



D4.3 Test Case evaluation report for reporting period 2

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D4.3 Test Case evaluation report for reporting period 2

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Abstract:	This document contextualizes the strategy developed to operationalize the TCs described in D4.1 – Testing and Assessment Guidelines and incorporates insights from the first evaluation cycle, deliverable D4.2 - Test Case Evaluation Report for Reporting Period 1. Efforts for monitoring and reporting the TCs’ activities are described, as well as challenges in data collection, stakeholder engagement, and methodological refinements. The document presents the evaluation of the second testing period for each TC, highlighting key outcomes, lessons learned, and recommendations to improve the Assessment Framework, digital tool adoption, and overall project implementation. The task “T4.3: Demonstration Events Implementation and Evaluation” is also introduced.

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List of Abbreviations and Acronyms	
TCs	Test Cases
DATs	Digital Agricultural Technology Solutions
TCL	Test Case Leader
DIHs	Digital Innovation Hubs
DIA	Digital Innovation Academy
AKIS	Agricultural Knowledge and Innovation Systems
GA	Grant Agreement
DMP	Data Management Plan
AF	Assessment Framework

Executive Summary

The Deliverable D4.3: Test Case Evaluation Report for reporting period 2, provides an overview of the operational progress and key results from the 30 Test Cases (TCs) in the second year (from April 2024 to March 2025, M22-M33, respectively) of testing under the QuantiFarm project. This phase builds on the first evaluation cycle, refining methodologies and deepening the analysis of Digital Agricultural Technology Solutions (DATSs) across economic, environmental, and social dimensions. The TCs are from 20 countries and 10 biogeographical regions, each managed by a Test Case Leader (TCL) responsible for local implementation, while WP4 coordinates monitoring and reporting at the project level.

This document outlines the evolution of the testing strategy, incorporating lessons from D4.1 (Testing and Assessment Guidelines) and D4.2 (First Evaluation Report). It details refinements in data collection, reporting, and evaluation methodologies, addressing challenges such as delays in data submission and variability in farming conditions. The final section presents the evaluation of the second annual testing cycle, highlighting key outcomes, common conclusions, and recommendations for improving DAT adoption, usability, and scalability.

By leveraging these insights, QuantiFarm ensures a comprehensive assessment of DATSs in real-life farm conditions, which will allow the refinement of tools (QuantiFarm Toolkit) and methodologies (Assessment Framework, Governance Mechanism).

1 Preface

1.1. Project summary

The QuantiFarm project is dedicated to advancing Digital Agriculture Technology Solutions (DATSs) as a crucial element in enhancing the sustainability (economic, environmental, and social) and competitiveness of the agricultural sector. To achieve this, QuantiFarm has developed a comprehensive Assessment Framework designed for independent qualitative and quantitative evaluations of the diverse costs and benefits associated with these technologies.

A key focus of the project is to ensure that digital solutions are widely adopted and easily replicable by developing innovative tools, services, and recommendations tailored to be practical and relevant for farmers, advisors, and policymakers throughout Europe. The project is structured around 30 Test Cases (TCs) spread across more than 20 countries and 10 Biogeographical regions, reflecting various geopolitical and economic contexts.

More than 100 farms, varying in type, size, ownership, and operational conditions, are involved in the initiative, either directly or through cooperatives and large umbrella organizations. The TCs serve as a collaborative platform engaging multiple stakeholders, including farmers, advisors, Digital Innovation Hubs (DIHs), researchers, DATSs providers, certification specialists, and policymakers.

Additionally, QuantiFarm aims to establish the Digital Innovation Academy (DIA) as a central hub for capacity building, equipping advisors and other Agricultural Knowledge and Innovation Systems (AKIS) stakeholders with knowledge on different digital technologies, their costs, benefits, and sustainability impacts. The DIA will also provide training sessions specifically designed for advisors.

The project brings together 32 partners, encompassing a diverse range of key stakeholders, including 8 scientific institutions and 12 organizations representing farmers and advisors.

1.2. Document Scope

The Deliverable D4.3 Test Case Evaluation Report for Reporting Period 2 represents the second annual periodic report on the monitoring and evaluation outcomes of each TCs during testing. This report provides a comprehensive assessment of the progress, challenges, and key insights gathered from real-world implementation across the 30 TCs.

This deliverable follows the similar structure of D4.2 (*Test Case Evaluation Report for Reporting Period 1*), reflecting on the most practical and operational segment of the QuantiFarm project: the Test Cases. Additionally, it includes a chapter with preliminary steps regarding the task T4.3 Demonstration Events Implementation and Evaluation.

The document begins by outlining the continuation of testing activities from the first reporting period, including refinements made based on the lessons learned in the first year. It details the progress and adjustments made in the second year, focusing on the evaluation of DATSs in diverse economic, and environmental settings.

Throughout the second year, monitoring and reporting activities have been systematically carried out across all 30 TCs. The execution of the evaluation framework, previously defined in D4.1 (*Testing and Assessment Guidelines*), has enabled the assessment of the costs, benefits, and sustainability impact of the tested DATSs. The annual testing plan and methodology have been shaped by a collaborative effort involving WPs 2, 4, 7, and the TC Leaders (TCLs).

The document further presents:

- An individual evaluation of each TC, analyzing outcomes and performance indicators.
- Common findings, patterns, and overarching conclusions from across the TCs.

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- Lessons learned and recommendations for improving the usability, replicability, and adoption of DATSs.
- Implications for subsequent project activities, particularly in refining the methodologies of WP2 (Assessment Framework), WP3 (Digital Tools), and WP5 (Policy Recommendations).

1.3. Document Structure

This document contains the following chapters:

Chapter 1: Preface

This chapter introduces the QuantiFarm project, outlining the scope, structure, and objectives of this deliverable. It provides an overview of its relevance within the project and how it contributes to the evaluation and refinement of DATSs.

Chapter 2: *Overview of Deliverables D4.1 and D4.2 Results*

This section summarizes key results from Deliverables D4.1 and D4.2, focusing on changes observed in TCs, particularly regarding DAT implementations and crop modifications. Updates to data collection methodologies and TC descriptions are highlighted, along with a structured overview of the modifications.

Chapter 3: *Updates on Data Submission and Methodology*

This chapter details modifications in the data submission process, including adjustments in reporting timelines, methodology refinements, and the adoption of a new data collection approach. It also discusses feedback from TCLs and enhancements made to the web-based reporting tools.

Chapter 4: *Monitoring Test Cases: Chasing data reporting news*

This section presents findings from the data submission phase, analyzing monitoring results and identifying challenges that impacted reporting timelines. It includes an assessment of Test Case updates and justifications for delays, serving as a foundation for refining the submission process in future iterations. It also includes a description of TCs changes and updates in comparison to first year of testing.

Chapter 5: *Evaluation Report of Test Cases*

This chapter outlines the evaluation process used to assess Test Case performance. It includes insights from discussions held during the plenary meeting in Lisbon, justifications for adjustments in the evaluation methodology, and an updated structure for reporting TC results, and TC Evaluation Reports provided by each TCL.

Chapter 6: *Discussion of the second annual cycle of testing*

This section presents the findings from the second testing cycle. It identifies key outcomes, common conclusions, and lessons learned, structured by agricultural sectors to facilitate comparative analysis.

Chapter 7: *Planning of Demo Events in QuantiFarm TCs (Introduction to T4.3)*

This additional chapter provides guidelines for organizing Demo Events, referencing relevant materials and guidelines, expected outcomes. It sets the foundation for effective knowledge transfer and engagement with stakeholders.

Chapter 8: *Conclusions and Next Steps*

The final chapter synthesizes key conclusions and outlines the next steps, to work as a baseline for the Deliverable D4.4 development, and also to enhance the engagement of TCLs and relevant stakeholders.

2 Overview of Deliverables D4.1 and D4.2 Results

2.1 Introduction

The deliverable D4.1 - Testing and Assessment Guidelines was officially submitted in December 2022 (M6 of the project) and provides a framework for piloting, reporting, troubleshooting, and decision-making mechanisms for all TCs within the QuantiFarm project. The report was the first deliverable of Work Package 4 - Testing and Assessment of Digital Technologies in Real Conditions, led by CONSULAI, and was result of Task T4.1 Launch of Test Cases.

The report describes a total of 30 TCs established across 20 countries in 10 biogeographical regions, evaluating DATSs in real-world conditions. The project follows a multi-actor approach, involving farmers, advisors, researchers, and policymakers. TCs contribute valuable data on costs, benefits, and sustainability impacts, forming the basis of a three-year evaluation cycle spanning three growing seasons. These findings are going to be documented in three other deliverables (D4.2, D4.3, D4.4).

Test Cases described on the deliverable follow a hierarchy: the WP4 Leader oversees coordination, TC Leaders manage individual TCs, Farmers and Advisors implement the technologies and provide feedback. It was establishing that communication is maintained through frequently meetings, online issue reporting tools, and a shared Google Drive repository.

In deliverable D4.1, a Test Case Launch Checklist was defined that each TC is correctly set up, and regular reporting helped identifying issues early. It was decided that data from each TC was stored in CSV and JSON formats and shared via Nextcloud, facilitating accessibility and collaboration. At the end of each growing season, it was established that an Assessment Framework should be developed per TC, and a structured Evaluation Report completed by TCLs, improving decision-making in policy and farm management.

The task, T4.2 Coordination, Monitoring & Evaluation of Test Cases aims to produce a common evaluation report (D4.2, D4.3, D4.4) presenting outcomes of each TC but also common conclusions and lessons learnt. At the end of each cycle, TC Leaders will write an annual evaluation report with the results from their TCs and CONSULAI will be responsible for producing

The deliverable D4.2 - Test Case Evaluation Report for Reporting Period 1 submitted on January 31, 2024, evaluates the first testing cycle of DATSs across the 30 TCs described on D4.1, analyzing their economic, environmental, and social impacts.

The report outlines the coordination efforts among stakeholders, and testing methodologies applied across diverse scenarios. Data collection was centralized via Nextcloud, ensuring compliance and consistency, though delays occurred due to technical issues and climate conditions. Farmers and TCLs provided feedback in Evaluation Reports, analyzing cost-benefit outcomes and farmer perceptions of DATSs. This analysis presented mixed results. Technologies used in TC1 (crop monitoring) showed positive economic impacts, such as higher yields and reduced operational costs. TC5 (water management), however, faced high initial costs with limited short-term benefits. DATSs improved farm efficiency, increasing crop productivity (up to +29%) and labor productivity (+217%), while water use efficiency improved (+42%). However, nitrogen emissions varied (-5% to +36%). Farmers showed high motivation to adopt DATSs but required better data collection support.

Moreover, challenges related to data submission occurred, including delays (only 11/30 TCs met deadlines), difficulties with the Assessment Framework analysis, and variability in farm operations affecting consistency.

The delays in data collection during the first piloting phase were due to a misalignment between the piloting phases' timeline and the TCs' cultivation periods.

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This challenge primarily arose because the growing periods for many TCs extend into late November or even December, while the deadline for piloting activities and corresponding deliverables was set for the end of the calendar year. As a result, delays in data acquisition from TCs affected the analysis of DATSs assessment results, including the reflection process with TC leaders and participating farmers, as well as the modeling and refinement of the Assessment Framework. Additionally, it impacted the timely integration of algorithms and the generated results (cost-benefit and sustainability results) into the Toolkit.

To address this issue, the consortium requested a three-month extension of the project duration to better align the piloting phases' timeline with the TCs' cultivation periods. This extension ensures that raw data from all participating farms in TCs (both DATSs users and non-DATSs users) can be acquired for the entire cultivation period in a timely manner.

After the extension, the piloting periods are shaped as follows:

- First piloting year: from M7 – M18 (completed)
- Second piloting year: from M19-M30 to M22-M33
- Third piloting year: from M31-M42 to M34-M45

The Evaluation Reports completed by TCLs expressed various recommendations, such as, training sessions, frequent workshops, better-aligned data submission schedules with growing seasons, and improved governance through automated monitoring tools. Key lessons learned highlight the need for standardized data collection, stronger communication between farmers and technology providers, and improved tool usability.

In conclusion, the report emphasizes improving data collection methods, standardizing evaluation metrics, and enhancing communication among stakeholders. Further optimization of tool efficiency and better farmer training are critical for successful adoption and long-term sustainability of DATSs in agriculture.

2.2 Test Cases: DATSs and crop changes

TCL from DELPHY felt that adjustments were needed to ensure farmer participation and the reliability of the TC6 to the Assessment Framework. During the second year of testing, DELPHY reported updates regarding crop change (within the same sector). Given the fact that this change is not an impediment to delivering what was promised in the GA and is methodologically aligned, these changes were validated by WP4, WP2 and the project coordination.

The main reasons for these changes were:

1. Low cooperation with the initial farmer, requiring the engagement of a new farmer for the 2nd and 3rd piloting phases.
2. Crop rotation in arable farming, which affects the continuity of specific crop trials within the same parcel.
3. Agronomic relevance, as wheat was not considered the most suitable crop for the designated DATSs.

To ensure methodological alignment, TC6 has transitioned to potatoes and onions, addressing each crop in both Year 2 and Year 3, but not in a rotating manner. This approach involves engaging different farms for potatoes in Year 2 and Year 3, as well as different farms for onions over the same period.

These changes are explicit in Table 1 and took place before data was submitted. Additionally, the new TC description is available in Annex I.

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Table 1 – Test Cases with changes on DATSs or other.

TCs	TCLLeader	Update	Observations
6	Delphy	Crop change	In the first year, the analyses refer to wheat, while in the second year, they cover onions and potatoes, which will be the same crops analysed next year.

3 Updates on Data Submission and Methodology

This chapter focuses on changes between the first- and second-year submission calendars, methodological updates, and the decision-making behind these adjustments. It introduces improvements in group divisions and outlines the new approach to data collection.

3.1 New calendar for data submission and group division

The first year of testing came with a set of challenges: the definition of a common calendar for data collection and submission of the 30 Test Cases. All TCLs were asked to provide information about the growing season timing in their TCs to evaluate the possible deadline. Analyzing this information, most TCs would finish their growing season by the end of October, so in 2023 the data submission deadline established was October 31st. However, significant delays were observed as illustrated on the picture below, highlighting the potential need to refine the data submission deadlines.

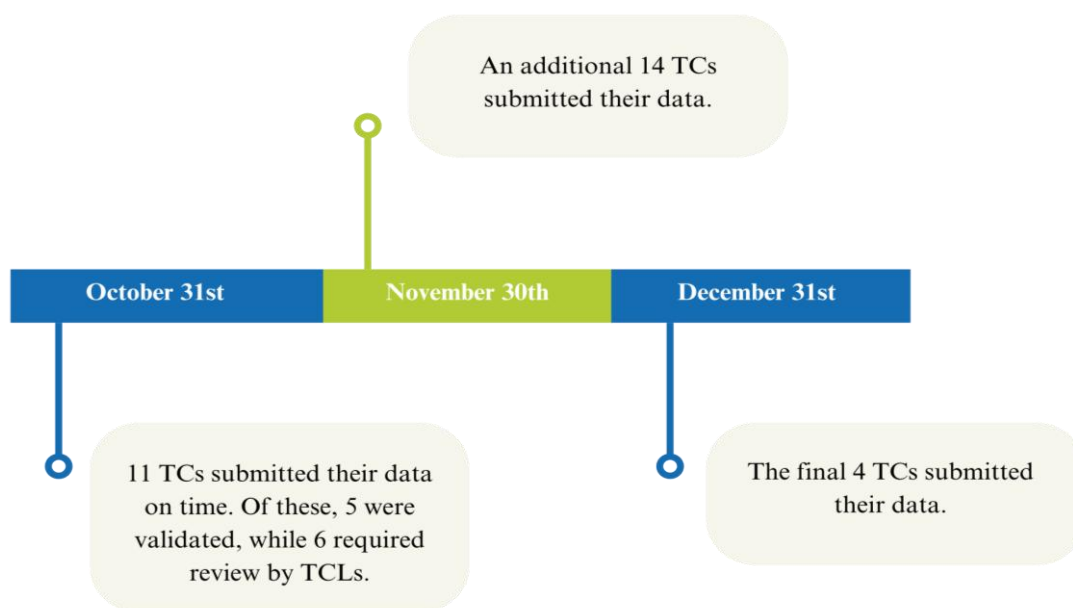


Figure 1 – Timeline of the data submission delays from the first year (January 2023 to December 2024, M7 – M18, respectively).

