Farm Management Information Systems as a Data Source for Official Agricultural Statistics: experiences in France, the Netherlands and Germany

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Abstract

The EU Regulation on Statistics on Agricultural Input and Output (SAIO) requires National Statistical Institutes to collect more detailed and timely data on agricultural practices, including the use of plant protection products. Traditional survey methods place a significant burden on farmers, who increasingly use Farm Management Information Systems (FMIS) to record their activities. This paper presents findings from the MAS2023 project, a collaboration between the statistical offices of France (SSP), the Netherlands (CBS), and Germany (Destatis), investigating whether FMIS-based data reporting is a feasible alternative to traditional survey methods to collect data for official statistics.

The MAS2023 project focusses on three interconnected dimensions for these countries: farmer acceptance, willingness and concerns regarding data FMIS-based data reporting, the FMIS market landscape and data coverage, and technical solutions for secure data transfer. The three countries are not at the same level of development: France, with its Prophyl pilot is the most advanced; the Netherlands a small-scale study focusing on the farmer's perspective, while Germany conducted a market study among FMIS vendors and an online survey among farmers to study the usage of FMIS systems in Germany. Results demonstrate that FMIS-based data reporting is feasible, but also challenges are identified that need to be addressed to make a large scale take-up possible.

Keywords: Farm Management Information Systems; FMIS; agricultural statistics; SAIO regulation; plant protection products; automated data collection.

Disclaimer: The views expressed in this paper are those of the authors and do not necessarily reflect the official policy of their institute.

1. Introduction

An often-heard complaint about official business surveys is that they cause substantial response burden for businesses [1, 2]. The same holds for the agricultural sector: farmers face substantial administrative burdens from various reporting obligations to governmental organizations, agricultural buyers, sector organizations, and the like. The proliferation of data requests has contributed to survey fatigue and declining response rates. This calls for investigating the data collection method, focusing on actually reducing the workload for farmers, and making the reporting process more efficient for them. Farm Management Information Systems (FMIS) offer a potential solution to these challenges.

Farm Management Information Systems are software applications that help farmers plan, monitor, and document their agricultural activities. FMIS are used in various parts of the agricultural sector, e.g. arable farming, green housing and livestock farming. In this paper we focus on arable farming, for which most of these FMIS typically record field-level data including crop rotations, planting dates, input applications (fertilizers, plant protection products (PPPs)), irrigation, and harvest information. Modern FMIS often integrate with precision agriculture technologies [3], providing georeferenced data with timestamps. These software systems are increasingly adopted by farmers across Europe, although the take-up rate is not yet very high.

FMIS also offer the option of the collection of more detailed data in a timely manner. The European Union's Regulation on Statistics on Agricultural Input and Output (SAIO, Regulation (EU) 2022/2379 [4]) establishes new requirements for agricultural statistics across Member States. The SAIO Regulation establishes a comprehensive framework for agricultural statistics covering five subject areas: animal production, plant production, agricultural prices, use of nutrients, and use of plant protection products (PPPs). For plant production statistics, for example, the regulation specifies 168 characteristics across arable farming and grassland, permanent crops, and vegetable cultivation. The PPP statistics requirements under Implementing Regulation (EU) 2023/1537 [5] are particularly demanding, requiring detailed treatment-level data for 21 specified crops beginning in 2026 and annual reporting from 2028. Much of the data required under SAIO regulations could be captured in FMIS under the assumption that recording these data in a FMIS is part of farmers' routine management activities.

The MAS2023 project (Modernization of Agricultural Statistics 2023 [6]) was established as a collaboration between the national statistical institutes of France, Germany, and the Netherlands: the French Statistical Services SSP (Service de la Statistique et de la Prospective), Statistics Germany DESTATIS (Statistisches Bundesamt), and Statistics Netherlands CBS (Centraal Bureau voor de Statistiek). MAS2023 is co-funded by Eurostat. Its goal is investigating the feasibility of using FMIS (in the arable farming sector) as a data source for official agricultural statistics and developing efficient data reporting methods that directly connect to these systems. Among other prior research, this project builds on research under the AGRI-SISA 2020 project, concluding that FMIS data (from providers in the Netherlands) showed sufficient overlap with the Crop Yield Survey and the Crop Protection Survey [7, 8, 9, 10]. This earlier work demonstrated the potentials of FIMS data (potentially good data quality and granularity) compared to survey data, including detailed timestamps and input/output records not typically captured through questionnaires. However, it was also concluded that many practical challenges have to be faced. How to make this work in practice is the focus of the MAS2023 project.

