraphs *39-47*) and impact assessments (see paragraphs *48-53*).

Recommendation 1 – Establish a framework for using disaggregated data from IACS

The Commission should establish a technical and administrative framework for sharing and re-using disaggregated data from IACS (beyond those needed for annual performance reports) in order to monitor, evaluate and ultimately design policy. This should respect principles of efficiency, and so minimise the administrative burden and costs on beneficiaries and Member State authorities.

Timeframe: 2024

Recommendation 2 – Make more use of and develop data sources to meet policy needs

The Commission should address the data gaps identified in evaluations of the 2014-2020 CAP and the impact assessment of the post-2020 CAP by:

- (a) making more use of existing data sources (e.g. administrative data and statistical surveys, and Copernicus data), considering new data sources, or combining existing ones;
- (b) examining the possibility of using proxies or indirect data sources when the use of direct sources is not feasible for assessing key indicators or aspects; and
- (c) assessing the possibility of scaling up the use of farm-machinery data.

Timeframe: 2025

88 At the Commission, the Directorate-General for Agriculture and Rural Development has an agreement with the Joint Research Centre for data analysis and for exploring how to make better use of existing data. Based on this agreement, the Commission uses advanced quantitative analysis and models for CAP policy analysis. However, the Directorate-General for Agriculture and Rural Development does not use big data techniques for textual analytics, text mining or automated extraction itself. There are potential benefits in replacing manual and time-consuming procedures with automated tools (see paragraphs *19, 25* and *Box 2*).

89 Across the EU, there are several initiatives, sometimes funded by the EU under Horizon 2020 or other programmes, that explore the possibilities for modernising data and IT tools for designing, monitoring and evaluating the CAP. Some of these initiatives have already produced deliverables in the field of interoperability and new and more comprehensive indicators. The projects are at various stages, and may address similar issues from different angles (paragraphs *70-75*). The Commission has not yet identified the elements that could be put into practice for the CAP.

90 There is therefore a significant scope for the Commission to incorporate costeffective advanced analytics and related tools into existing IT systems and/or other IT solutions for automated information processing (e.g. replacing manual or nonreproducible procedures) and make better use of data assets (e.g. increasing data processing outcomes) for policy analysis.

This report was adopted by Chamber I, headed by Ms Joëlle Elvinger, Member of the Court of Auditors, in Luxembourg on 18 May 2022.

For the Court of Auditors

Klaus-Heiner Lehne President

Annex – Selected Commission data-related actions and ambitions

 \checkmark - completed ? - too early to assess or delay is less than a year 0 - delay more than a year

Topic/ challenge	Source document	Ambition/action	Objective/purpose	Deadline	State of implementation	Next steps, including timing
Modernisation of European agricultural statistics	Strategy for agricultural statistics for 2020 and beyond	New framework regulation for Integrated Farm Statistics enters into force in 2018 at the latest.	To ensure that the series of European farm structure surveys continues, thus ensuring consistent time series, while fulfilling new and emerging needs for data at farm level.	2018	Regulation (EU) 2018/1091 entered in force in August 2018.	Agricultural census was carried out in 2020 and the next data collection is in 2023.
		Framework regulation on Statistics on Agricultural Input/Output (SAIO) in place by 2022.	To harmonise and better integrate statistics on inputs into agriculture and outputs from it (e.g. crops and animals, pesticides, nutrients, agricultural prices); to take account of new data needs; to make collected data easier to compare.	2022	The Commission adopted proposal (COM(2021) 37) in February 2021, currently undergoing the legislative process.	The Commission will launch legislative procedures for implementing and delegated acts under the framework regulation.
		Launch legislative procedures for the delegated/implementing acts on the SAIO framework regulation.	Specifying data sets for SAIO.	2021	Adoption of implementing acts possible after the co- legislators adopt the main legal act. Estimated adoption of the main legal act: 2022.	Current timeframe for adoption of implementing regulations is 2022- 2023.