To improve data submission efficiency and streamline the feedback process, WP2 and WP4 analysed the end dates of growing seasons for each TC, as presented in Table 2. Additionally, input from the Test Case Evaluation Report, presented on deliverable D4.2, and individual feedback from TCLs were also considered when defining this allocation. Therefore, the 30 TCs were divided into three groups.

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Table 2 – Test Cases groups division.

TC No	Test Case Leader	Crop	End of season	Group
3	ITACyL	Barley, wheat	July	September
5	HORTA	Wheat	June	
8	AgroSmart	Wheat, Rapeseed, Rye, Barley	July	
10	ANAMOB	Wheat	July	
14	Terra	Strawberry, Blueberry	June	
20	AnySol	Bananas	NA	
21	LUKE	Tomatoes	NA	
22	FLOX	Poultry	NA	
23	IDELE	Cows	NA	
24	KULeuven	Pigs	NA	
27	KULeuven	Cows	NA	
30	BENCO	Oyster	NA	
1	NP	Potatoes	October	
2	Agromais	Corn	October	
7	FFP2	Potatoes	October	
9	KGZS	Barley, Corn, wheat	October	
12	Delphy	Apples	October	
13	HORTA	Grapes	October	
17	ANAMOB	Grapes	October	
18	HORTA	Tomatoes	September	
26	TEAGASC	Cows	September	
28	ANAMOB	Cows	September	
29	Art21	Bees	September	November
4	Augmenta	Cotton	October	
6	Delphy	Wheat, Onion, Potato	October	
11	NP	Olives	December	
15	Filagro	Olives	November	
16	Delphy	Apples	October	
19	Delphy	Tomato	NA	
25	IDELE	Cows	NA	

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Compared to the first year of data submission, significant methodological improvements were implemented in the data collection process. To support this transition, meetings with TCLs from each submission group were organized to introduce the new data submission approach and demonstrate enhancements made by WP3 through the new web-based tool. WP2 representatives were also present in these meetings to provide support and answer any questions from TCLs. Additionally, TCLs had the opportunity to provide feedback, and Q&A sessions were held to clarify any doubts. Specific deadlines were established for each TC group as illustrated in Table 3.

Table 3 – Meeting dates and data submission deadline per group.

<i>TC Group</i>	<i>Meeting date</i>	<i>Data Submission Deadline</i>
September	19 th September	30 th September
October	4 th October	31 st October
November	8 th November	30 th November

The previous data collection method, which involved manually entering data into an Excel file (.xlsx format), was replaced by a web-based tool that automatically generated a JSON file, illustrated in Figures 1 and 2. Each TCL then uploaded this JSON file, containing all relevant data, to the Nextcloud folder, which ensured improved data protection, centralized storage, and seamless collaboration.

The screenshot shows the 'TEST CASE DATA' web-based tool interface. At the top, there is a navigation bar with 'Home', 'Toolkit', 'Test cases', 'FAQ', and 'Contacts'. Below the navigation bar, there are three buttons: 'Create new TC data', 'Load from file', and 'Save to file'. The main content area contains 'Instructions' and 'How-tos' sections. The 'How-tos' section lists several steps for entering and validating data, including selecting a TC, entering data for a parcel, and uploading the JSON file. At the bottom, there is a 'Funded by the European Union' logo and a copyright notice for 2023.

Figure 2 – New web-based tool Test Case Data page.

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The screenshot shows the 'TEST CASE DATA' page in the QuantFarm Toolkit. At the top, there is a navigation bar with 'Home', 'Toolkit', 'Test cases', 'FAQ', and 'Contacts'. A 'Login' button is in the top right. The main header includes 'TC 1' in a dropdown menu, 'Load from file', and 'Save to file' buttons. Below this is a tabbed interface with 'Instructions', 'General data', 'Testing period 2023', 'Testing period 2024' (selected), and 'Testing period 2025'. A 'Validate current data' button is on the right. The main content area is titled 'General market information that influences the costs and benefits of the production in the specific year'. It contains several input fields with labels and units: 'The calendar year for which the assessment has been done *' (input: 2024, unit: n), 'The average price of water in Euros per m³ in the specific year *' (unit: €/m³), 'The average price of fuel in Euros per liter in the specific year *' (unit: €/l), 'The average price of electricity in Euros per kWh in the specific year *' (unit: €/kWh), 'The average salary of an employee in Euros per hour in the specific year *' (unit: €/h), and 'The average salary of a professional (agronomist, veterinary) in Euros per hour in the specific year *' (unit: €/h). Below this is a 'Parcel comparison data' section with a 'Parcel Comparison 1 (add new)' button and two input fields: 'Parcel with DATS' and 'Parcel without DATS'. A blue banner at the bottom states: 'You enter data for TC 1, Testing period 2024, Parcel Comparison 1, Parcel with DATS'.

Figure 3 – New web-based tool Test Case 1 Testing Period 2024 page.

Many TCLs expressed satisfaction with the new process and showed optimism. Some of them requested a file listing the data and indicators to guide them and the farmers during data collection, enabling each TCL to confirm offline which data points were needed. This file was provided by WP2 to all TCLs, facilitating the data collection process between farmers and advisors before the data is added to the new web-based tool.

Besides the meetings held for each TCL group and the provision of the data file, WP2 recorded a step-by-step video tutorial (made available on YouTube) that covered:

1. Introduction to the tool
2. Using the tool
3. Compiling the tool
4. Saving and loading

This combination of resources ensured that all TCLs could smoothly transition to the new data collection process and easily share their progress and results through Nextcloud.

4 Monitoring Test Cases: Chasing data and reporting news

In 2023, it was observed that the majority of TCs were unable to gather data on time for the first annual testing cycle before the end of October, given the expected growing season's conclusion. Consequently, the TCs were grouped according to the respective end of their growing seasons. However, significant delays were still encountered in 2024, suggesting the need for further refinement of the group distribution strategy. Future adjustments should be considered while ensuring alignment with the project's lifecycle and deliverables deadlines.

4.1 Data Submission

The **September group**, with a submission deadline of September 30th, experienced the greatest challenges, with a compliance rate of only about 7%. Delays ranged from 26 to 71 days, with only two TCs managing to submit data close to the deadline (one 4 days early), indicating a significant misalignment between the deadline and the capacity of TCs in this group to collect, process, and submit data. The misalignment might suggest that the September deadline may not adequately reflect the operational timelines or growing seasons for these TCs. A reassignment of TCs with the longest delays (e.g., over 40 days) to later groups, such as October or November, may provide additional time and improve their performance in future cycles.

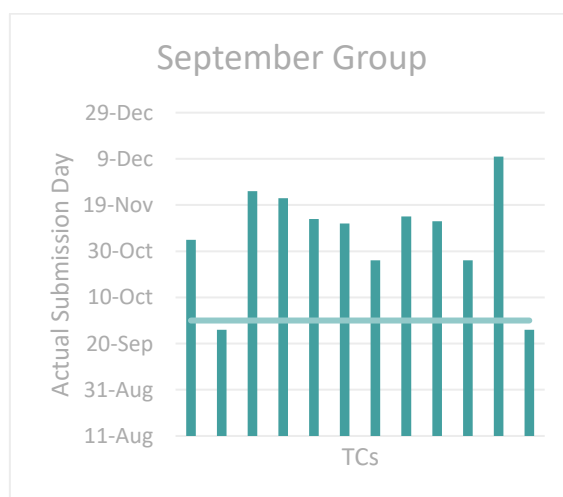


Figure 4 – Submission dates from the September group.

The **October group**, with a submission deadline of October 31st, showed better alignment, with approximately 23% of TCs either meeting the deadline for submitting data early. Some TCs submitted data early, up to 5 days before the deadline, while others experienced delays ranging from 4 to 34 days, suggesting that the deadline was better aligned with the growing season for a portion of the group. However, delays of 28 days or more for certain TCs highlight potential challenges in meeting this timeline. These TCs could benefit from reassignment to the November group, where additional time may reduce the risk of late submissions. Overall, the October group's performance suggests that the deadline works well for a subset of TCs, though adjustments for outliers may further improve compliance.

D4.3 Test Case evaluation report for reporting period 2

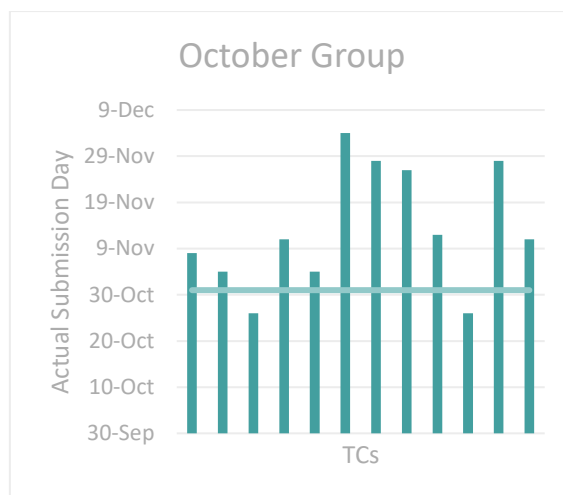


Figure 5 – Submission dates from the October group.

Finally, the **November group**, with a submission deadline of November 30th, had the highest proportion of TCs experiencing significant delays. While one TC submitted data ahead of the deadline, the majority faced delays ranging from 4 to 27 days, resulting in a compliance rate of approximately 17%. This indicates that, for many TCs, the November deadline may not have provided sufficient time to complete the required tasks. Delays of over 20 days were particularly notable, emphasizing the importance of further refining group assignments and deadlines.

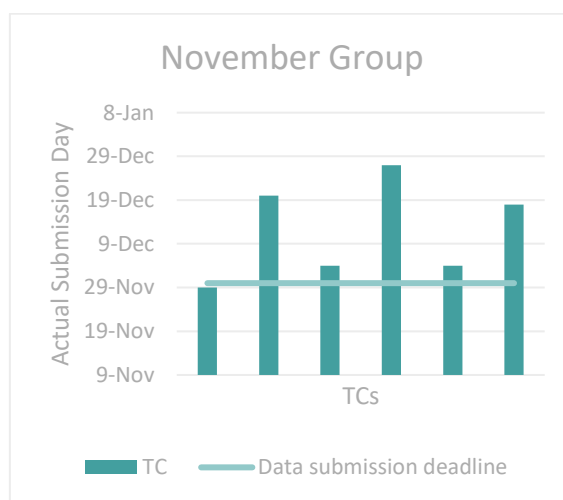


Figure 6 – Submission dates from the November group.

In conclusion, the creation of data collection groups has been instrumental in coordinating project work and monitoring data gathering in TCs. However, the current allocation of TCs based on submission deadlines should be optimized to align better with their respective growing seasons and operational constraints.

Reassigning TCs with substantial delays to more suitable groups, coupled with improved support and resources, could enhance compliance rates and reduce delays. By implementing these recommendations, the project can achieve better alignment between submission deadlines and TCs' operational constraints, ultimately ensuring a smoother and more efficient reporting process in subsequent cycle.

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To understand the reasons behind these delays and to proceed, with a potential reorganization of the groups, interviews were conducted in collaboration with WP2. These interviews clarified the situation regarding the delays and addressed other issues related to the data itself.

4.2 Test Cases updates on data collection process and justifications

The monitoring process was actively maintained throughout the data collection phase, ensuring a continuous and systematic flow of information regarding the TCs. The coordinated efforts of the TCLs enabled WP2 and WP4 partners to remain updated on the local progress of the TCs, effectively establishing a detailed Excel file shared on the project's Google Drive during the reporting period. Open communication channels with the TCLs, facilitated via email and other platforms, further ensured that project stakeholders were promptly informed of developments and challenges as they. This consistent flow of information allowed WP2, WP3 and WP4 to anticipate data availability for most cases and to provide strategic support to the TCLs in overcoming emerging challenges.

The monitoring activities also included a thorough analysis of delays, which will be utilized to adjust the group composition. Interviews conducted collaboratively with WP2 played a pivotal role in identifying the underlying causes of delays, documenting deviations from the planned timelines, and addressing extreme climatic events that may have contributed to the challenges. These discussions provided a clearer understanding of the barriers encountered and facilitated the identification of strategies for optimizing future data collection processes.

Table 4 provides a comprehensive summary of the challenges experienced by the TCs concerning data collection activities, alongside deviations from the projected schedule. Only delays exceeding 5 business days are included in the table, as these are considered significant enough to potentially jeopardize the submission deadlines. For TCs requiring an extension for data submission, detailed justifications were presented by the TCLs, accompanied by practical measures proposed to ensure the completion of the data collection phase.

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Table 4 – Observations related to TCs delays on data submission.

TC	Country	TC Leader	Observations
3	Spain	ITACyL	The delay was caused by the complexity related to the number of farmers, and parcels studied, and the need for uniformization of data metrics. Furthermore, the farmer involved showed the desire to abandon the project. TCL promptly found a backup farmer for last year's analysis.
5	Turkey	HORTA	The postponement occurred due to delays in receiving data from farmers. Furthermore, it was requested to aggregate all TCs managed by HORTA under the October group. This request will be analysed in collaboration with WP2 and WP7.
6	Netherlands	DELPHY	<p>The reason for the delay was a change in location and farmer, unforeseen logistical challenges, and an update in the DATSs description due to a technology change.</p> <p>To maintain methodological consistency, TC6 has shifted its focus to potatoes and onions, ensuring that both crops are covered in Year 2 and Year 3. Rather than using a rotational system, different farms are involved each year for each crop - distinct farms for potatoes across both years and likewise for onions.</p>
8	Latvia	AGROSMART	The delay stemmed from initial difficulties in identifying a smaller farm, which subsequently triggered a chronic delay.
9	Slovenia	KGZS	The delay was due to difficulties in collecting data from certain farmers within the scope of the project.
10	Romania	ANAMOB	The delay in providing the required data can be attributed to a combination of factors related to the timing and challenges faced by the farmers, namely harvesting late crops and planting new grains, which limited their availability to provide the necessary data. Furthermore, the TCL informed that wheat planted areas this year differed from 2023 (e.g., 500 hectares in 2023 compared to 450 hectares in 2024), adding complexity to the data collection process. These circumstances collectively contributed to the delay in data submission.
13	Italy	HORTA	The delay in completing TC13 and submitting the corresponding JSON file was due to several factors. Adverse weather conditions made it challenging to carry out fieldwork, causing frequent postponements. Moreover, since TC13 involved only one farm, there were particularly demanding weeks for performing the necessary treatments, and poor soil conditions further complicated the process.