Building on the earlier findings, the MAS2023 project addresses three key questions:

1. whether farmers can use and would accept FMIS-based data transfers to statistical offices,
2. which FMIS providers offer sufficient market coverage and data quality (like completeness and up-to-dateness), and
3. how FMIS-based reporting could be implemented in practice?

To answer these questions, three interconnected work packages were established:

1. WP1: understanding farmer perspectives and legal frameworks (executed in the three partner countries),
2. WP2: analyzing the FMIS market and data quality (for the three countries), and
3. WP3: developing technical solutions for data transfer (for the Netherlands).

This paper presents the MAS2023-project preliminary findings, demonstrating that FMIS-based data collection is technically feasible, but will not perse lead to higher data quality or more data than traditional surveys, while also identifying the challenges that need to be taken into account for successful implementation. Section 2 discusses the situation for the three partner countries, which are different levels for FMIS-based data reporting. Section 3 outlines the studies that have been conducted in the three countries and presents the findings. Section 4 concludes this paper with conclusions and discussion.

2. Three countries, three situations

When discussing the starting point for the MAS2023 project among the three partner countries, the three countries were at various level of development: SSP had already implemented a working approach (Prophyl) using a datahub as data intermediary, while CBS was at the start of developing a system and studied two scenarios for FMIS-based data reporting building on the AGRI-SISA experiences [7, 8, 9, 10]. Because Destatis was only at the very beginning of investigating FMIS-based data reporting, this section will discuss the situations in France and the Netherlands. The experiences with these studies, including a study conducted by Destatis, will be discussed in the next section.

2.1 France: the Prophyl project

The French Prophyl project (PROduits PHYtosanitaires dans les Logiciels - PPPs in Software) represents the most advanced implementation within the MAS2023 project. This experimental project was launched by SSP in 2019; it was aimed at studying the retrieval of PPP data recorded in FMIS, and assessing the statistical potential of these data. From the very start, the project had to address the reluctance of both FMIS vendors and farmers. In this context, the SSP has established partnerships with three leading FMIS vendors (ISAGRI, SMAG and CDAF), and a technical agricultural institute (Acta). The data communication was taken care of by the data intermediation service Agdatahub. In the months June to November 2024, SSP conducted a large-scale field pilot to study real-life challenges for this approach. The Prophyl pilot is summarized in table 1.

As part of the 2024 field pilot, an extensive communication campaign was setup to encourage farmers to take up the Prophyl approach. This campaign included informational flyers, a presentation video, dedicated web pages with FAQs and step-by-step consent instructions, a project slideshow presented to agricultural chambers, and a webinar organized by SMAG for its distributors. A postal mail-out was sent to 5,800 farmers who had responded to previous cultivation practice surveys and indicated willingness to share data. A reminder email reached 5,400 farms. Additionally, four on-farm visits were conducted to observe the consent procedure and understand barriers to participation.

Table 1: Prophyl Experiment Results

Metric	Result
Participating farms	116
Plots transmitted	1,003
Phytosanitary treatments recorded	4,784
Target crops covered (of 21)	15
Plots with complete treatment data	58%
Plots registered with CAP	24%

2.2 The Netherlands: two scenarios

In the Netherlands, CBS studied two scenarios for FMIS-based automated data reporting: 1. A reporting template, and 2. an API-based approach (see figure 1).