Topic/ challenge	Source document	Ambition/action	Objective/purpose	Deadline	State of implementation	Next steps, including timing
		Amending Regulation 138/2004 on Economic Accounts for Agriculture	Inclusion of regional economic accounts (NUTS 2)	2021	Agreement reached, but not yet adopted	
Technologies for data analytics	Communication: Coordinated Plan on Artificial Intelligence (COM(2018) 795) and 2021 review (COM(2021) 205)	Commission and Member States seek to establish world-leading testing and experimentation sites for Al-powered products and services throughout Europe	To optimise investment and avoid duplication or competing efforts, a limited number of AI specialised large-scale reference sites should be developed and opened to all stakeholders across Europe.	2020	The Agri-food AI Testing and Experimentation Facility for Agri-Food is included in the Digital Europe Programme's Work Programme for 2021-2022. The call was launched in Q1 2022. (Note: there is a general delay in implementing the Digital Europe Programme)	
Data sharing/making data open	Communication: A European strategy for data (COM/2020/66)	The Commission will take stock of experiences gained with the stakeholder code of conduct on agricultural data sharing by contractual agreement, also on the basis of the current market for digital farm solutions and their requirements in terms of data availability and use.	Preparatory action for the agricultural data space.	Q3/Q4 2020	Deadline not met. The body that will do this is yet to be set up. The call for the Coordinated and Support Action (the "preparatory action" was launched at the end of 2021 and will close on February 2022, with the subsequent evaluation of proposals and contracting and launch of the project expected in the course of 2022.	The results of the Coordinated and Support Action will inform the roll-out of the implementation action subsequently funded under the second work programme of the Digital Europe Programme.

Topic/ challenge	Source document	Ambition/action	Objective/purpose	Deadline	State of implementation	Next steps, including timing
					(Note: there is a general delay in implementing the Digital Europe Programme)	
		The Commission will take stock of agricultural data spaces in current use, including those funded under the Horizon 2020 programme, with stakeholders and MS organisations and then take a decision on an EU approach.	Preparatory action for the agricultural data space.	Q4 2020/ Q1 2021	Deadline not met. The body that will start doing this is yet to be established. (Note: there is a general delay in implementing the Digital Europe Programme)	The results of the Coordinated and Support Action will inform the roll-out of the implementation action subsequently funded under the second work programme of the Digital Europe Programme.
		Start a procedure to adopt an implementing act on high-value data sets.	To open up key public-sector reference datasets for innovation, and make them available across the EU for free, in machine- readable format and through standardised Application Programming Interfaces (APIs).	Q1 2021	As of February 2022, the draft act is still being discussed at the Commission	Public consultation in 2022
	Coordinated Plan on Artificial Intelligence 2021 Review	Set up an agricultural data space.	To enhance the sustainability performance and competitiveness of the agricultural sector by processing and analysing production and other data, allowing for precise and tailored application of production approaches at farm level.	2024	? Too early to assess.	

Topic/ challenge	Source document	Ambition/action	Objective/purpose	Deadline	State of implementation	Next steps, including timing
Decreasing fragmentation and possible administrative burden	Communication: A long-term Vision for the EU's Rural Areas - Towards stronger, connected, resilient and prosperous rural areas by 2040 (COM(2021) 345)	Set up a Rural Observatory at the Commission to bring together all data it has collected on rural areas, including official statistics.	To improve data collection and analysis on rural areas further	2022	Too early to assess. The observatory will be created under Knowledge Centre for Territorial Policies.	The first dashboards of the rural data platform are tentatively scheduled for the end of 2022.
	Analysis of links between CAP Reform and Green Deal (SWD(2020) 93)	The Commission will propose legislation to convert the FADN into the Farm Sustainability Data Network.	Also to collect data on 'Farm to Fork' targets and other sustainability indicators, in full compliance with data protection rules.	No specific deadline	No specific deadline. The Commission plans to present a legislative proposal in Q2 of 2022.	
Use adequate data for policy analysis	Impact Assessment accompanying the post-2020 CAP legislative proposals (SWD(2018) 301)	New sources of data such as satellite monitoring (Copernicus), big data solutions, and cooperation with specific data providers should be put to better use.	To reduce the burden on farmers and administrations, while at the same time improving the policy evidence base.	No specific deadline	The Area Monitoring System (AMS) will be introduced into the post- 2020 CAP. The AMS will make use of Copernicus Sentinel data and other data sources of at least equivalent value, such as geotagged photos, ortho-rectified and/or very high spatial resolution imagery.	Not applicable – an ongoing process with no specified end.

Topic/ challenge	Source document	Ambition/action	Objective/purpose	Deadline	State of implementation	Next steps, including timing
Information management in DG AGRI	DG AGRI Data Management Work Programme 2021-2022	Implementation of corporate data governance principles for key DG AGRI data assets.	To implement corporate data strategy.	January 2021 – December 2024	Too early to assess. Assessment of ISAMM data policies has been finalised.	The assessment for the AGRIVIEW system has started, and will be followed with the FADN.
		Extend DG AGRI data dissemination through the Agri-Food data portal.		January 2021 – December 2022	Too early to assess. DG AGRI has a multi- annual plan for the portal.	
		Promote and enable data sharing and analytics in DG AGRI: — Country data knowledge portal/dashboard — Thematic dashboards	To promote and enable data sharing	March 2021 – December 2022	Too early to assess. Country data in the form of analytical factsheets have been published.	