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TC	Country	TC Leader	Observations
14	Serbia	TERRA	The delay was attributed to the complexity of working with four farmers, despite a significant amount of information being sourced from GLOBAL GAP. Furthermore, an extreme weather event - a storm in 2023 - resulted in a 30% loss in production and required rebuilding of its infrastructure.
15	Cyprus	FILAGRO	The delay was due to difficulties in collecting specific data, such as soil bulk density and carbon content, particularly for organic farms. There was also a slight delay in uploading the JSON file, though no major technical issues were reported. 2024 was particularly challenging due to a severe drought (the third or fourth consecutive year) and a heatwave in May, which affected olive flowering and reduced yields. These conditions made it difficult to measure the impact of the DSS, as differences between users and non-users of Digital Agriculture Technologies (DATSs) were less evident.
17	Romania	ANAMOB	The delay was due to the complexity associated with the number of farmers, the DATSs, and the parcels involved. The data from the parcel without DATS was delivered too late, and therefore, the Assessment Framework was shared with a delay but the TCL was able to share with WP4 the Evaluation Report.
18	Italy	HORTA	The delay was caused by heavy rainfall, which postponed the harvest/campaign as well as the data collection process.
19	Netherlands	DELPHY	The delay was due to the farmer's prioritization regarding management and operational tasks, which made it challenging to collect the necessary data on time.
20	Spain	Anysol	The delay in completing and submitting the data was largely attributable to the involvement of a third party in the data collection process. While Cooperative Agrícola del Norte maintained direct contact with the farmers, Anysol was responsible for translating all reports and information, which added an extra layer of complexity. Additionally, 2024 turned out to be an unusually dry year, with little to no rainfall, further complicating field-related activities and exacerbating the delay in data gathering.
22	UK	FLOX	The delay was caused by an internal restructuring within the company, which impacted the coordination and workflow processes. Furthermore, the departure of the

D4.3 Test Case evaluation report for reporting period 2

TC	Country	TC Leader	Observations
			individual who had expertise in operating the FLOX system necessitated a handover period, further contributing to the delay. This transition required additional time to ensure that the new personnel could effectively manage the system and complete the required tasks.
23	France	IDELE	The delay in data collection was likely influenced by the transition of farm management, as the farmer was in the process of handing over operations to his daughter. This shift in leadership may have temporarily impacted data availability and coordination, as management transitions often lead to changes in priorities and adjustments in farm operations.
24	Belgium	KULeuven	The delay in data collection was due to difficulties in obtaining information from the farmer. While the initial form was completed, the farmer stopped responding for several weeks despite multiple follow-up attempts. As a result, some key metrics were incomplete or missing, including electricity consumption for the farm with DATSs and water usage for the farm without DATSs.
25	France	IDELE	The delay occurred due to internal processes that made it challenging to provide the required data before the end of the month. These internal constraints impacted the ability to meet the initially established deadline.
27	Germany	KULeuven	<p>Last year, this TC did not provide any data. The action plan defined was to invite another farmer to the project. The farmer was changed, and in the 2nd year of analysis, although some delay in uploading data, WP2 was able to complete the Assessment Framework, and the TCL completed the Evaluation Report.</p> <p>The data upload had a significant delay, and the primary reason was farmer engagement, which made it challenging to gather and process the necessary information promptly. Furthermore, the trial focuses on health data—specifically heat detection and rumen digestive tract information—that are stored in a cloud-based system. These results are then sent back to the farmer through a dedicated app, with two antennas in the barn collecting data around the clock. As these are medium-sized farms with minimal high-tech infrastructure, integrating these solutions required additional coordination and led to further delays in completing the overall process.</p>
28	Romania	ANAMOB	The delay was due to the complexity related to the number of farmers, the DATSs, and the parcels

D4.3 Test Case evaluation report for reporting period 2

TC	Country	TC Leader	Observations
			involved. Additionally, the farmers showed some reluctance to provide the data as they did not perceive clear benefits from the DATSs.
29	Lithuania	ART21	The delay was caused by issues related to NextCloud permissions, which restricted access and hindered the timely upload of the required data. This technical limitation required additional time to resolve before the submission could be completed.

5 Evaluation Report of Test Cases

During the project's 5th plenary meeting, held in Lisbon on June 25th and 26th of 2024, a dedicated workshop was conducted on the first day to revise and refine the Test Case Evaluation Report in response to the needs and feedback expressed by the various TCLs.

This revision was primarily aimed at enhancing the report's accuracy in reflecting the realities of data collection, assessment methodologies, and operational challenges encountered during the 2023 testing cycle. Ultimately, it laid the groundwork for a more comprehensive and actionable evaluation framework in 2024.

The adjustments made to the Evaluation Report should take into consideration the mandatory sections defined in the Grant Agreement: Outcomes, Common Conclusions and Lessons Learned, but could include different questions under each section, that were reviewed and improved. Figure 7 illustrates the Evaluation Report from 2023.

Outcomes	Assessment Framework
	<i>(Please provide details on the DATS data collection process, reliability to your TC, and clearness of the Assessment Framework. Identify challenges, and possible recommendations, for the collection of the data associated with the list of indicators)</i>
	Comparison between DATS use and non-DATS use
Common Conclusions	<i>(Please provide details on the challenges of collecting data from farms (or parcels) using the DATS and the farms (or parcels) not using a DATS.)</i>
	Calendar
	<i>(Please provide details on how the calendar for data collection moments were suitable (or not).)</i>
	Training
Lessons Learned	<i>(Please provide details on how the training sessions could be improved <u>in order to</u> facilitate the data collection moments and the evaluation report.)</i>
	Test Case Operability
	<i>(Please provide details on the usefulness of the monitoring and evaluation tools provided (and missing), as well as the communication channels available for troubleshooting and decision-making support)</i>
	Best practices
Lessons Learned	<i>(Please provide information on what were the best practices you found useful for the success of your TC up to the present moment)</i>
	Farmers motivations
	<i>(Please provide information on the farmers' overall motivations towards QuantiFarm, and what (if any) action should be considered towards improving said motivations.)</i>
	Recommendations

Figure 7 – Evaluation Report from 2023.

D4.3 Test Case evaluation report for reporting period 2

The initial version of the report focused largely on the Assessment Framework and the comparison between DATSs users and non-users. However, it became clear that it required some adjustments, as illustrated in Figure 8.



Figure 8 – Adjustments needed on the Evaluation Report.

The Evaluation Report workshop took place under the WP4 session, and its goal was to draft a revised version of the evaluation report for TCLs to be submitted and included in the results of the present deliverable, D4.3 Test Case Evaluation Report for Reporting Period 2.

The new version of the Evaluation Report aims to ask TCLs for as much context as possible about the analysis and the farming activities that took place during the second year of testing. Also, contrary to what happened in the first year of analysis, TCLs had access to the WP2 preliminary results and Assessment Framework report: cost-benefit analysis, expected benefits vs actual benefits of DATSs use and sustainability impact. This Deliverable is also an opportunity to feed information back to WP2, WP3, and WP5.

Project partners presented in the plenary meeting were divided into six groups who worked with flipcharts labelled with one of the mandatory sections under the Grant Agreement: Outcomes, Common Conclusions, and Lessons Learned. The steps of the workshop were the following:

1. Brainstorming for 5 minutes: each group reflected on their assigned section.
2. Content identification for 15 minutes: members wrote at least one relevant suggestion, with guidance from CONSULAI’s facilitator, who encouraged specificity (e.g., including reflections on the cost-benefit analysis under Outcomes).
3. Prioritization and Reporting for 10 minutes: each group selected the top three suggestions on the flipchart and appointed a speaker to present them in plenary.

By focusing on group collaboration, the exercise revealed shared challenges and best practices, which were incorporated into the final version of the Test Case Evaluation Report. As a result, the new report template became better aligned with both project objectives and the on-the-ground experience of the TCLs, ensuring that the evaluation findings would be more robust and readily applicable for future testing cycles.

D4.3 Test Case evaluation report for reporting period 2

The new structure of the Evaluation Report is as follows:

Under the Outcomes section:

- Results from the Assessment Framework
- Relationship between advisor (TC Leader) and farmer

Under the Common Conclusions section:

- Contextualization of the results
- Farming Business Models and DATSs integration

Under the Lessons Learned section:

- Test Case high-level context
- Farmers contribution and motivations
- Recommendations

In each of the sections and subsections listed above, the TCL can find informative bullet points with questions and remarks about the type of information that QuantiFarm is interested in collecting from each Test Case.

Although the TCL has the responsibility of completing the evaluation report, it is important to include the farmer's views and perspectives in this reflection. TCL should involve the farmer as much as possible in the redaction of the report without compromising too much of the farmer's time. The relationship between TCL and a farmer is a personal one, so WP and task leaders fully trust TCL's capacity to involve the farmer in this activity without compromising the farmer's motivation to participate in the project.

One of the main challenges is to collect information that would enable an assessment of common conclusions across different TCs. However, this refinement in the reporting framework means that a direct comparison of results between the 2023 and 2024 test cycles is not feasible due to significant differences in the structure and focus of the evaluation reports. The 2023 report was data-driven, providing clear quantitative indicators such as net benefits per hectare and specific productivity increases, whereas the 2024 report shifted towards a more qualitative approach, emphasizing contextual factors such as resource management improvements, farmer acceptance, and external influences like climate variability. As a result, the two reports should be interpreted independently, with each providing valuable insights into different aspects of the digital agriculture technologies' impact rather than serving as directly comparable datasets.

Nevertheless, we will conduct a comparative cost-benefit analysis between 2023 and 2024 results. In addition to this analysis, a sector-based review will also be conducted, where we take a high-level look at the comments for the chapters "Outcomes," "Common Conclusions," and "Lessons Learned."

In the Evaluation Reports from the 30 TCs presented in the following subchapters, a section with the main KPIs from the Assessment Framework was included. The KPIs considered in this section are the ones impacted directly by the implementation of DATSs on the farm. Furthermore, it is important to note that the KPI variation is not always fully attributable to the implementation of DATSs (e.g. weather conditions).

Table 5 – New Evaluation Report structure.

Test Case Evaluation Report for Year 2	
Partner Name and TC number: <i>[Please enter here]</i> DATs: <i>[Please enter the DATs used in your TC here]</i> Agricultural Sector and Crop: <i>[Please enter here regarding your TC]</i> Biogeographical Region: <i>[Please enter here regarding your TC]</i>	
Main Results	Assessment Framework KPIs directly impacted by the DATs.
Outcomes This section refers to the results of the analysis made	Results from the Assessment Framework
	<ul style="list-style-type: none"> ● Challenges on data collection process ● Comment sustainability results: economic, environmental, and social. Please elaborate on the cost–benefit analysis ● Are there deviations between the results from the Assessment Framework and the expected outcomes before the analysis? How do these results compare to the previous testing period?
Common Conclusions This section refers to the possible reflections based on the Outcomes	Relationship between advisor (TC Leader) and farmer
	<ul style="list-style-type: none"> ● What is the farmer’s opinion about the relevance of the Assessment Framework to agricultural activity? ● Did the farmers had the opportunity to reflect upon the results of the analysis together with the TC Leader? If so, what were the main outcomes of that discussion? If not, please describe the reasons that prevented it.
Common Conclusions This section refers to the possible reflections based on the Outcomes	Contextualization of the results
	<ul style="list-style-type: none"> ● Looking at the results provided by the Assessment Framework, what are the further needed considerations to understand the true impact of the DATs? ● How exceptional circumstances in the TC influenced the results of the Assessment Framework? ● How the farm size or the number of animals/plants influence the results of the Assessment framework?
Common Conclusions This section refers to the possible reflections based on the Outcomes	Farming Business Models and DATs integration
	<ul style="list-style-type: none"> ● How does the farmer define the value provided by the DATs? (ex: cost reduction, time saving, knowledge and information, risk reduction, ability to adapt, etc.) ● The results provided by the Assessment Framework enable some type of (in)validation of the business model used? (either by using the DATs or by not using the DATs) ● What role does the DATs play in scaling up the business model?

Test Case Evaluation Report for Year 2	
<p>Lessons Learned</p> <p>This section refers to the most relevant information that can be extracted from the reflections on the outcomes and conclusions of the TC second year of testing.</p>	<p>Test Case high-level context</p>
	<ul style="list-style-type: none"> ● Conditions for optional application of DATSs on the field based on challenges filed and contextual factors. ● Despite the requisite to have two parcels as similar as possible to make up a QuantiFarm Test Case. There are some inevitable differences between DATSs user and non-user. What is those main difference and how do they influence the results of the Assessment Framework?
	<p>Farmers contribution and motivations</p>
	<ul style="list-style-type: none"> ● What is the opinion of the farmer regarding the results of the Assessment Framework? ● Does the assessment analysis provide relevant results for the farming practice? Please explain why. ● Please elaborate on the farmer’s motivation to keep participating in QuantiFarm for another testing period.
	<p>Recommendations</p>
	<ul style="list-style-type: none"> ● What can be done to improve the quality of the results generated through by the project? ● What information about the results can be used (and how), by farmers and advisors, to assist in decisions about DATSs adoption? ● What information about the analysis can be used to improve the policy makers’ understanding about DATSs adoption and operation?

5.1 TC1

TC1 Evaluation Report for Year 2				
Partner Name and TC number: NEUROPUBLIC, TC1				
DATs: DSS, gaiasense				
Agricultural Sector and Crop: Arable, Potatoes				
Biogeographical Region: Greece, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	+148 €/ha
	Sustainability Impacts	Economic	Yield	+1.9%
			Labour productivity	+13.7%
			N applied (kg/ha)	+54.4%
		Environmental	P applied (kg/ha)	+68.4%
			K applied (kg/ha)	+51.5%
			Pesticides used (kg/ha)	+161.3%
			Water consumption (kg/ha)	-27%
			Irrigation water productivity (kg/ha)	+32%
			Electricity consumption (kg/ha)	-26.7%
			Fuel consumption	-19.3%
			GHG emissions	-7.7%
			Social	Working time (h/ha)
Outcomes	Results from the Assessment Framework			

TC1 Evaluation Report for Year 2	
Common Conclusions	<p>During the process, the primary challenge encountered was communication with the farmers, which was largely attributed to the age gap. This gap made it difficult to fully engage them in the adoption of DATSs at the beginning. From a sustainability perspective, the economic outcomes included an 11% reduction in irrigation, which ultimately led to a decrease in economic activities. However, the environmental impact was positive, particularly reflected in the advice provided to farmers regarding better resource management and sustainable practices. Socially, farmers were initially hesitant to adopt DATSs, but over time, the team successfully persuaded them to embrace the technology. By the end of the process, farmers were satisfied with the results and had become more comfortable using the technology.</p> <p>In terms of deviations from the expected outcomes, one farm experienced a lower harvest due to the biological nature of the potatoes. Another farm produced 3 tons, which was slightly below expectations. However, these results were consistent with the previous testing period, with no significant variations observed. It's also important to note that two of the farmers had used DATSs in the previous year, which likely contributed to a smoother implementation process, as they were already familiar with the technology.</p> <p style="text-align: center;">Relationship between advisor (TC Leader) and farmer</p> <p>The farmers hold a very positive view of the Assessment Framework about their agricultural activities. They value the opportunity to observe the tangible impact that DATSs has on their operations. However, the farmers do not typically discuss the results of the analysis with the TC Leader. Instead, they engage in these discussions with the agronomist from Neuropublic, as this department maintains direct communication with the farmers in the TC.</p>
	Contextualization of the results
	<p>Based on the data collected, a positive impact of using DATSs on agricultural practices was observed. However, exceptional circumstances, such as the severe drought and lack of rainfall, had a significant influence on the results of the Assessment Framework. These conditions led to increased irrigation needs across the farms. While irrigation usage was higher than initially expected, we were able to reduce the need for spraying. Overall, the drought conditions shifted the focus toward irrigation, which in turn affected the outcomes measured by the Assessment Framework.</p> <p>The size of the farm did not significantly influence the results of the Assessment Framework. A more important factor was the spacing between the plants. Ensuring a specified distance between the plants is crucial for proper airflow, which supports healthy plant growth and contributes to more accurate results in the assessment.</p>
	Farming Business Models and DATSS integration
	<p>Farmers are clearly able to see the positive impact of DATSs on their agricultural practices. There has been a noticeable reduction in costs, along with significant time savings in their daily workloads. This is reflected in their</p>

TC1 Evaluation Report for Year 2	
	<p>increasing interest in the technology, as farmers actively approach us to request its implementation on their farms.</p> <p>The insights generated by DATSs help validate the business model, as evidenced by the outcomes of the Assessment Framework. DATSs play a crucial role in scaling up the business model by ensuring productivity through data-driven insights and optimized decision-making, which enhances overall operational efficiency and growth potential.</p>
Lessons Learned	Test Case high-level context
	<p>The application of DATSs depends on costs, technical complexity, farmer acceptance, and contextual factors like farm size and climate. Adoption is easier with technical support, financial incentives, and proper training for seamless integration. For effective DATSs application, proper maintenance of the IoT station by trained personnel and timely, accurate recording of farming practices are also essential. Farm advisors play a key role in interpreting data and supporting farmers, for its effective implementation, while manual data entry poses challenges due to potential errors, which can impact the quality of the advice generated.</p> <p>The main difference between a DATSs user and a non-user is that DATSs users receive tailored advice on agricultural practices, whereas non-users rely on traditional methods for managing their farms. As a result, there are noticeable differences in costs and overall agricultural practices. DATSs users follow the recommendations provided by technology, which often lead to more efficient and informed decision-making, as opposed to the traditional approaches used by non-users.</p>
	Farmers contribution and motivations
	<p>Farmers are highly satisfied with the results of the Assessment Framework. The analysis provides valuable insights that are directly relevant to farming practices. The use of DATSs has enabled more data-driven decision-making, offering crucial information on resource management, crop yield, and cost efficiency. This has helped farmers identify key areas for improvement, such as reducing irrigation needs, optimizing pesticide usage, and saving time in daily operations. These results are directly applicable to their farming practices, empowering them to make informed decisions that enhance both productivity and sustainability.</p> <p>The primary motivation for farmers to continue participating in the project for another year is the cost reduction they have experienced. The ability to save on resources like water and fertilizers has proven to be a significant incentive, encouraging their continued involvement in the project.</p>
	Recommendations
	<p>Improving communication with farmers and ensuring the timely registration of farming activities in the calendar will significantly enhance the quality of the results generated by the project. By doing so, farmers and advisors can</p>

TC1 Evaluation Report for Year 2

leverage the results to evaluate cost savings, productivity improvements, and resource efficiency, allowing them to make informed decisions about DATSs adoption. Advisors can also recommend the most suitable technologies based on the specific needs of each farm, fostering greater efficiency and sustainability.