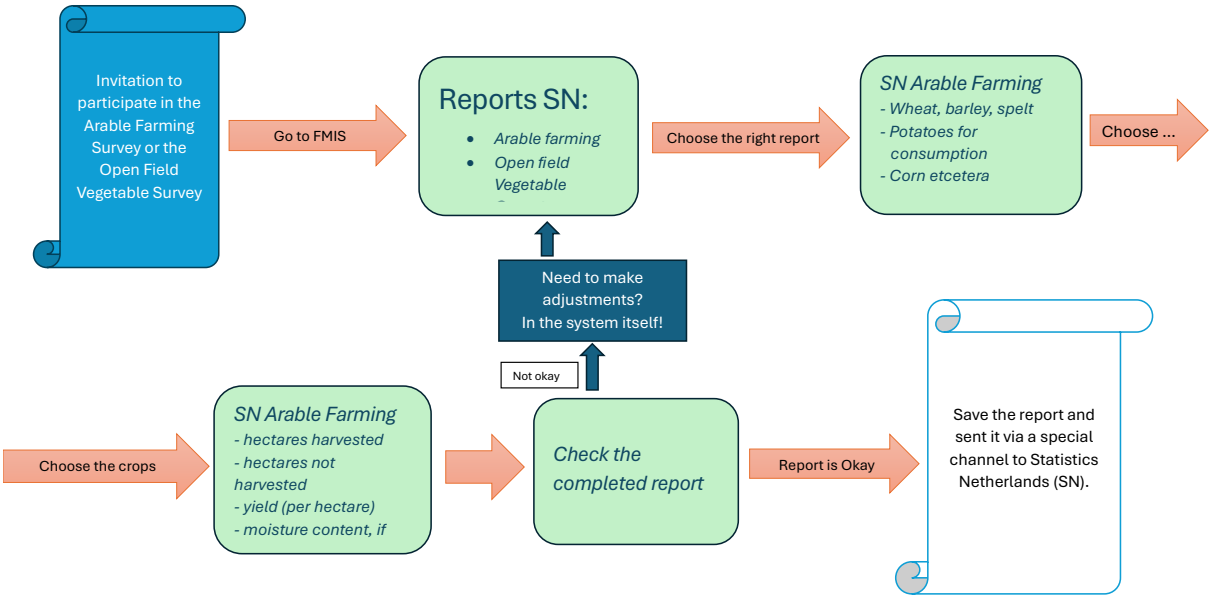
Scenario 1 (Reporting Template): A CBS-suited reporting template is built into the FMIS. Farmers select the relevant report, review the data to be transmitted, make any necessary corrections within the system, and then send the report to CBS via a dedicated secure channel. Farmers are used to this approach for reporting to customers and other stakeholders.

Scenario 2 (API-Based Extraction): Farmers authorize CBS to access their FMIS data through an API. Data is automatically retrieved and used to pre-fill electronic questionnaires, which farmers then review, adjust if necessary and approve before submission. This approach offers greater automation but requires more complex technical infrastructure.

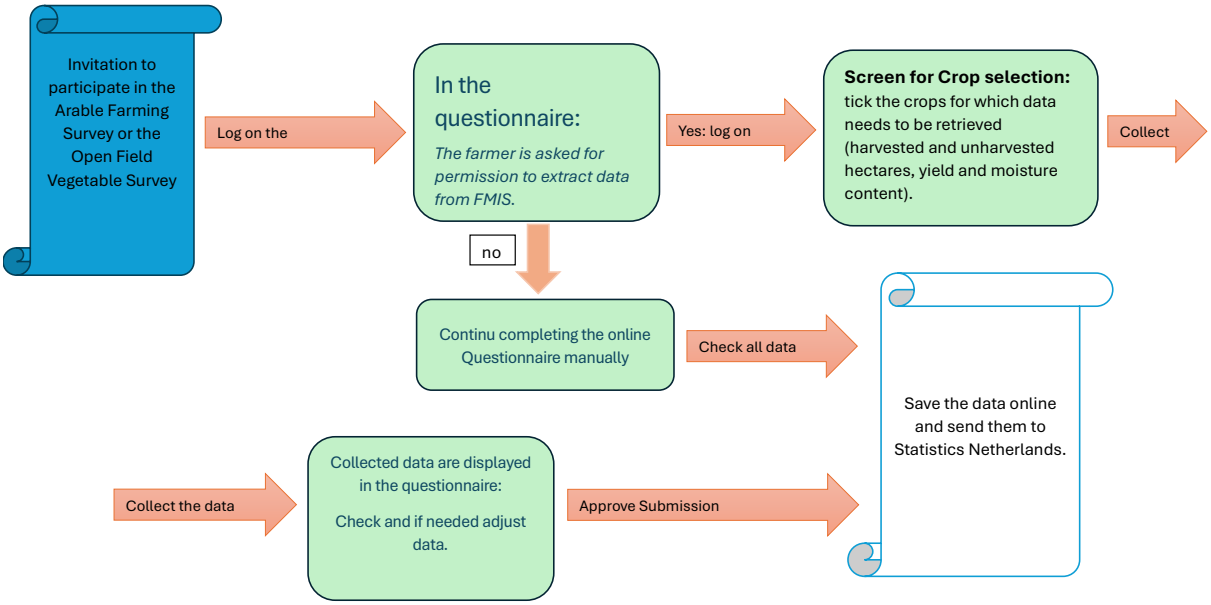
These scenarios were based on the findings from the previous AGRI-SISA project and were presented to a small number of farmers.