Q = quarter

Source: ECA, based on Commission documents and interviews.

Acronyms and abbreviations

AMS: Area Monitoring System

- ATLAS: Agricultural Interoperability and Analysis System
- CATS: Clearance of Accounts Audit Trail System
- CROP-CASMA: Crop Condition and Soil Moisture Analytics
- FADN: Farm Accountancy Data Network
- FaST: Farm Sustainability Tool for Nutrients
- FSDN: Farm Sustainability Data Network
- **GSAA:** Geo-Spatial Aid Application
- IACS: Integrated Administration and Control System
- IFM-CAP: Individual Farm Model for the Common Agricultural Policy
- **IFS:** Integrated Farm Statistics
- **ISAMM:** Information System for Agricultural Market Management
- LPIS: Land Parcel Identification System
- LUCAS: Land Use/Land Cover Area Frame Survey
- MEF4CAP: Monitoring and Evaluation Frameworks for the Common Agricultural Policy
- NIVA: New IACS Vision in Action
- SAIO: Statistics on Agricultural Input and Output
- SEN4CAP: Sentinels for Common Agricultural Policy
- SFC: System for Fund Management

Glossary

Advanced analytics: Use of high-tech methods such as predictive modelling and machine learning to analyse big data.

Big data: Data sets of increasing volume, velocity and variety: the three Vs. Big data is often largely unstructured.

Data: Concrete, objective facts, measurements or observations that need to be processed to generate information.

Data analysis: The process of collecting, modelling, and examining data to extract insights that support decision-making.

Data analytics: Science of analysing data using systematic computational methods to produce insights.

Data asset: An IT system, application or database owned by an entity.

Data gap: Any data that are required for a specific purpose but are unavailable.

Data re-usability: The ease with which data collected for one purpose can be used for another.

Database: Structured set of data stored electronically and available for consultation and extraction.

Deep learning: Artificial intelligence technique that entails training a software system using millions of examples.

Interoperability: Ability of a system to communicate and work with other systems, including by exchanging data.

Land Use/Cover Area frame Survey (LUCAS): A regular, harmonised survey carried out on the spot across all EU Member States to gather information on how land is used and what is growing on it, including an analysis of underlying soil.

Spatial data: Data referring to a specific location or geographical area and its natural or constructed features.

Structured data: Standardised quantitative information that follows a predefined data structure, making it easy to analyse.

Unstructured data: Information stored in its original format without pre-defined categorisation or organisation, often making it more complex to analyse. It can include both quantitative and qualitative information, such as images, text, dates, emails, or numbers.

Replies of the Commission

https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=61415

Timeline

https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=61415

Audit team

The ECA's special reports set out the results of its audits of EU policies and programmes, or of management-related topics from specific budgetary areas. The ECA selects and designs these audit tasks to be of maximum impact by considering the risks to performance or compliance, the level of income or spending involved, forthcoming developments and political and public interest.

This performance audit was carried out by Audit Chamber I Sustainable use of natural resources, headed by ECA Member Joëlle Elvinger. The audit was led by ECA Member Joëlle Elvinger, supported by Liia Laanes, Head of Task; Dimitrios Maniopoulos, Deputy Head of Task; Ildikó Preiss, Head of Private Office; Paolo Pesce and Charlotta Törneling, Private Office Attachés; Emmanuel Rauch, Principal Manager; Claudia Albanese, Auditor and data scientist; Marika Meisenzahl, Auditor and graphic design; Michał Szwed, Auditor. Mark Smith provided linguistic support.







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Using an evidence-based approach in policy decisions requires various data from different sources and subsequent analysis. We assessed whether the Commission is making good use of data and data analytics for policy design, monitoring and evaluation of the Common Agricultural Policy, which represent more than a third of the EU budget. We found that the Commission has taken several initiatives to make better use of existing data. However, barriers to making the best use of collected data remain. Obstacles such as a lack of standardisation and limitations due to data aggregation reduce data availability and usability. We make a number of recommendations, including improving the use of disaggregated data from Member States.

ECA special report pursuant to Article 287(4), second subparagraph, TFEU.



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