Policymakers can utilize the analysis to develop financial incentives, promote sustainable farming practices, and address challenges in DATSs adoption. Insights on cost reductions and resource conservation play a key role in shaping policies that support the digital transformation of agriculture.

5.2 TC2

TC2 Evaluation Report for Year 2				
Monitoring and Evaluation of the activities				
Partner Name and TC number: Agromais, TC 2				
DATSS: Precision irrigation, Irristrat				
Agricultural Sector and Crop: Arable, Corn				
Biogeographical Region: Portugal, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	+264 €/ha
	Sustainability Impacts	Economic	Yield	+9.6%
			Labour productivity	-50.4%
		Environmental	Water consumption (kg/ha)	-54%
			Irrigation water productivity (kg/ha)	+27%
		Social	Working time (h/ha)	+146%
Outcomes	Results from the Assessment Framework			
	There were a few main challenges in the data collection process, namely, variability and the sustainability factor.			
	In the case of sustainability, it was not easy to quantify how much was got, but one thing is certain, farms have an increase in flora and fauna that they did not have for many years. Economically it was possible to reduce costs, because whenever a cover crop is installed a incorporation in the the soil occurs, nutrients and water are retained and the main crop will benefit, which allows a decrease in inputs to the soil and crop. On the social side, an immigration move was verified, and staff from other nationalities were integrated.			
	There are always some deviations because one thing is what is predicted, and another is what happens.			
The difference between this year's results and the results of the previous year did not surprise TCL because the years are not all the same, therefore, it is difficult to make a real comparison since the conditions for conducting the crops were not the same.				

TC2 Evaluation Report for Year 2	
	Relationship between advisor (TC Leader) and farmer
	<p>For the farmer, the evaluation framework is always important to help understand what is going on in the field.</p> <p>The results were discussed, and this analysis highlighted some unanimous factors from a sustainability and economic point of view.</p>
Common Conclusions	Contextualization of the results
	<p>A potential for water reduction was observed through greater efficiency in the application of water in the crop. In turn, by being more efficient in this application, the energy costs and, in the case of fertigation use, savings occurred, also, comparing to plots where DATSs are not used.</p> <p>In the TC both farmers already adopted DATSs, so they were quite familiar with these tools.</p> <p>The beneficial effect increases with the farm size. The results that are obtained in the farm with an area of 10 ha and in the farm with 1000 ha, are different. It is also true that the adoption of DATSs has costs, and to recover your investment, you must do the math carefully to see whether it is worth it due to the size of the plots.</p>
	Farming Business Models and DATSS integration
	<p>The farmer assigns great importance to the data collected by the DATSs, not only because it informs him of the state of the soil, but also by analysing this data he know the evolution since the installation of the equipment until the moment he is viewing this data, and thus understand how the crop has progressed.</p> <p>Data analysis allows the farmer to understand the dynamics of crop development. The data does not surprise the farmer since he is aware of his business model that he considers feasible.</p> <p>In the two farms analysed, it was clear that there is a great dependence on this data to carry out the crop development, which indicates that if there is any expansion of the business model, there will necessarily have to be an increase in the use of DATSs.</p>
Lessons Learned	Test Case high-level context
	<p>In this region, there are several types of farmers, some with greater aptitude for adopting precision agriculture tools, others who use them just because they receive subsidies of it, and others who don't even want to hear about them, because they have been farmers for so many years and don't accept advice on irrigation.</p> <p>There are always differences in the plots, but these differences were minimised. One main difference was the irrigation system; the plot where DATSs were used was irrigated by pivot, and the plot that did not have DATSs used drip irrigation. The drip irrigation system is more efficient than the pivot</p>

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	<p>system. Since in the drip plot, DATSs was not used, irrigation data was carried out using empirical methods.</p>
	<p>Farmers contribution and motivations</p>
	<p>The farmer is aware of the values for himself, and his calculations were nothing new. For him, it continues to make sense to adopt these practices. The farmers chosen for the project are very available and have a great ability to show what they do on their farms without hesitation, hoping that they can motivate other farmers to do the same.</p>
	<p>Recommendations</p> <p>At this moment, producers who use DATSs already have a lot of information; what they want now is to work on it and make it clear for immediate use. The paradigm now is to analyse all the information, perhaps taking advantage of AI to help.</p> <p>It is important to promote the use of equipment and technological solutions by demonstrating their results and showing examples that work in other farmers.</p>

5.3 TC3

TC3 Evaluation Report for Year 2				
Partner Name and TC number: ITACYL TC3				
DATs: DSS/Agri-environmental Monitoring, Sativum				
Agricultural Sector and Crop: Arable, wheat and barley				
Biogeographical Region: Spain, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	-47 €/ha
	Sustainability Impacts	Environmental	N applied	-15%
			N use efficiency	+22%
			P applied	-21%
			P use efficiency	+16%
			K applied	-21%
			K use efficiency	+24%
			Fuel consumption	+6%
			GHG emissions	-12%
		Economic	Yield	-8.4%
	Social	Working time	-13%	
Outcomes	Results from the Assessment Framework			
	<p>It's a challenge because farmers have an increasing bureaucratic burden and the responsibility to carry out field work when it's pertinent. Sometimes TCLs ask them for data when it's not a good time, and they can get overwhelmed. Additionally, in most cases, they record their input cost and consumption data in an aggregated way for the entire farm or on average, but not parcel by parcel or separating different products, which makes it more laborious to provide this data in the structure that the project requires.</p> <p>Obviously, the greatest benefit of using the tool is environmental, by not wasting the inputs applied to the soil, as they are utilized by the crop. The main social benefit that farmers obtain is having greater confidence in the decisions they make regarding fertilization and variable rate application. Economically, it depends on the opportunity provided by the weather conditions of that year.</p>			

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	<p>Surprisingly, there is a significant variability in the results between the first two campaigns due to several factors. The first data collection campaign did not have favourable weather conditions for high production, so farmers who adhered to the recommended fertilizer amount saved on inputs and increased their cost–benefit. However, in the parcels that did not use Sativum, the higher fertilizer input did not translate into better yields because the rainfall and temperature regime of that year did not allow it. On the contrary, in the 2024 campaign, the weather conditions allowed for higher yields in those parcels where more fertilizer was applied, amply compensating for the cost of inputs. By not modifying the production target in many parcels, which was expected to be higher at the beginning of spring, it resulted in lower yields and therefore a lower cost–benefit, to the detriment of the DAT.</p>
	Relationship between advisor (TC Leader) and farmer
	<p>It is believed that the key factors in agriculture, such as the meteorological conditions of each parcel, crop varieties, or soil type, including organic matter content and other nutrients, are not considered in these analyses. No matter how many sophisticated tools are used, if the variables are not measured, the yield results will not be favourable, especially in a dryland area like this region, which is so dependent on rainfall.</p> <p>From the beginning, the communication between ITACyL and the farmers has been very fluid and positive. The use of the tool within the project has led some to gain confidence in it, as they were initially reluctant to follow the recommendations and change their fertilization management style. Others have learned to use it correctly, given that, lacking a complete understanding of the tool, they didn't know how to modify the production target once the fertilization plan was created, and thus obtained lower yields in the DAT parcels because they under-fertilized those parcels. Now that farmers have learned, they are more motivated to follow the DAT fertilization recommendations and have all signed up for intensive training courses on this DAT offered by ITACyL.</p>
Common Conclusions	Contextualization of the results
	<p>To fully understand the impact of Sativum, several factors must be considered. Pedoclimatic variability plays a crucial role, as weather conditions directly affect fertilizer efficiency and, consequently, the DAT outcomes. Additionally, farmer confidence and adoption take time to develop, which can influence the consistency of results across different test campaigns. Data collection challenges also impact the assessment, as farmers often record input costs and consumption in an aggregated manner rather than parcel by parcel, making it difficult to analyse detailed economic and agronomic effects.</p> <p>Exceptional circumstances during the test campaigns significantly influenced the results. In the first campaign, unfavourable weather conditions limited production potential, allowing farmers who applied less fertilizer following DAT recommendations to save costs without reducing yields. In contrast, the 2024 campaign experienced better weather conditions, which enabled higher</p>

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yields in plots with increased fertilizer input, making the cost–benefit more favourable for those who did not follow the DAT recommendations. Furthermore, many farmers did not adjust their production targets in response to improved conditions, leading to lower–than–expected cost–benefit ratios.

Farm size and production scale also affect the Assessment Framework's outcomes. Larger farms may benefit more from the DAT due to economies of scale and increased field variability, allowing for better optimization of fertilizer use. Smaller farms, on the other hand, may find DAT adoption less cost–effective due to higher relative investment costs and lower overall fertilizer savings. The differences between wheat and barley production also suggest that the DAT's effectiveness varies depending on the crop type, with wheat showing a greater yield reduction than barley. Additionally, farms that integrate both crops and livestock might experience different outcomes, as natural fertilizer from manure could reduce reliance on DAT recommendations for synthetic fertilizers.

Overall, the variability in results highlights the need for multi–season assessments and large–scale comparisons to determine the true effectiveness of the DAT in improving economic, environmental, and social sustainability.

Farming Business Models and DATSs integration

What farmers value most is being able to compare their fertilization practices with the proposal made by the tool. Until now, they didn't have such a simple way to calculate the nutritional needs of the crop. And another functionality that farmers greatly appreciate about Sativum is being able to zone their parcels to apply variable fertilizer rates based on the potential of each zone and the calculated needs in each one. Thanks to the zoning maps of their parcels generated in Sativum, they can export them and use them in their tractor to apply variable rates, not only of fertilizer but also of plant protection products in the future when they have these machines available.

The results provided by the Assessment Framework suggest unexpected yield reductions when using the DATSs, which calls for a deeper evaluation of the way the trials are being conducted. It is not reasonable to expect that the tool itself would negatively impact final yields, so it is essential to analyse whether external factors, such as pedoclimatic variability or methodological aspects of the study, are influencing the outcomes.

Moreover, the use of the DAT does not prevent a farmer from conducting a new simulation in case of a higher yield expectation. The flexibility of the tool allows for adjustments based on real–time conditions, which means that a lower–than–expected performance may not necessarily be attributed to the DAT itself but rather to how it is being integrated into decision–making processes.

In any case, these types of studies must be conducted over the long term to capture the full benefits of the technology. Agricultural performance is subject

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	<p>to yearly fluctuations, and only a multi–season assessment can provide a solid validation of the business model used, whether it involves the adoption of the DAT or not.</p> <p>There is no formal business model associated with the DATSs, as it is a free tool. However, its scalability among potential users depends on how its long–term economic impact is perceived. If further analysis confirms that it negatively affects yield, its adoption could be significantly hindered, even if it ultimately leads to better economic outcomes by optimizing input costs. Farmers often focus on immediate yield performance, but a proper evaluation should consider multi–year economic analyses rather than just a single season. Short–term fluctuations in yield may not fully reflect the true benefits of the tool, and only a long–term assessment can determine whether the DATSs contribute to sustainable profitability.</p>
Lessons Learned	<p style="text-align: center;">Test Case high–level context</p> <p>A key lesson learned from the second year of testing is the critical role of adaptability in DATS implementation. While the tool offers economic and environmental benefits, its effectiveness depends on how well it integrates real–time decision–making. The assessment framework highlights inevitable differences between DATS and non–DATS parcels, particularly in how farmers adjust their fertilization strategies in response to seasonal conditions. If non–DATS fields are managed dynamically while DATS fields follow fixed recommendations, the comparison may not fully reflect the tool’s potential. Moving forward, ensuring traceability of fertilization decisions and allowing farmers to update DAT recommendations throughout the season will be essential for obtaining a more accurate evaluation of its impact.</p> <p style="text-align: center;">Farmers contribution and motivations</p> <p>The commitment of farmers to using the DATS is highly appreciated, especially considering that even when the season indicated a potential for higher yields, they remained faithful to the tool's recommendations. This demonstrates their willingness to rigorously test the technology and obtain objective conclusions about its effectiveness. Their opinion regarding the assessment framework results is undoubtedly influenced by the observed yield reductions in some cases, which naturally raises concerns. However, they also recognize that these outcomes must be analysed within a broader context, considering factors such as weather variability, adaptation of fertilization strategies, and the potential long–term economic benefits of optimizing input use.</p> <p>The assessment analysis provides relevant insights for farming practices, as it highlights the importance of real–time decision–making and adaptability in fertilization management. The results suggest that the DATS, while beneficial in optimizing input efficiency, must be used with updated recommendations throughout the season to ensure fair comparisons with conventional practices. If non–DATS fields are being adjusted based on seasonal conditions while DATS–managed fields follow a fixed recommendation from months prior, the</p>

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tool may appear to underperform when, in reality, it is simply not being utilized to its full potential. These findings are valuable in guiding future improvements in the way the DATS is implemented in real-world farming.

Farmers remain motivated to participate in QuantiFarm for another testing period because they see the long-term potential of the DATS. Their commitment to following recommendations, even when it resulted in lower yields, demonstrates their strong interest in understanding the tool's true value. However, for continued participation to be meaningful, it is essential to refine the trial methodology, ensuring that DATS recommendations remain dynamic and adaptable throughout the season. Farmers are invested in determining whether the DATS can consistently improve economic and environmental sustainability, and by addressing the current challenges in evaluation, the next testing period could provide more conclusive and actionable insights for both farmers and policymakers.

Recommendations

The involvement of farmers in using the DAT and their long-term vision in demonstrating its efficiency are highly valued. Their commitment to the project and their willingness to test the tool under real farming conditions provide valuable insights into its potential impact. However, it is essential to clarify with them how they adapt their decision-making in fields where they do not use the DAT compared to those where they do. If farmers adjusted their fertilization decisions in non-DAT parcels based on rainfall conditions during the season but did not do so in the DAT-managed plots, this creates a significant disadvantage. The tool cannot be fairly evaluated if its recommendations remain unchanged from four months prior while decisions in non-DAT fields are continuously updated based on real-time conditions.

To improve the quality of the results, ensuring traceability of fertilization decisions in both DAT and non-DAT fields would be beneficial. This would allow for a more accurate assessment of whether the DAT is being used with the same level of updated information as conventional practices. If farmers are actively adjusting their fertilization strategies based on evolving weather conditions, the DAT should allow them to do the same. The tool's effectiveness should be tested under realistic conditions where farmers can run updated simulations throughout the season, rather than being constrained by outdated recommendations. This will provide more reliable data to support decision-making about its adoption.

From a policy-making perspective, these insights highlight the importance of continuous adaptation and flexibility in digital agricultural tools. Policymakers should recognize that rigid application of technology without real-time updates may lead to misinterpretation of its effectiveness. Additionally, the commitment of farmers to faithfully execute the project, even when it resulted in lower yields, demonstrates a strong willingness to engage with innovation. This suggests that, with the right adjustments, DAT adoption could be encouraged through policies that support ongoing monitoring and adaptive decision-making rather than fixed, pre-season recommendations.