Figure 1: the two scenarios discussed with farmers

Scenario 1: Reporting using special reporting template included in the FMIS



Scenario 2: Reporting by using an API developed by Statistics Netherlands for the FMIS



3. Towards FMIS-based reporting: the Farmer's and FMIS's perspectives

Before developing and implementing technical solutions for FMIS data transfer, it was considered essential to understand farmers' attitudes toward data sharing and to map the FMIS market landscape in each country. This is in line with important lessons learned from the previous AGRI-SISA project [Snijkers et al. 2023a: p. 31]:

- "involve the user (i.e the farmers) as early as possible,
- communicate and keep all stakeholders involved,
- identify project prerequisites and test as early as possible, from an early mock-up to test with the real system and real data."

MAS2023 Work Packages 1 and 2 were exactly addressed at these lessons learned: Work Package 1 focused on the farmer, while Work Package 2 investigated the FMIS vendors' market.

3.1 Assessing the Farmer's Attitude (Work Package 1)

Each partner country conducted research to understand farmer perspectives on FMIS data sharing, using approaches suited to their contexts and prior relationships with the agricultural community.

France and the Netherlands

In France, prior to the start of MAS2023, and prior to the start of the Prophyl field pilot (as discussed in section 2.1), SSP conducted twelve interviews with farmers, farmers representatives, FMIS vendors, and other parties related to the agricultural sector. The aim for these interviews was to identify incentives and obstacles for participation in the Prophyl experiment. The findings were input for the pilot's communication campaign (see also paragraph 2.1), and the development of feedback information to participants in the 2025 pilot test.

In the Netherlands, Statistics Netherlands (CBS) conducted eight qualitative interviews with farmers and agricultural consultants. The research aimed to understand farmers' daily data practices and their preferences for sharing data with third parties and CBS. Recruiting participants proved difficult, due to tensions between farmers and government institutions. Also the request for more data every year and the numerous regulations farmers have to deal with, may have a negative effect on their attitude.

Common concerns emerged across France and the Netherlands. In France, farmers expressed fear that sharing individual PPP use data could expose them to *"agri-bashing"*, i.e. being exposed to public criticism because ofn their f agricultural practices. In both countries farmers are worried that statistical data might be used against them: in France, there is fear of repurposing data for regulatory compliance, and in the Netherlands that the data will be used against the farmers themselves. In both countries, this worry mainly concerns the data on plant protection products. For example, in France an environmental law allows any organization to retrieve all data on emissions into the environment. As such, individual data on PPP are not protected by statistical confidentiality, which may severe effects on survey participation.

In France as well as in the Netherlands, farmers also worry about extra data requests. In France, farmers feared that participating in data sharing experiments would lead to additional data requests in the future. While in the Netherlands farmers already saw a demand for extra data by the government the last years, they are wondering when the extra demand for data will stop.