5.4 TC4

TC4 Evaluation Report for Year 2				
Partner Name and TC number: Augmenta TC4				
DATs: VRA add-on for old tractors, Augmenta Field Analyzer (AFA)				
Agricultural Sector and Crop: Arable, Cotton				
Biogeographical Region: Thessaly and Macedonia Prefectures, Greece, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	-106 €/ha
	Sustainability Impacts	Economic	Yield (t/ha)	-5.1%
		Environmental	Nitrogen applied (kg/ha)	-13.6%
			Pesticides applied (kg/ha)	-23%
			GHG emissions (KG CO ₂ eq/ha)	-13.6%
Results from the Assessment Framework				
Outcomes	<p>The comparison of the applications was combined with ground truth measurements, yield data, and data regarding the quality of the cotton fibre. Yield data remains challenging given that no commercially available harvesting equipment is considered trustworthy enough for yield map production, and the soil source of yield data is by gravimetric determination. The productions must be weighed separately, an approach that is often less accurate and logistically challenging.</p>			
	<p>As expected, data analysis suggests that DAT might contribute to a more sustainable production of a highly demanding crop such as cotton. Reduction of multiple inputs was realized during the production process (PGR, HA, N fertilizers, Insecticides) without compromising productivity, which means a reduced environmental input and production cost for the farmers.</p>			
	<p>There are no deviations between the results from the Assessment Framework and the expected outcomes before the analysis.</p>			
	Relationship between advisor (TC Leader) and farmer			
<p>During the cultivation period, information was gathered regarding significant parameters that can impact crop productivity in every field of the Test case (for example, plant heights in case of PGR application and the number of individual insects in case of Insecticide application). As part of the assessment, yield and quality characteristics were recorded at the end of the cultivation period.</p>				

TC4 Evaluation Report for Year 2	
	<p>The farmers were highly involved in the process. All steps involved were thoroughly explained and discussed with them to ensure they had a deep understanding of the expected outcomes, the limitations and the potential benefits. Consequently, yield data just confirmed for them the expected outcomes.</p>
Common Conclusions	Contextualization of the results
	<p>Apart from the financial benefits, which are evident to the farmer, sustainability also includes social and environmental impacts. However, these impacts are hard to quantify to make it easier for the end user to realise the added value of the DAT's usage. For example, reduced inputs during the production process, means a reduced environmental impact, and consequently a healthier working and living environment for the farmer, smaller risk of exposure to harmful chemicals, reduced working hours as the operator can complete his operations with less tank refills, etc.</p> <p>Exceptional circumstances, such as the extended heatwaves that were recorded this year, might influence the results since they directly affect the number and type of applications carried out during the production period. However, it is expected that such exceptional circumstances will have a comparable impact in plots where an operation is carried out with the use of DAT or conventionally. Thus, it will not affect the expected outcome.</p> <p>The DAT was tested in large scale pilots, in commercial farms. Consequently, timely ground truth measurements and representative sampling was often challenging due to the fields' size and the pilot's scale. Meticulous planning and combined effort by all stakeholders ensured that the results of the Assessment framework remained unaffected.</p>
	Farming Business Models and DATSs integration
	<p>DAT offers an easy plug 'n play solution to the farmers that can realise multiple benefits. First and foremost, it is designed to impose savings during multiple agrochemical applications the magnitude of which depends on the current fields condition. These savings result in the reduction of the production cost.</p> <p>The DAT is an easy-to-use solution that does not require extensive training and does not intervene with the farmer's planning given that no additional resources (time and labour) are required for its adoption. Finally, the data gathered (Vegetation Index Maps and high-resolution snapshots) during an operation –or when driving in a field–can provide added value for future planning and management options (e.g. selecting other practices or increased soil fertilization in poor areas), since they provide valuable insights regarding the fields' condition</p> <p>According to the results, the savings imposed result in a reduced production cost. Moreover, despite the reduction of the inputs –or even because of it and the subsequent rationalisation of the range added in each consecutive loci– a</p>

TC4 Evaluation Report for Year 2	
Lessons Learned.	<p>tendency towards increased productivity (increased yield) has been recorded when using the DAT, which validated the business model used.</p> <p>The DAT was tested in large scale pilots, in commercial farms. Thus, the true impact is immediately evident to the farmers. The larger the farm, the greater the benefits that can be realised and the greater the ROI.</p>
	Test Case high-level context
	<p>DAT cannot be used under low light intensity or unfavourable weather conditions. DAT is equipped with hardware and software designed to mitigate changes in light intensity, e.g., the presence of clouds. However, given that the core of DAT is a passive optical sensor, factors that affect clear view, e.g. fog, rainfall, and the presence of snow on the field, might compromise the quality of the operations. Likewise, DATS cannot currently be utilised during night operations and the sun elevation must be over 12 degrees.</p> <p>Vegetation Index maps of consecutive production periods and productivity maps are taken into consideration to ensure that comparable parcels are selected. If necessary, regions are exempted from further analysis, e.g. regions extremely damaged from flash flooding.</p>
	Farmers contribution and motivations
	<p>Both farmers who used the DAT during the previous cultivation period were quite satisfied. For the evaluation of DATS, the farmers took into consideration their personal evaluation of the ground truth assessment into their farms as well as the final results that combined the inputs' savings and the efficiency of the operations.</p> <p>The assessment analysis includes a lot of information regarding the growth of the crop throughout the cultivation period, including data regarding the plant height, the percentage of open Balls, etc., which can assist the farmer in making data-driven decisions. Moreover, this information can be directly linked to yield data and quality characteristics of the harvested product, which is essential for long-term farm management.</p> <p>The farmers participating in QuantiFarm were genuinely interested in adopting new technologies. Given that they were participating in the project with large-scale pilots, they had the opportunity to realise the exact magnitude of the positive impact of the DAT and are, therefore, willing to keep participating for another testing period.</p>
	Recommendations
	<p>Close collaboration with the farmers especially at the challenging points of the pilot (eg harvesting) in order to minimise the chances of malpractices, that will result in loss of crucial data (ground truth measurements, yield data etc).</p> <p>DAT offers a solution that can realise multiple benefits to the farmers. The savings achieved during multiple agrochemical applications, when translated</p>

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to reduction of the production cost can be used as an indicator to assist in deciding whether to adopt DATSs or not. The tendency of increased productivity can be used as a complementary indicator, since the yield increase is directly translated in increased income.

The benefits are usually proportional to the farm size and highly dependable to the crop type. Thus, cost reduction and income increase should be evaluated in this context in order to estimate the respective ROI.

In addition, using a different VRA type of operation, the farmer can gather insights about his farm that will define future decisions about his cultivation practices. E.g. using Nitrogen VRA, he can identify low productivity areas, using PGR he can identify areas with extensive vegetation etc.

As already mentioned, additional benefits can be realised on a socio–environmental level. Reduced inputs of agrochemicals reduce the risk of the farmers' exposure to harmful substances and contributes towards a healthier working and living environment for the farmer, reduced working hours as the operator may complete his operations with less tank refills, etc. This information is not easily quantifiable in order to make it easier for the end user to realise the added value of the DAT's usage.

5.5 TC5

TC5 Evaluation Report for Year 2					
Partner Name and TC number: Horta – TC5					
DATs: SF DSS					
Agricultural Sector and Crop: Arable, Wheat					
Biogeographical Region: Turkey, Anatolian					
Main Results	Cost and Benefit	CBA	Net Benefit	+195 €/ha	
	Sustainability Impacts	Economic	Yield (t/ha)	+1.4%	
			Labour productivity (t/h)	-2%	
			Protein (% on dry matter)	+20%	
		Environmental	Nitrogen applied (kg/ha)	-37.6%	
			Nitrogen use efficiency (%)	+21.5%	
			Phosphorus applied (kg/ha)	-38.3%	
			Phosphorus use efficiency	-25.3%	
			Pesticides applied (kg/ha)	-6.4%	
			Working time (h/ha) Water use (m ³ /ha)	+11%	
			Irrigation water productivity (m ³ /ha)	-10%	
			Fuel consumption (l/ha)	-1.2%	
			GHG emissions (KG CO ₂ eq/ha)	-29.5%	
			Social	Working time (h/ha)	-3.8%

TC5 Evaluation Report for Year 2	
Outcomes	Results from the Assessment Framework
	<p>Data on the crop management operations carried out in the parcels were entered as input in the Decision Support System. The main challenge was the communication with farmers, due to the language barrier. Being the second year of use, the process improved, but some remarkable difficulties were still present in the use of the DSS.</p> <p>The use of the DATSs led to a positive impact in the economic domain, mainly due to the improvement in the quality of the harvested product, as a direct consequence of the optimisation of the agronomic techniques adopted in the fields. The impact on yield in general is also positive, while a small reduction of labour productivity was observed.</p> <p>From an environmental point of view, the use of the DATSs led to an optimisation in the input of nutrients, regarding the amount of Nitrogen and phosphorus applied to the crops. It also had a direct impact on the amount of Plant Protection products applied, which was decreased in the fields using DATSs. On the other hand, the use of the tool led to an increase in water usage to better align with crop requirements.</p> <p>Fuel consumption was reduced, as well as the total amount of GHG emissions, thanks to the general reduction of the use of technical inputs.</p> <p>From the social point of view, a slight reduction of the working time was highlighted.</p> <p>The cost–benefit analysis highlights a net benefit, mainly due to savings thanks to the optimisation of the cultivation technical inputs, especially for the fertilisers. In both years a positive cost–benefit analysis was assessed.</p>
	Relationship between advisor (TC Leader) and farmer
	<p>The assessment highlighted clearly the positive effects the use of DATSs can have on the farmer's agricultural activities. The repeated experience of positive effects generated from the use of DATSS can build up trust in the tool from the farmers.</p>
	Contextualization of the results
Common Conclusions	<p>The comparison of the use and non–use of DATSS was performed in the same farms, in two different plots, so that comparison of the obtained data can be considered robust.</p>
	Farming Business Models and DATSS integration
	<p>The most important point for the evaluation of the utility of the DATSs is the economic aspect. The result is satisfactory, as the use of DATSs allowed both to reduce costs by mean of the optimisation of technical inputs, and to improve the harvested product quality, which deserved an increase price.</p>
	Test Case high–level context

TC5 Evaluation Report for Year 2	
Lessons Learned	<p>The comparison of the use and non-use of DATSs was performed in the same farms, in two different plots, thus allowing to avoid main bias linked to the analysis of different farms. This approach was more demanding for the farmers, as they had to apply two different management strategies for the same crop but it was also interesting for them to see how the use of the DATSs allowed improvement in the crop management.</p>
	Farmers contribution and motivations
	<p>The Assessment Framework provides useful results for the farms, testifying the positive impact of the use of the DATSs. Anyway, the effort required in the implementation of the use of the DATSs is impactful for them, as well as the recoding of the large amount of data requested for the calculation of the impacts.</p>
	<p>The results of the Assessment Framework prove the value of the application of the DATSs, and expectations are also positive for the third testing season.</p>
	Recommendations
	<p>It is important to clarify the data request at the very beginning of the collaboration so that every actor can have its commitment in the project clear.</p> <p>The information collected is useful to prove the advantages of the use of DATSs in the monitored parcels, providing a comparison to the normal practice of the same farmer. For the farmer, the economic aspect can be the most relevant in the short term, while the environmental one can become relevant in the longer term.</p> <p>The environmental aspects can be more relevant for the policy makers, which can have a prospection of the positive impacts which can be achieved from the upscaling adoption of the tested DATSs at regional or wider geographical scale.</p>

5.6 TC6

TC6 Evaluation Report for Year 2					
<p>Partner Name and TC number: <i>Delphy – TC 6</i></p> <p>DATSs: <i>QMS Water & Estede</i></p> <p>Agricultural Sector and Crop: <i>Arable – Potato & Onion</i></p> <p>Biogeographical Region: <i>Atlantic</i></p>					
				Onion	Potato
Main Results	Cost and Benefit	CBA	Net Benefit (€/ha)	2544	-1,244
	Sustainability Impacts	Economic	Yield (t/ha)	+36.5%	-8.6%
		Environmental	Electricity consumption (kWh/ha)	+7.8%	+35.6%
			Water consumption (m3/ha)	+8%	-8%
			Irrigation water productivity (t/m3)	+27%	-0.4%
		Social	Working time (h/ha)	+230%	+100%
Outcomes	Results from the Assessment Framework				
	<p>One of the main challenges in data collection was the limited availability of precise operational data from the farmer, particularly regarding working time. Many farmers are primarily focused on running their farm efficiently rather than documenting every detail of the process. As one farmer described, "A farmer farms", meaning that their priority is crop performance, not tracking exactly how much energy or time was used during irrigation.</p> <p>This practical mindset often means that detailed records on water volumes, labor hours, or energy use are not systematically recorded, especially on farms not using digital systems. As a result, baseline data for comparison is often</p>				

TC6 Evaluation Report for Year 2	
	<p>incomplete or based on estimations, which can reduce the reliability of comparisons in the assessment framework.</p> <p>It is interesting to see that for one of the two crops, the implementation of DATSs resulted in a net positive benefit. However, it is important to note that these results are based on a single year of trials without repetitions, which limits the strength of the conclusions.</p> <p>Still, TC leaders hope that farmers will feel encouraged when they see that working with digital agricultural technologies can offer clear advantages. Demonstrating tangible benefits in practice could be an important step in building trust and interest in these tools within the farming community.</p> <p>There were clear deviations from expected outcomes, especially in the case of potatoes. The DATSs system was expected to improve water use efficiency and yield but yield instead declined. This contradicts initial assumptions that smart irrigation would consistently lead to productivity gains. The decline may be due to unaccounted agronomic stress factors, which the system could not compensate for.</p> <p>In onions, the results exceeded expectations, both in terms of yield and water productivity. The crop responded very well to improved irrigation management, demonstrating the potential of DATSs when aligned with crop physiology and needs.</p>
	<p>Relationship between advisor (TC Leader) and farmer</p>
	<p>The farmer considers the Assessment Framework valuable and relevant for evaluating the impact of digital technologies on agricultural practices. However, he also pointed out that "one year is no year" highlighting the fact that farming outcomes can vary greatly due to seasonal conditions and that a single-year assessment is not enough to draw firm conclusions.</p> <p>He expressed hope that in the coming year, both crops will show a positive net benefit, which would help further demonstrate the practical value of the technology across different contexts and seasons.</p> <p>The farmer has not yet had the opportunity to reflect on the results of the analysis together with the TC Leader due to time constraints. He has reviewed his own data and drawn conclusions independently. However, TCL plans to discuss the outcomes with him at a later stage.</p>
<p>Common Conclusions</p>	<p>Contextualization of the results</p>
	<p>In this case, the system used was QMS Water in combination with soil moisture sensors, which directly influenced irrigation management. However, the outcomes were highly crop-dependent, and the data came from only a single season without repeated trials, making it difficult to separate technology-driven effects from natural variation due to weather, soil conditions, or pest pressure.</p> <p>To gain a more accurate understanding of the DATSs impact, we need:</p> <ul style="list-style-type: none"> • Multi-year trials to capture seasonal variability.

TC6 Evaluation Report for Year 2	
Lessons Learned	<ul style="list-style-type: none"> • Possibly replicated plots or on-farm trials across diverse locations. <p>The exceptionally wet spring and overall extreme rainfall this year significantly influenced the results of the Assessment Framework. These unusual weather conditions likely mitigated some of the expected impacts. In a dry year, the influences on the outcomes might have been more pronounced.</p> <p>In this case, farm size did not influence the results of the assessment framework. The analysis focused on the relative performance of the DATSs system (QMS Water with soil moisture sensors) compared to conventional practices, making the outcomes scale independent.</p>
	Farming Business Models and DATSs integration
	<p>The farmer sees the main value of the DATSs in the flexibility they offer in the long run. While the initial setup and learning phase can be labor-intensive, he believes that once the system is running smoothly, it allows for more precise and responsive irrigation management. This ultimately provides greater flexibility in how and when decisions are made on the farm, particularly regarding water use. Over time, this could support better planning, reduce risks, and improve adaptability to changing weather conditions.</p> <p>The results provided by the Assessment Framework don't validate the business model used. Also, DATSs don't play a role in scaling up the business model.</p>
	Test Case high-level context
	<p>For the optional application of DATS (Digital Agricultural Technology Systems) in the field, several key conditions must be met. First and foremost, the farmer must be interested in technology and recognize the value of precision irrigation, such as the benefits of drip irrigation. This includes understanding how DATS can improve water use efficiency and reduce waste, leading to cost savings and better crop yields.</p> <p>Additionally, farmers must be open to adopting automated systems and be willing to invest the time and effort needed for the initial setup and learning curve. While technology can save time and effort in the long term, it requires a certain level of technical comfort and adaptability, especially when integrating with existing farm operations.</p> <p>Contextual factors also play a role, such as crop type, farm size, and local climate conditions. For example, drip irrigation systems are most beneficial in areas where water availability is limited or in crops that are highly responsive to precise water management.</p> <p>In our test case, both the DATS and non-DATS parcels are located on the same farm.</p>
	Farmers contribution and motivations
	<p>The farmer is cautious about interpreting the results, emphasizing that "one year does not make a trend." He notes that last year was not a particularly good year</p>

TC6 Evaluation Report for Year 2	
	<p>for irrigation, which may have affected the outcomes. Therefore, he prefers to view the results with some reservation.</p> <p>The assessment analysis provides partially relevant results for the farming practice. This farmer supports the technology itself, but he does not base his decision to continue or discontinue its use solely on the one year of data provided by QuantiFarm. He considers the results as part of a broader, longer-term evaluation.</p> <p>The farmer is motivated to continue participating in QuantiFarm based on the agreements that have been made.</p>
	Recommendations
	<p>Improving the quality of the results is challenging due to the nature of real-life farming conditions, which inherently include many uncontrollable variables. However, this is also the core setup to assess technologies under real, practical conditions. While it may limit precision, it increases relevance for actual farming practice.</p> <p>The results can inspire farmers and advisors by showing that technologies like drip irrigation may be especially appealing to those with an interest in innovation and digital tools. The project highlights that digital support systems are available to help improve decision-making. However, it is important to be cautious when drawing firm conclusions from the data, as the results are not based on scientific research. Rather, this project serves as a source of inspiration for arable farming, offering practical insights rather than definitive evidence.</p>

5.7 TC7

TC7 Evaluation Report for Year 2				
Partner Name and TC number: FFP2, 7				
DATSs: SF DSS/ App				
Agricultural Sector and Crop: Arable, Potatoes				
Biogeographical Region: Poland, Continental				
Main Results	Cost and Benefit	CBA	Net Benefit	+3 €/ha
	Sustainability Impacts	Environmental	Water use (m ³ /ha)	-11%
		Environmental	Irrigation water productivity (kg/m ³)	+40%
Outcomes	Results from the Assessment Framework			
	<p>The farm has been collecting and analysing data related to agricultural production for a long time because only in this way can it effectively improve its performance and make better decisions about its crops. Modern technologies such as DATSs enable more precise planning of key processes such as irrigation. The use of DATSs systems allows you to accurately determine both the amount and timing of crop irrigation, leading to optimized irrigation planning. Thanks to this system, it is possible to effectively manage water resources, which directly affects:</p> <ul style="list-style-type: none"> • improvement of expected yields. • maximum use of nutrients contained in the soil. • minimisation of losses resulting from excessive or insufficient irrigation. • reduction of costs related to water consumption. 			
	Relationship between advisor (TC Leader) and farmer			
<p>Farmers are increasingly appreciating the benefits of DATSs and are convinced that the implementation of modern data management systems is the only way to achieve satisfactory economic results in agriculture. The key aspects that convince farmers to use DATSs are:</p> <ul style="list-style-type: none"> • the ability to make more precise decisions about the amount and timing of irrigation. • real-time analysis of soil moisture levels. • reduction of labour intensity through automation and analytical support. • Improvement of agricultural production efficiency through precisely tailored irrigation strategies. <p>Cooperation between the agricultural advisor and the farmer plays a key role in the implementation of DATSs systems. The advisor helps in interpreting the collected data, proposes appropriate solutions, and supports the farmer in</p>				

TC7 Evaluation Report for Year 2	
	making data-driven decisions.
Common Conclusions	Contextualization of the results
	When analyzing the impact of DATSs systems on a farm where most potato plantations are irrigated, we notice some difficulties in comparing the actual effects of the system. This is because when a farmer makes crop decisions without using DATSs, they often rely on data from fields equipped with the system. This demonstrates the importance of DATSs technology for the entire farm, not just for selected crops.
	Farming Business Models and DATSs integration
	<p>The implementation of DATSs brings significant savings and benefits, such as:</p> <ul style="list-style-type: none"> • precise determination of the correct irrigation rate and timing. • effective monitoring of crop water requirements. • optimization of the irrigation process, which leads to a reduction in water losses. • improved irrigation efficiency and increased efficiency of nutrient uptake. • achievement of higher yields due to optimal soil moisture during the growing season. • ensuring adequate quality which is crucial for the market value of agricultural products. <p>The use of DATSs enables a uniform water management strategy and consistent farm-wide agricultural practices. This allows the farmer to better adapt his activities to changing weather and soil conditions, which translates into increased production efficiency.</p>
Lessons Learned	Test Case high-level context
	<p>On-farm observations and analyses using DATSs systems indicate that this technology has great potential for the future of precision farming. Its further development, including integration with artificial intelligence systems and automation of decision-making processes, can further improve agricultural production management and increase farm profitability. The adoption of new technologies, the education of farmers and openness to innovation are key to further progress in this sector.</p> <p>The use of DATSs requires access to the appropriate technical infrastructure, i.e. data collection devices (sensors, monitoring systems) and analytical platforms capable of processing this data.</p> <ul style="list-style-type: none"> • Cooperation between the farmer and the advisor is crucial as it allows for the correct interpretation of the results and informed decisions to be made based on these results • Areas where weather conditions and soil moisture levels vary, benefit from the precise selection of the amount and timing of irrigation. • Farms where water optimisation and minimising losses (e.g. due to over- or under-irrigation) are important can benefit from the implementation of DATSs.

TC7 Evaluation Report for Year 2	
	<ul style="list-style-type: none"> In practice, there may be a problem with comparing the effects – data from DATSs–equipped fields can influence decisions about fields that do not have a system.
	Farmers contribution and motivations
	<p>Farmers are positive about the results of the DATSs evaluation. Their opinion is based on the following observations:</p> <ul style="list-style-type: none"> Precision of decisions: The system enables accurate decisions to be made regarding the application rate and timing of irrigation, which has a direct impact on the quality and quantity of crops. Savings: Reduction of water–related costs and minimization of losses due to suboptimal irrigation. Advisory support: Cooperation with an agricultural advisor who helps with the interpretation of data, builds trust in technology and supports the daily management of the farm. <p>The evaluation analysis provides valuable results that result from several key aspects:</p> <ul style="list-style-type: none"> Irrigation optimization: With precise data on soil moisture and crop water needs, farmers can fine–tune the irrigation process, leading to better water use. Increased efficiency: Precise water dosing and irrigation schedule adjustment lead to improved crop quality and increased yields. Cost reduction: Reduced water loss and better management of financial resources contribute to lower production costs Response to changes: The ability to monitor conditions in real time allows you to react quickly to changing environmental conditions, which is especially important in unstable weather conditions. Despite some difficulties in comparing results between fields with and without DATSs, the system provides consistent data that significantly supports daily agricultural decisions. <p>A farmer chooses to continue participating in the QuantiFarm program because:</p> <ul style="list-style-type: none"> Measurable economic benefits: noticeable savings on irrigation costs and better yields translate directly into better financial results for the farm. Improved production efficiency: precise irrigation to the needs of the crop allows for better nutrient utilization and higher quality results. Expert support: continuous cooperation with an advisor enables continuous improvement of management. Technological development prospects: the ability to integrate DATSs with new solutions such as artificial intelligence or automation promises even greater efficiency in the future.
	Recommendations
	<p>The following actions could be considered to improve the quality of the Project's results:</p>

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- Improvement of data collection technology: upgrading sensors and monitoring devices to provide even more accurate data.
- Integration of advanced analytical systems: implementation of AI-based solutions for better data processing and interpretation.
- Standardization of methodologies: introduction of uniform standards for data collection and analysis throughout the project on-site monitoring and feedback: systematically evaluate performance and adjust irrigation strategies based on the data obtained.

Farmers and advisors can benefit from the following information:

- Water consumption data: detailed measurements of the amount of water applied to each field to assess the effectiveness of irrigation.
- Soil moisture monitoring: real time information on soil moisture levels to quickly respond to changes.
- Crop performance comparison: analysis results showing how precise irrigation affects crop quality and quantity.
- Financial savings: reports illustrating the reduction of operating costs through optimized water management.
- Irrigation Efficiency Analyses: data on minimizing water loss and improving nutrient utilization in the soil.

Policymakers can use DATSs analysis to better understand the problems associated with the adoption and operation of the system by:

- Reviewing water efficiency reports: data showing how DATSs implementation translates into water savings and better resource management.
- Investigating crop productivity analyses: statistics on crop quality and yield improvements that can serve as a basis for introducing support schemes.
- Considering economic comparisons: information on reduced production costs and financial savings that justify investment in modern technologies.
- Examples of farms where the use of DATSs has contributed to increased productivity and profitability, supporting arguments for financial and legislative support.
- Inclusion of policy recommendations: conclusions for further development of technologies and education of farmers that can shape policies supporting innovation in agriculture.

5.8 TC8

TC8 Evaluation Report for Year 2				
<p>Partner Name and TC number: <i>Agrosmart SIA – TC8</i></p> <p>DATSs: <i>Silos management</i></p> <p>Agricultural Sector and Crop: <i>Arable, Wheat</i></p> <p>Biogeographical Region: <i>Latvia, Boreal</i></p>				
Main Results	Cost and Benefit	CBA	Net Benefit	+3.1 €/t
	Sustainability	Economic	Labour productivity	+220%
	Impacts	Economic	Quality control time ratio	–64%
Outcomes	Results from the Assessment Framework			
	<p>There are no major challenges in data collection. However, there are critical periods (referring to the season) when all employees at the elevators are very busy and do not have time to provide data. In all other cases, everything is okay. Additionally, the relationship with the company is good, and we maintain mutual communication.</p> <p>DATSs provides tangible economic benefits. It increases productivity and contributes to saving both time and costs. Since most processes are recorded with the help of DATSs, it facilitates process monitoring and ensures that grain quality is always clear while preventing any mix-ups. Moreover, it helps protect against theft or incorrect data submissions. The results are approximately as expected. However, the greatest influence on overall outcomes comes from economic challenges beyond the company's control, such as fuel and electricity prices.</p>			
	Relationship between advisor (TC Leader) and farmer			
<p>The company's responsible staff were introduced to the system evaluation results. The company representative gave positive feedback on the DATSs evaluation and believes that such information is very important and relevant. They understand that it provides tangible benefits, but it is difficult for them to assess it since they have been using DATSs for several years. However, they emphasize that it saves a significant amount of time by eliminating manual work, as a large portion of the information is uploaded automatically.</p>				
Common Conclusions	Contextualization of the results			
	<p>To better understand the difference between those using DATSs and those who do not, more testing with a larger number of participants is needed. Although Latvia is not a large country, it has diverse terrain and climatic conditions. Additionally, the proximity of companies to major cities also plays</p>			

TC8 Evaluation Report for Year 2	
Lessons Learned	<p>a role, as it leaves smaller areas available for farming. The size of the farm and its ability to serve a larger number of clients also influence the results.</p> <p>Depending on the size and location of the company, differences can also be observed among DATSs users. Larger companies often have greater needs, which leads to a demand for additional functionalities that provide extra benefits. If we were to compare these users with those who do not use DATSs, we would observe even more differences.</p> <p>However, smaller companies find it more challenging to implement such solutions, as additional functionalities come with extra costs that they may not always be able to afford.</p> <p>Differences can also be observed between seasons, as fluctuations in service costs (such as gas, fuel, and electricity) have an impact.</p> <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>The company uses DATSs to improve work efficiency, as its implementation speeds up processes and reduces costs. It also enhances information management by centralizing all data in one place. Additionally, integrations with separate tools allow data to be transferred directly into the system, minimizing the risk of human error. DATSs also play a crucial role in controlling operations related to grain storage.</p> <p>DATSs significantly contribute to communication with clients. Since all data is stored in one place, customers can access information about the grain being sold much faster. Moreover, DATSs greatly enhance security. Automatic data integrations and centralized data management provide additional security in monitoring grain and its related processes.</p> <p style="text-align: center;">Test Case high-level context</p> <p>The main differences between those who use DATSs and those who do not are data entry, management, and storage. Those who do not use DATSs often struggle to manage a large portion of their information, as it is scattered across different locations. Some data may be stored on a computer, some on a phone, and some in handwritten notes. This directly impacts work efficiency, accuracy, and transparency.</p> <p>When needed, it becomes difficult to get a comprehensive overview, monitor stored grain, communicate effectively with clients, and provide timely information. Additionally, without centralized data management, certain analyses cannot be performed, making it harder to manage emerging risks.</p> <p style="text-align: center;">Farmers contribution and motivations</p> <p>The company positively evaluates the obtained results and is interested in observing the comparison and the advantages provided by using the system.</p>

TC8 Evaluation Report for Year 2	
	<p>However, they note that the results may vary, as they depend on fluctuating prices, grain season quality, clients, and additional requirements.</p> <p>The evaluation analysis highlights the key advantages between those using DATSs and those who do not. Further insights could be gained by analyzing differences among various DATSs users, as this would reveal the benefits of different functionalities.</p> <p>The farmers will continue participating in the project as they are eager to see new insights after another year. However, the main request is to collect data outside the peak work season.</p>
	Recommendations
	<p>Based on the obtained results, it is possible to explore additional areas for improving the analysis outcomes. However, the most effective approach would be to implement additional functionalities that provide more comprehensive information and results. Nevertheless, the implementation of additional functionalities comes with extra costs.</p> <p>The results could also be utilized for conducting various training sessions for agricultural companies, businesses, and farmers to demonstrate the tangible benefits of technology and the value of digitalizing their processes. This could serve as a best–practice example.</p> <p>Highlighting the clear advantages of digitalization could help stakeholders better understand and visibly recognize its benefits. In turn, this could support decision–making when planning new financial years, allocating subsidies, grants, or necessary funding to enable companies to adopt DATSs more quickly and efficiently.</p>

5.9 TC9

TC9 Evaluation Report for Year 2				
Partner Name and TC number: [KGZS, TC9]				
DATs: [FMIS: Farm Manager]				
Agricultural Sector and Crop: Arable, Wheat and Corn				
Biogeographical Region: Slovenia, Alpine				
Main Results	Cost and Benefit	CBA	Net Benefit	+63 €/ha
	Sustainability Impacts	Economic	Labour productivity	-19.5%
			Test weight (kg/hl)	+9%
			Nitrogen applied (kg/ha)	-47.1%
		Environmental	Nitrogen use efficiency (%)	+34.5%
			Phosphorus applied (kg/ha)	-68%
			Phosphorus use efficiency (kg/ha)	+49.1%
			Potassium applied (kg/ha)	-70.1%
			Potassium use efficiency (kg/ha)	+55.1%
			Fuel consumption (l/ha)	+3.1%
Outcomes	Results from the Assessment Framework			
	<p>There are always challenges in data collection because first is need to prepare tables in Slovenian, which are pre-filled with the data available to TCL before sending them to farmers via email for completion. Then we set deadlines, which farmers never adhere to. Even when they do return the tables, they are often poorly filled out, with many key data points missing. As a result, we must call farmers and conduct interviews until we have all the necessary data. This process is quite demanding, and we always struggle with data delivery on time at the end of October.</p> <p>The impact of DATs in TC9 will only become apparent after several years, and even then, it will depend on the farmers' decisions. TCL provided to the farmers data insights, showing comparisons with other farms, but the decision to adopt the advice and make any changes in production technology remains entirely up to them. The changes they can implement include optimizing the</p>			