Germany

In Germany, Destatis conducted a literature review of prior FMIS surveys. Various surveys that were previously conducted provided valuable insight into usage behavior, acceptance and barriers. For example, a nationwide online survey conducted in 2019 captured the views of 591 farm managers. It showed that FMIS are particularly prevalent in arable farming (29% use, 22% planned purchase) and livestock farming (37% use, 16% planned purchase). The respondents cited high acquisition costs, lack of compatibility between different systems, and uncertainties regarding cost-effectiveness as the main barriers. In addition, concerns about data security and data sovereignty are becoming increasingly important. With the help of this survey from 2019, a monitoring system for the continuous assessment of the acceptance of digital technologies was also developed, which has been in use since 2020, particularly in Bavaria (LfL Bayern, 2019).

For MAS2023 Destatis developed its own anonym online survey. The aim of the survey is to obtain a general picture of FMIS usage in Germany and its potential to transfer data to the NSI. In addition, the advantages, disadvantages, and problems associated with the use of FMIS are recorded. The target group includes farmers of all sizes based in Germany. In order to identify possible reasons for non-use not only farmers that are using FMIS were invited to fill in the questionnaire, but also farmers that are not using FMIS and those who plan to use FMIS in the future. The survey was advertised outside of the statistical system via various channels and platforms of stakeholders such as Ministry of Agriculture, Chamber of Agriculture, different associations related to agriculture, etc. The survey can be accessed from November 1, 2025 to February 28, 2026. Participation is voluntary.

Preliminary results of 95 completely filled out questionnaires reveal that 54 respondents (57%) are already using FMIS. The majority of the FMIS user (76% or 41 respondents) say that if they could, they would use their FMIS for data delivery for official statistics, and of these 37 prefer a review-before-submission approach. Of those who have no FMIS but would use it for fulfilling reporting obligations (32 respondents) 24 (75%) would prefer a review-before-submission approach. More in-depth analysis will be conducted after the survey has ended.

Although the response on the survey is lower than expected, it gives insight in FMIS use and whether respondents are willing to use the FMIS data for filling in surveys.

3.2 FMIS Market Analysis (Work Package 2)

Understanding the FMIS market structure in each country was essential for identifying potential partners and assessing the coverage that could be achieved through FMIS-based data collection. At the start of MAS2023 SSP and CBS already had contact with the FMIS vendors where they would be working with during the project. One of the main tasks for Destatis in this project was exploring the FMIS market in Germany.

In **Germany**, Destatis contacted approximately 30 FMIS providers through the "Drehscheibe Agrar" working group. Eleven providers engaged in bilateral discussions. Their FMIS portfolio has been checked for the five SAIO topics animal production, plant production, agricultural prices, use of nutrients, and use of plant protection products. None of these FMIS providers covers all of the five SAIO topics. The topic “agricultural prices” is not offered at all. The topic “animal production” is only offered by four vendors, and only in the area of cattle farming to meet the

requirements ((EU) 2022/2379 [4]). All providers, except for two vendors, offer the topics “plant production”, “use of nutrients” and “use of plant protection products”.

Based on market reach and product coverage, three providers were shortlisted for potential pilot collaboration: Agravis ("ackerprofi"), Next Farming, and Landwirtschaftsverlag ("top farmplan"). These providers collectively serve a significant portion of German arable farmers. For the durance of the project Destatis will be working with two of the three vendors, namely Agravis and Next Farming.

In the **Netherlands**, the prior AGRI-SISA project [9, 10] identified Agrovision and Dacom as the largest FMIS providers for arable farming. An exploratory analysis done in 2024 [11] showed that between 35% and 55% of arable farmers use a FMIS. Additionally, the data showed that approximately 45% of fields with the largest crop volumes are registered in AgroVision. Although these numbers are rough estimates, they provided a good business case for continuation of AGRI-SISA in MAS2023. Although both vendors were involved in the AGRI-SISA project, for pragmatical reasons it was decided to continue working with AgroVision only in the MAS2023 project.

In **France**, three major FMIS vendors were identified and engaged for the Prophyl experiment: Chambre d'Agriculture France (Mes Parcelles software), Isagri (Geofolia software), and SMAG (SMAG Farmer software). These three providers partnered with the SSP through Agdatahub, a data intermediation service, to facilitate secure data transfer.

3.3 FMIS: Metadata Assessment and Trust Building

A critical component of the market analysis included assessing whether FMIS metadata meet SAIO requirements.

In **Germany**, Destatis gained access to the systems of the two shortlisted providers and compared their data fields against the 168 characteristics specified for plant production in the SAIO Regulation, divided in 1) arable farming and grassland, 2) permanent crops and 3) vegetable cultivation. Whereas Next Farming covers all 168 characteristics, Agravis only covers 95 characteristics for mainly arable land and grassland, with the gap explained by its regional focus within Germany (the missing characteristics can be extended anytime if required). The two FMIS providers fully meet requirements for field records, harvesting, fertilization, plant protection, and nutrients. These topics are methodologically interlinked - assessing nutrient cycles requires data on both fertilizer application and crop production. Apart from the coverage, the FMIS data also has to fulfil the quality requirements of the SAIO regulation. For the data quality assessment volunteer FMIS users should be identified to compare FMIS data with statistically reported data. So far, no volunteers have been identified.

In **France**, a collaborative effort has been undertaken to identify and analyse relevant data in the FMIS in order to produce PPP use statistics in accordance with SAIO regulations. This work has been carried out by SSP in close partnership with the three major FMIS vendors and an intermediation data service provider. A list of 21 variables was selected for the Prophyl data transfer, covering farm and plot identification, crop and cultivation methods, and plant protection treatments (product used, dose, application date). The variables were aligned with public standards including the IFT (Treatment Frequency Index) calculation framework and the Agro-EDI crop identification system.

In the **Netherlands**, the metadata of Agrovision's FMIS systems had already been investigated in the AGRI-SISA project [9, 10]. From this small-scale exploration [10] AgroVision reports were studied. It was concluded that the FMIS data in Agrovision had sufficient overlap with data collected via questionnaires of the Plant Protection Survey, as required by SAIO obligations. The findings indicated that FMIS data on PPP use are of higher quality and more detail than the data normally received by the questionnaire. In addition to PPP data, one farmer had crop yield data registered in his FMIS, which were shared with CBS. Also these data were of good quality but the fact that only one farmer had crop yield data stored in his FMIS raise the question how many farmers store crop yield data in the FMIS they use. It was hypothesized that FMIS-based data reporting would fit better for PPP reporting.

Based on the metadata assessment, FMIS can be a good new source for existing data collections. We see also new possibilities. FMIS can also serve as a new data source for immature statistical topics such as the (local) use of fertilizers (with timestamps). But in the end it stands or falls with what the farmer puts into his or her system.

Trust building with FMIS vendors proved essential for project success. Destatis had regular communication through biweekly online meetings in the beginning. In this way challenges can be identified early in the process and solutions developed collaboratively. Meanwhile Destatis contacts the FMIS providers when necessary. In France, a working group under the National Council for Statistical Information (CNIS) has operated since 2021, bringing together FMIS publishers, SSP, Agdatahub, agricultural representatives, and research institutes. This sustained engagement was decisive in securing vendor participation and building confidence in the project's approach to data security and use. In the Netherlands, CBS has contact with Agrovision whenever necessary: the lines of communication are direct.

4. Conclusions and discussion

The MAS2023 project findings demonstrate that FMIS-based data reporting for official agricultural statistics is feasible, but successful implementation requires attention to several critical factors. These include challenges from various perspectives [11]: farmer-related issues, data quality issues, NSI issues, and the FMIS vendor related issues.

Farmer-related issues involve ability and willingness to take this up. It turns out that the usage of FMIS's among farmers is still limited, but the usage of FMIS is large enough to start with in a mixed-mode design, i.e. FMIS-based reporting for farmers that are able and want to use this approach, and traditional survey questionnaires for others.