TC9 Evaluation Report for Year 2	
	<p>number of field operations (e.g., reducing the number of soil treatments, changing the method, or using fewer pesticides and fertilizers, which saves fuel) or using different, more cost-effective fertilizers and pesticides. This makes it very difficult to comment on the sustainability results of TC9, as the analysis does not directly show the actual impact of DATSs. Instead, it highlights differences in how farmers using DATSs compared to those without DATSs carried out their production practices. These differences also stem from variations in yields (which are influenced by weather and soil conditions) and fluctuating prices.</p> <p>Looking at 2024, one might get the impression that DATSs in TC9 reduces fertilizer costs for both maize and wheat while increasing fertilizer use efficiency (N, P, and K) in maize. However, these differences between DAT and non-DATSs farms are due to individual decisions made by farmers regarding which fertilizers to use, the applied quantities, fertilizer prices, and yields on specific farms.</p> <p>It will take several years for DATSs to influence these parameters, as farmers will need time to adjust their practices based on benchmark analyses to achieve cost reductions or adopt new technologies. The only certain conclusion is that DATSs increases the administrative workload, as it requires time for reviewing, entering, and analysing data. However, in the long run, this should contribute to reducing agricultural production costs while also easing farmers' reporting processes for CAP measures to the Agricultural Market Agency.</p> <p>Due to the reasons mentioned above, significant deviations or noticeable effects of DATSS were not expected.</p> <p>Systematizing these activities is thinking further and developing so-called study groups for arable farmers, where benchmark analysis over the years could yield more visible results. Compared to the previous period, the difference in 2024 is that the DATSs maize farmer for silage had lower fertilizer costs, whereas in 2023, the DATSs maize farmer had higher fertilizer costs compared to the non-DAT farmer. However, in both years, the DATSs farmer applied less N, P, and K per area than the non-DATSs farmer. This difference is likely due to the fertilizer prices and choices made by each farmer. Regarding wheat, the DATSs farmer has consistently had lower pesticide costs and used fewer pesticides than the non-DATSs farmer for two consecutive years, which is a result of different production technologies. Unfortunately, data on nitrogen use efficiency for wheat in 2023 is missing, which would be an interesting comparison given the low efficiency observed in the DATSs farmer's case.</p>
	Relationship between advisor (TC Leader) and farmer
	<p>Farmers are not quite interested in the Assessment Framework. They see this as a tool for data collection.</p> <p>Before visiting the farmers, TCL need to perform additional analysis of the data to provide them with benchmark results, this is planned for March.</p>

TC9 Evaluation Report for Year 2	
Common Conclusions	Contextualization of the results
	<p>To improve benchmark analysis and therefore enhance advisory services for farms, helping farmers choose more efficient crop production methods, TC9 would require a larger sample of farms for mutual comparison. Data collection would need to be conducted over several consecutive years. Based on TCL's experience with a similar method applied to dairy farming, the impact of this advisory approach becomes evident after several years, approximately five consecutive years. Furthermore, the indicators monitored within the QuantiFarm Assessment Framework do not cover all the necessary aspects of arable farming. Some indicators are indeed relevant but do not serve the purpose of measuring the impact of DATSs on farm sustainability.</p> <p>The biggest impact on results comes from the quantities and prices at which a farmer uses fertilizers and pesticides, as well as the number of times they go to the field in a single season (for soil cultivation or other crop management practices), as this directly affects fuel consumption. To optimize these aspects (where DAT can be of assistance), the farmer must ultimately make their own decisions.</p> <p>When looking at the results, the number of animals or the farmed area does not have a significant impact on the outcomes. All farmers have a relatively large number of animals by Slovenian standards, which means they also have access to farmyard manure or slurry. The differences then emerge in the quantity and type (and consequently the cost) of mineral fertilizers that farmers are willing to use additionally to increase their yield.</p>
	Farming Business Models and DATSs integration
	<p>The added value that farmers see in using DATSs is real-time monitoring of operations, fieldwork activities, and the subsequent processing of this data, which allows them to compare their performance with other farms. They understand that this does not necessarily save time; in fact, using DATSs requires additional time and effort. They are also aware that without implementing changes in their farming technology, they cannot achieve additional savings, as this ultimately depends on their own decisions. However, DATSs provides them with decision-making support based on real data.</p> <p>The Assessment Framework provides valuable insights, and by tracking farm operations, input costs (fertilizers, pesticides, fuel), and yields over several consecutive years, the results can indicate whether the adoption of DATSs contributes to a more efficient and sustainable business model.</p> <p>DATSs primarily support decision-making by providing farmers with real-time monitoring of field operations and post-season analysis for benchmarking. While they do not directly save time or reduce costs on their own, they help farmers optimize input use (fertilizers, pesticides, fuel) and improve efficiency.</p>

TC9 Evaluation Report for Year 2	
Lessons Learned	Test Case high-level context
	<p>For optimal utilization of the potential of DATSs, farmers should systematically maintain not only records of field operations but also business accounts (accounting), which is not mandatory or common practice in our country. Additionally, different types of data are collected in various platforms that are not interconnected, nor are they linked to public databases. As a result, data must be manually transcribed and entered multiple times, which reduces farmers' enthusiasm for using these tools.</p> <p>In TC9, DATSs is used at a systemic level, meaning at the level of the entire farm or a specific agricultural production (e.g., maize production across all fields of the farm, the same for wheat). Because of this approach, TCL did not ensure that the fields remained identical, as farmers practice crop rotation, and production takes place on different fields each year. However, TCL aimed to include farms that were as similar as possible to each other. This means that the DATSs and non-DATSs farm pairs are comparable in terms of farm size, land area, and the type and number of animals. The main differences between the farms are:</p> <ul style="list-style-type: none"> • For wheat production, the DATSs farm raises beef cattle, while the non-DAT farm has dairy cows. • For maize production, both farms have almost the same land area, a similar number of dairy cows, and a production system based on maize and grass.
	Farmers contribution and motivations
	<p>TCLs haven't had the opportunity to discuss this year's results yet.</p> <p>Yes, for TC9, this would be relevant information if it were conducted on a larger sample of farms and over several consecutive years. Currently, however, the results of TC9 appear somewhat "unfortunate," as a farmer might get the impression that using DATSs could lead to worse outcomes for certain indicators. This is not true, as the results are shaped by the farmer's own decisions compared to those of another farmer, or simply by weather conditions or market circumstances.</p> <p>Out of the four farms, currently three are enthusiastic and interested in continuing, while one is more reserved and participates out of necessity, without motivation to continue. We are already in contact with the three farms to continue the work, and we have applied for new projects where we would continue the work started in QuantiFarm. The greatest value they see at the moment is the insight into the tracking system and the recording of tasks on the field. They have not fully embraced the DAT and the related economic consulting with the help of Farm Manager yet, because this requires more time, as well as more engagement from the farmer in terms of collecting, submitting, entering data, and communication and cooperation.</p>
	Recommendations

TC9 Evaluation Report for Year 2

To improve the quality of the results generated by the project, consideration must be given to the high level of variability among the DATSs applied across farms with significantly different production systems. Given this diversity, more relevant and comparable results are likely to be achieved when a higher number of farms within the same sector adopt the same DATSs. This would allow for more robust analysis and greater consistency in the interpretation of outcomes.

The results produced by QuantiFarm - such as those observed in the case of TC9 (Farm Manager) - are currently focused on the crop production sector. However, certain DATSs, particularly FMIS tools, have potential applicability beyond crops, as they serve broader economic advisory functions. When applied within the crop sector, the indicators selected have been designed to reflect key performance areas, including cost breakdowns, input consumption, and environmental and labour impacts. For these results to inform decision-making by farmers and advisors, an initial assessment of farm-specific priorities, such as cost reduction, input efficiency, labour relief, or environmental performance, is required. Based on these priorities, and the relative impact of each DATS on those dimensions, the most suitable DATSs or combinations thereof can then be identified according to the farm's sector, scale, and operational capabilities.

From a policymaking perspective, the environmental impact of DATSs and the key factors influencing farm-level adoption are critical elements. These insights can be used to inform the design of targeted support measures and policy instruments aimed at fostering the adoption of DATSs across relevant farming systems.

5.10 TC10

TC10 Evaluation Report for Year 2				
Partner Name and TC number: ANAMOB / TC 10				
DATs: Satellites, Weather station, Instrumented machinery				
Agricultural Sector and Crop: Arable, Wheat				
Biogeographical Region: Romania, Steppe				
Main Results	Cost and Benefit	CBA	Net Benefit	+182 €/ha
	Sustainability Impacts	Environmental	N applied (kg/ha)	-6%
			N use efficiency	-12.4%
			P applied (kg/ha)	-34%
			P use efficiency	-62.9%
			Pesticides used (kg/ha)	-57%
			Fuel consumption	-8%
		GHG emissions	-32.5%	
		Economic	Yield (t/ha)	+13.7%
			Labour productivity (h/t)	+80%
Protein dry matter (%)	+4%			
Results from the Assessment Framework				

TC10 Evaluation Report for Year 2	
Outcomes	<p>In 2024, the implementation of Digital Agricultural Technologies (DATSs) in the winter wheat Test Case has led to substantial improvements in operational efficiency, highlighting both economic and environmental benefits. The net benefit per hectare from DATSs adoption was €426.66, driven by higher yields and more efficient input management, including fertilizers, water, and pesticides. These improvements were particularly visible in areas such as resource management and labor productivity.</p> <p>The payback period for the initial investment in DATSs systems (€70,395.60) is estimated at approximately 3 months, showing the rapid financial return from cost reductions and increased crop yields. This short payback period further justifies the financial feasibility of implementing DATSs in wheat farming.</p> <p>The cost–benefit analysis revealed that the use of DATSs led to significant reductions in agrochemical use. Fertilizer and pesticide applications were optimized, leading to better resource use efficiency. However, the analysis also highlighted a slight increase in nitrogen application, which resulted in a small increase in greenhouse gas emissions (N₂O).</p> <p>This environmental concern should be carefully monitored moving forward, but overall, DATSs adoption contributed positively to reducing other environmental impacts, such as water usage and fuel consumption.</p>
	Relationship between advisor (TC Leader) and farmer
	<p>The overall relationship between the farmer and the TC Leader has been collaborative and constructive, ensuring that DATSs adoption aligns with the farmer’s long-term business strategy while maintaining efficiency and sustainability goals. The farmer found the Assessment Framework useful, particularly in tracking input efficiency and resource management improvements.</p> <p>The implementation of DATSs provided better real–time monitoring, which allowed for faster decision–making on fertilization, irrigation, and pesticide application. However, the farmer also pointed out that while the framework helped in identifying key performance indicators, additional customization would further enhance its relevance to their specific farm structure.</p> <p>One of the key points discussed was the learning curve associated with the new reporting system. The transition from manual data collection to a fully digital process required additional training and adaptation, which was supported by the TC Leader through targeted training sessions and follow–up meetings. The farmer acknowledged that, despite initial challenges, the digital system improved accuracy and efficiency in tracking farm performance.</p>

TC10 Evaluation Report for Year 2	
	<p>Another important aspect of the collaboration was cost-benefit validation. With the support of the TC Leader, the farmer was able to analyze profitability metrics based on net benefits per hectare (€426.66) and understand the financial return on investment (ROI) in adopting DATSs. This helped reinforce the farmer’s motivation to continue integrating digital solutions into their farming operations. Going forward, both the farmer and the TC Leader agreed that continued monitoring and refinement of the framework would be beneficial. Specifically, they highlighted the need for better integration of real-time data visualization tools to enhance decision-making and the potential for expanding benchmarking to compare results with similar farms in the region.</p>
Common Conclusions	Contextualization of the results
	<p>The results from the assessment framework indicate that while the farm with DATSs saw a clear improvement in efficiency and sustainability, some external factors (such as weather conditions and market fluctuations) had an impact on the overall outcomes.</p> <p>For example, drought conditions affected water consumption efficiency, which had a slight impact on the predicted environmental benefits of DATSs. Similarly, market price fluctuations for wheat influenced the financial outcomes, making some benefits from higher yields harder to capture in the short term.</p> <p>The size of the farm played an important role in the extent to which the benefits of DATSs were realized. Larger farms, in particular, were able to scale the adoption of DATSs more effectively, which led to improved labor and input management.</p>
	Farming Business Models and DATSs integration
	<p>The farmer views the value of DATSs primarily in terms of cost reduction, labor optimization, and yield improvement.</p> <p>The results of the cost-benefit analysis confirm that the business model used on the farm, particularly through the use of DATSs, was economically viable, with a net benefit of €426.66 per hectare.</p> <p>The scalability of the technology was evident, as it allowed for better management of resources, leading to higher production with fewer labor hours.</p>
Lessons Learned	Test Case high-level context
	<p>Despite the aim to have similar conditions between the DATSs and non-DATSs areas, differences in results were clear. The farm with DATSs saw greater efficiency, particularly in resource management, such as fertilizer use, water management, and pesticide application. However, the discrepancy between the two areas was more noticeable in the initial stages, as the non-DATSs areas were still operating under more traditional methods.</p> <p>The key lesson here is that the integration of DATSs has significant long-term benefits, but the transition to digital tools should be managed carefully, particularly when scaling the technology across different areas of the farm.</p>

TC10 Evaluation Report for Year 2	
	Farmers contribution and motivations
	<p>The farmer expressed a positive outlook on the results of the assessment framework and the integration of DATs into their farming practices.</p> <p>The main motivation for continued participation in the QuantiFarm project stems from the improved resource management and higher yields. They see the technologies as valuable tools that contribute to their overall business growth, and they are motivated to further integrate DATs into the farm’s operations.</p>
	Recommendations
	<p>Based on the findings from the 2024 assessment framework and cost-benefit analysis, we recommend the following actions to further optimize the use of DATs in future farming operations:</p> <ol style="list-style-type: none"> 1. Increase Data Collection Frequency: To provide more timely insights into crop conditions, we recommend more frequent data collection, especially during key growing and harvest periods. This will allow for quicker responses to changing conditions and better overall farm management. 2. Ongoing Training and Feedback: Continue to provide regular training sessions for farmers to improve their understanding of the reporting tools and help them better interpret data. Establishing a more structured feedback mechanism will also ensure that the tools evolve to meet their needs and make adjustments based on their experiences. 3. Independent Validation and Benchmarking: To ensure the accuracy of the collected data, we suggest incorporating independent validation processes and benchmarking against industry standards. This will help improve the reliability of the findings and support data-driven decision-making.

5.11 TC11

TC11 Evaluation Report for Year 2				
Partner Name and TC number: NEUROPUBLIC, TC11				
DATs: DSS, gaiasense				
Agricultural Sector and Crop: Fruit, Olives				
Biogeographical Region: Greece, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	+243 €/ha
	Sustainability Impacts	Social	Working time (h/ha)	-32.1%
			Electricity consumption (kWh/ha)	-46.6%
		Environmental	Fuel consumption (l/ha)	-7%
			GHG emissions (KG CO ₂ eq/ha)	-6%
			Nitrogen applied (kg/ha)	-13.3%
			Phosphorus applied (kg/ha)	-2.9%
			Potassium applied (kg/ha)	-18.6%
			Pesticides applied (kg/ha)	+3%
			Water use (m ³ /ha)	-59%
			Economic	Labour productivity (t/h)
Outcomes	Results from the Assessment Framework			
	<p>The data collection process proceeded smoothly without any significant challenges. The only difficulty encountered was that one of the farmers' main occupation is not farming, which made communication difficult during regular working hours. As a result, discussions had to take place outside of office hours to ensure effective communication.</p> <p>From a sustainability perspective, the economic impact was positive, as it led to cost reductions in economic activities. Environmentally, the initiative had a beneficial effect, particularly by offering farmers valuable guidance on improving resource management and adopting more sustainable practices. Socially, farmers were initially hesitant to adopt DATs, but with continuous support and engagement, they gradually became more comfortable with the</p>			

TC11 Evaluation Report for Year 2	
Common Conclusions	<p>technology. By the end of the process, they were satisfied with the results and had gained confidence in using it.</p> <p>There were no unexpected outcomes following the assessment framework, and the findings were largely consistent with those from the previous year.</p> <p style="text-align: center;">Relationship between advisor (TC Leader) and farmer</p> <p>Overall, the farmers had a generally positive opinion about the assessment framework. However, they suggested that it should also account for certain tasks that require additional time, such as communication with agronomists and consultants, as well as the time spent searching for workers for their farms.</p> <p>Instead of reflecting on the results of the analysis with the TC Leader, the farmers discuss them with the agronomist from Neupublic, as this department maintains direct communication with the farmers.</p>
	Contextualization of the results
	<p>Based on the data collected, we can observe the positive impact of using DATSS on agricultural practices. However, the full extent of its benefits will become more evident over time as farmers continue to integrate the technology into their operations. Exceptional circumstances, such as severe drought and a lack of rainfall, had a significant influence on the results of the assessment framework. These conditions led to a reduced likelihood of plant diseases, which meant that the true impact of DATSs was not fully reflected, as fewer plant protection advisories were needed.</p> <p>Farm size also plays a role in the implementation of DATSs. On larger farms, applying the provided advice can be more challenging due to higher costs associated with the technology. However, productivity improvements tend to be more noticeable on these larger farms, highlighting the potential benefits of DATSS on a broader scale.</p>
	Farming Business Models and DATSs integration
	<p>Farmers can clearly recognize the benefits of DATSs in their agricultural practices. They have experienced a notable decrease in costs and a significant reduction in the time required for their daily tasks. This has contributed to a more efficient and streamlined workflow on their farms.</p> <p>The results generated by DATSs help confirm the effectiveness of the business model, as evidenced by the findings of the assessment framework. These outcomes validate the value of the technology and its impact on farm operations.</p> <p>DATSS play a crucial role in scaling up the business model by ensuring enhanced productivity through data-driven insights and optimized decision-making. By improving efficiency and enabling more informed choices, DATSs help expand the potential for growth and success in agricultural enterprises.</p>