If farmers use an FMIS and are able to take up FMIS-based data reporting, their willingness is a next issue: farmer's trust and control over the reported data emerge as paramount concerns. Across all three countries, farmers expressed wariness about government data collection, rooted in broader tensions between agricultural communities and public authorities. Trus is also related to having a secured way of data communication,

Next, if farmers report data based on the data they have in their FMIS, the **quality of the reported data** may not be taken for granted. This includes completeness and up-to-datedness of the reported data. The Prophyl findings show that only 58% of transmitted plots had complete treatment records. This indicates that farmers do not uniformly enter all activities into their FMIS. Similarly,

the selective submission of plots (only 24% registered with CAP) suggests farmers may curate what they share. These patterns could introduce bias if FMIS-based statistics are not supplemented with appropriate estimation methods or if farmer engagement does not emphasize the importance of comprehensive data. In the Netherlands, we have seen that the data landscape for individual farmers may be scattered [12]: their data may not be stored in one central FMIS database, but in various not-related simple data files. Data-mindedness (including routinely registering all data in one place) among farmers still is an issue, which needs to be promoted by agriculture organisations.

These issues relate to the **NSI issues** like timeless of the publication of statistics: according to the SAIO regulations the statistics need to be published at a specific date, which may not align with farmer's procedures of updating their FMIS. Also, mixed-mode effects may need to be considered: because data are collected with various modes (questionnaires, automated data reporting) the resulting statistics may be biased. This relates to the combined usage of survey data and register data, which are collected for other purposes than for statistical use [13].

Furthermore, for NSIs, FMIS-based data reporting needs to fit within the NSI IT architecture, and implemented in a cost-efficient and scalable way. Finally, legal issues need to be considered, e,g. purposiveness of the collected data for specific statistics. This legal requirement still reflects the stove pipe system of statistics and may be a stumbling block for FMIS-based reporting. And, due to its independence, NSIs are reluctant to enter into partnerships with other organisations, whereas endorsing the code of conduct for data use as issued by agricultural organisations could increase farmers' confidence in an NSI.

A final set of challenges concerns the **FMIS vendors**. The future success of FMIS-based data reporting depends on sustained engagement with FMIS vendors. With this approach, data collection depends on the continued involvement of FMIS vendors: for them the business case should be profitable. If they drop out, going back to traditional questionnaire data collection seems the only remedy. The CNIS working group model in France, with monthly meetings since mid-2022, demonstrates the value of inclusive governance structures. Trust building takes time - the Prophyl project began in 2019 and required years of relationship development before the 2024 pilot. Multi-stakeholder collaboration, including collaboration with agricultural organizations and farmers themselves, is essential.

Despite these challenges, FMIS-based data collection is feasible and offers substantial benefits. Data quality can exceed survey-based collection. The reduced workload on farmers - who need only authorize access to data they have already recorded - may improve cooperation over time. The infrastructure investments made now will enable expansion to additional FMIS providers and statistical domains, but, there is still a long way to go.

The MAS2023 project has established that Farm Management Information Systems potentially can serve as a viable data source for official agricultural statistics under the SAIO regulation. The Prophyl pilot in France successfully demonstrated data transfer from FMIS to statistical authorities, while the CBS study pointed at farmer-related issues that need to be considered. The German indicated that farmers definitely show an interest in this approach, and maybe willing to use it.

Key success factors identified through the project are not the technical systems and implementation: the French Prophyl pilot shows that this approach works, as did a previous Agri-Sisa pilot in the Netherlands [11]. Instead, key success factors are related with the various partners in this approach: farmers as data providers, FMIS vendors as facilitators, and NSI legal issues and policies. Farmers need to be able and willing to take this up, by giving them control over their data through review-before-submission approaches. Also building a sustained relationship with farmers through agricultural organisations and endorsing their code of conduct of data use is important to improve trust and to encourage complete and up-to-date data entry by farmers. A sustained relationships with FMIS vendors needs to be established to ensure future collaboration. Finally NSIs, in close collaboration with Eurostat [14], need to review their legal framework and policies to facilitate FMIS-based data reporting. All this needs time, still it is our firm belief that this approach is the future to produce granular SAIO statistics in a cost-efficient way, both for NSIs and farmers.

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