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Lessons Learned	Test Case high-level context
	<p>The application of DATSs depends on costs, technical complexity, farmer acceptance, and contextual factors like farm size and climate. Adoption is easier with technical support, financial incentives, and proper training for seamless integration. For effective DATSs application, proper maintenance of the IoT station by trained personnel and timely, accurate recording of farming practices are also essential. Farm advisors play a key role in interpreting data and supporting farmers, for its effective implementation, while manual data entry poses challenges due to potential errors, which can impact the quality of the advice generated.</p> <p>The main difference between parcels using DATSs and those not using DATSs is that the productivity of a parcel in the year of the assessment may not align with the productivity of another parcel in the same year. Productivity can vary across years and between parcels, which means that comparisons between them might not always be realistic in certain cases. This variability should be taken into account when assessing the overall impact of DATSs on agricultural practices.</p>
	Farmers contribution and motivations
	<p>Farmers are highly satisfied with the results of the assessment framework, as they see clear benefits such as cost reduction, time savings, improved knowledge and information, reduced risk, and an enhanced ability to adapt to changing circumstances. These advantages have contributed to their positive perception of the technology.</p> <p>The assessment results reveal that in the parcels not using DATSs, there were signs of poor management in areas like fertilizer application and irrigation. In contrast, no such mismanagement was observed in the parcels using DATSs, highlighting the system's effectiveness in promoting better farming practices.</p> <p>The primary motivation for farmers to continue participating in the project for another period is their desire to access the technology and trust the advice they receive, knowing that it will result in increased productivity. Additionally, they appreciate the opportunity to observe the yield of their crops, further reinforcing their commitment to the project.</p>
	Recommendations
<p>Improving communication with farmers and ensuring the timely registration of farming activities in the calendar will significantly enhance the quality of the results generated by the project. This will allow for more accurate and relevant data, which can be used to assess the effectiveness of the project.</p> <p>Farmers and advisors can showcase the results produced by the project, such as the observed increase in yield, improvements in water usage, and more targeted application of resources. These insights can assist in decision-making</p>	

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regarding the implementation of DATSs, enabling more informed choices that drive efficiency and productivity.

The analysis provides valuable information, including the impact of DATSs on productivity, cost reduction, and resource efficiency. It also highlights how DATSs improves decision-making by facilitating better management of inputs like water and fertilizers. Furthermore, data on farmer satisfaction, ease of use, and the barriers to adoption can offer policymakers a deeper understanding of the factors influencing DATSs adoption and its operational effectiveness. This information can be used to develop policies that support the wider adoption and integration of DATSs in agricultural practices, helping to foster more sustainable and efficient farming systems.

5.12 TC12

TC12 Evaluation Report for Year 2				
Partner Name and TC number: DELPHY, 12				
DATs: Data maps, Soilsensors, Digital pest monitor				
Agricultural Sector and Crop: Fruits, Apple				
Biogeographical Region: Poland, Continental				
Main Results	Cost and Benefit	CBA	Net Benefit	+138 €/ha
	Sustainability Impacts	Social	Working time (h/ha)	+10.7%
			Environmental	Irrigation water productivity (kg/ha)
		Electricity consumption (kg/ha)		-8.1%
		Fuel consumption		+0.8%
		Economic	Yield	+1.3%
Outcomes	Results from the Assessment Framework			
	Challenges in the data collection process were identified, notably the geographical distance and the language barrier. Additionally, data logging was not performed. Deviations between the results from the assessment framework and the previously expected outcomes were observed. For instance, electricity costs were included in the data despite not being relevant to field operations, indicating a mismatch between the data inputs and the actual on-farm practices. Comparisons with the previous testing period were not made explicit, as the inconsistency in data hindered the possibility of establishing a reliable comparison.			
	Relationship between advisor (TC Leader) and farmer			
Common Conclusions	Contextualization of the results			
	The results of the assessment framework were influenced by exceptional circumstances in the TC, namely a dry season, which affected the normal			

TC12 Evaluation Report for Year 2	
Lessons Learned	<p>course of agricultural operations and potentially the performance of the DATSs.</p> <p>The farm size was reported to have had no influence on the results of the assessment framework, and no significant impact was attributed to the number of animals or plants in the context of this evaluation.</p> <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>The value provided by the DATSs was perceived by the grower as limited in certain cases, with some DATSs not delivering sufficient added value. On the other hand, other DATSs were considered useful in supporting more informed decision-making at the agricultural level.</p> <p>The results provided by the assessment framework were considered to offer an overview of cost-related dynamics in the field, contributing to a partial validation of the business model, particularly in terms of financial awareness rather than a full strategic assessment.</p> <p>In the context of scaling up the business model, the role of the DATSs was highlighted through the use of pest monitors, which enabled the grower to monitor a wider area of the orchard within a shorter timeframe, thus facilitating more efficient management practices at scale.</p> <p style="text-align: center;">Test Case high-level context</p> <p>The optional application of DATSs in the field was reported to depend on the establishment of greater trust in certain systems. Without this confidence, further expansion of their use is unlikely to occur.</p> <p>Despite the requirement to use two parcels as similar as possible in the QuantiFarm Test Case, only one grower was involved, and the field conditions were considered quite equal. As such, only minimal natural variation was expected to influence the results of the assessment framework, and no significant differences between the DATSs user and non-user were identified in this case.</p> <p style="text-align: center;">Farmers contribution and motivations</p> <p>The opinion of the farmer regarding the results of the assessment framework was that the profit outcome was too low to justify adopting all the new techniques presented.</p> <p>The assessment analysis was considered partially relevant for the farming practice, as it provided information related to yield, expressed solely in monetary terms. However, farming decisions were seen as being more strongly influenced by actual production levels. It was noted that a capable farmer may achieve high yields and additional production, but still earn less than another with lower yields if the latter possesses stronger sales skills.</p> <p>The motivation to continue participating in QuantiFarm for another testing period was linked to the hope that the water sensors would contribute positively to his water management strategy. In addition, the support received</p>

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	<p>from the advisor throughout the project and while using the DATSs was also valued.</p>
	<p>Recommendations</p>
	<p>To improve the quality of the results generated by the project, a clear distinction should be made between yield expressed in kilograms and net profit. The sales price was highlighted as a critical factor that can significantly influence the overall outcome.</p> <p>Information on the costs and benefits of the DATSs, along with the additional yield they generate, can be used by both farmers and advisors to support decision-making regarding the adoption of these technologies.</p> <p>For policymakers, insights from the analysis could enhance their understanding of the conditions required for effective DATSs adoption and operation. Including an evaluation of the total production cost would further support this understanding by indicating whether a viable business case exists. It was noted that even if a technology has the potential to increase income, farmers might still be unable to invest if their financial resources are insufficient.</p>

5.13 TC13

TC13 Evaluation Report for Year 2							
Partner Name and TC number: Horta – TC13							
DATSS: SF DSS							
Agricultural Sector and Crop: Fruit – grapevine							
Biogeographical Region: Italy, Mediterranean							
Main Results				IMP Vineyard	Organic Vineyard		
	Cost and Benefit	CBA	Net Benefit	+361 €/ha	+195 €/ha		
	Sustainability Impacts		Social	Working time (h/ha)	-13%	-54%	
			Environmental		Pesticides use (kg/ha)	-26.8%	-16%
					Water consumption (kg/ha)	-75%	-86%
					Irrigation water productivity (kg/ha)	+199%	+348%
					Fuel consumption (kg/ha)	-17.7%	-24%
					GHG emissions (kg CO ₂ eq/ha)	-17.7%	-24%
			Economic		Yield	+11.3%	-20.4%
					Labour productivity	+12.4%	+28.5%
Outcomes	Results from the Assessment Framework						
	<p>The main challenge is posed by the use of different technologies in the test case, namely the Decision Support System, remote sensing, and drone images aimed at the Variable Rate Application of Plant Protection Products.</p> <p>The use of the DATSSs was associated with a positive economic impact in the vineyards under Integrated Pest Management (IPM), while a more limited impact was observed in the vineyards managed organically. In both cases, labour productivity was increased in the parcels where DATSSs were used, although yield was slightly reduced in the organically managed parcels.</p> <p>It should be noted that the 2024 cropping season was particularly challenging in Northern Italy, where the parcels were located, due to weather conditions being especially favourable to disease development.</p>						

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	<p>The use of the DATSs resulted in a reduction of working time, thereby lowering the labour requirements for crop management.</p> <p>From an environmental perspective, the use of the DATSs enabled a reduction in technical inputs, including Plant Protection Products, water, and fuel consumption, which in turn decreased greenhouse gas (GHG) emissions per hectare.</p> <p>A cost–benefit analysis revealed net benefits, primarily due to reduced expenses resulting from the optimisation of technical inputs.</p> <p style="text-align: center;">Relationship between advisor (TC Leader) and farmer</p> <p>The assessments clearly highlight the positive effects that can be generated in farmers' agricultural activities through the use of DATSs. The repeated experience of such positive effects resulting from the use of DATSs can support the development of trust in these tools by the farmers.</p>
Common Conclusions	<p style="text-align: center;">Contextualization of the results</p> <p>The comparison between the use and non-use of DATSs was carried out on the same farm by testing two different management strategies: Integrated Pest Management and Organic. Each strategy was tested in two different plots, allowing for a robust comparison of the data obtained.</p> <p>The 2024 grapevine season was particularly challenging in Northern Italy, where the Test Case is located. The beginning of the season was characterized by cold and humid weather conditions, which were conducive to disease development. Frequent rainfalls increased the risk of disease outbreaks, while also preventing access to the parcels for the application of Plant Protection Products due to wet soil conditions.</p> <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>The most important aspect for evaluating the utility of the DATSs is the economic dimension. A satisfactory result was achieved, as the use of DATSs allowed for cost reductions through the optimisation of technical inputs, even during a challenging season that generally resulted in lower yields compared to normal conditions.</p>
Lessons Learned	<p style="text-align: center;">Test Case high–level context</p> <p>The comparison between the use and non-use of DATSs was conducted on the same farm, in different plots, thus allowing the main biases associated with the analysis of different farms to be avoided. This approach was more demanding for the farmer, as two different management strategies had to be applied, but it was also considered valuable, as it allowed the improvements in crop management resulting from the use of the DATSs to be observed directly.</p> <p style="text-align: center;">Farmers contribution and motivations</p> <p>The assessment framework is considered to provide useful results for the farms, demonstrating the positive impact of the use of the DATSs. However, the effort required for the implementation of the DATSs is significant for the</p>

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	<p>farmer, particularly in relation to the recording of the large amount of data needed for the calculation of the impacts. The value of applying the DATSs is confirmed by the results of the assessment framework, and expectations remain positive for the third testing season.</p>
	<p style="text-align: center;">Recommendations</p> <p>It is important that the data requirements are clearly defined at the very beginning of the collaboration, so that the commitment of each actor in the project can be properly understood. The information collected is used to demonstrate the advantages of applying DATSs in the monitored parcels, by providing a comparison with the conventional practices of the same farm. For the farmer, the economic aspect may be the most relevant in the short term, while the environmental dimension may become more significant in the longer term. Environmental aspects may be particularly relevant for policymakers, as they can gain insight into the potential positive impacts that could be achieved through the broader adoption of the tested DATSs at regional or wider geographical scales.</p>

5.14 TC14

TC14 Evaluation Report for Year 2						
Partner Name and TC number: TERRA LITTERA TC 14						
DATs: Digital System for Fertigation and Irrigation, IoT Weather Station with Soil Sensors						
Agricultural Sector and Crop: Blueberries and Strawberries						
Biogeographical Region: Serbia, Pannonian						
Main Results	Cost and Benefit	CBA	Net Benefit	Blueberry	Strawberry	
				-2205 €/ha	In progress	
	Sustainability Impacts	Social		Working time (h/ha)	+27%	+68%
		Environmental		N applied (kg/ha)	+44%	+15
				N use efficiency	+28.7%	+18%
				P applied (kg/ha)	-40%	-45%
				P use efficiency	+11.7%	+22%
				K applied (kg/ha)	-12%	-6%
				K use efficiency	+0.1%	+54%
				Pesticides used (kg/ha)	+180%	+6%
				Water consumption (m ³ /ha)	-15%	+9%
				Irrigation water productivity (kg/m ³)	+3%	+175%
				Electricity consumption (KWh/ha)	+148%	+275%

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		Economic	Yield (t/ha)	-12.1%	+212.5%
			Labour productivity (h/t)	-76%	-9%
			Yield (t/ha)	-12.1%	+212.5%
			Labour productivity (h/t)	-76%	-9%
Outcomes	Results from the Assessment Framework				
	<p>No particular challenges were encountered during the data collection process. As this is now the second year of collaboration, the farmers are already familiar with the questions. Two of them have Global GAP certification, so most of the required information could be extracted from existing documentation.</p> <p>The Short Report was reviewed. In the case of blueberries, the higher electricity costs are likely due to the generally more expensive and energy-demanding DATSs, as well as other infrastructure equipment (e.g., computers). The higher labor costs for irrigation and fertilization were not considered significant (approximately €800–1,000 for the entire farm, which corresponds to nearly one month's salary of an average worker in Serbia).</p> <p>For strawberries, the higher irrigation and fertilization costs in the DATSs-managed farm, once adjusted to the actual size of the strawberry area, amounted to approximately €300 per farm per season, which is also a relatively small amount. The increased cost for administration was also considered minimal.</p> <p>Regarding sustainability results in blueberries, negative outcomes related to fertilization and chemical application are likely due to differing production practices and the involvement of different technical advisors.</p> <p>For strawberries, higher electricity consumption on the DATSs farm was expected due to device usage and better on-site infrastructure. The increased working time in this case is believed to be largely attributed to individual work habits and, naturally, to the greater complexity of the infrastructure, which automatically requires more effort.</p> <p>The results appear to be similar to those observed in the previous testing period. However, this year, no initial investments in equipment were made, which makes the current results more objective. This topic will be further addressed in the sections below.</p>				
	Relationship between advisor (TC Leader) and farmer				
	<p>A more educated farmer is generally more likely to understand the importance of tracking data and production parameters.</p> <p>In blueberry production, several opportunities have been identified. The main conclusion drawn from the analysis is that blueberry cultivation represents an ongoing learning process, where new practices and improvements can be implemented each year. At the same time, each season also brings new challenges</p>				

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	that must be addressed and overcome by the farmer in order to achieve optimal results.
Common Conclusions	Contextualization of the results
	<p>The main consideration refers to the initial investment, as the negative results observed during the first year were largely due to the significant upfront costs associated with the acquisition of the technology. During live events and meetings, this point has been emphasised, along with the fact that, while the farmers involved in this case made a one-time purchase of the equipment, such capital investments are typically financed through bank loans by average agricultural producers. This implies that the cost of the investment is not incurred all at once, but rather distributed over several years - usually six to seven - along with interest.</p> <p>It is believed that the financial results would appear more favourable if this factor were taken into consideration. Therefore, it is suggested that this element be accounted for when presenting the results of investments in this type of technology. Please feel free to correct this interpretation if necessary.</p> <p>This year was also marked by exceptional weather conditions - very hot and humid - which led to a reduction in yield and in product quality.</p> <p>The farm sizes compared in this Test Case are similar, making direct comparison based on farm scale not applicable in this context.</p>
	Farming Business Models and DATSS integration
	<p>A positive attitude towards the information provided by the assessment framework has been observed among some farmers, who recognise its value, while others remain neutral.</p> <p>In both strawberry and blueberry production, the results generated by the assessment framework have allowed the business models applied—whether involving the use of DATSs or not - to be reflected upon and evaluated. The outcomes have contributed to a better understanding of the effectiveness of each approach.</p> <p>The role of DATSs in enabling the scaling of business models has been considered significant. By allowing for systematic tracking and recording of both costs and benefits, the use of DATSs supports more informed decision-making. This contributes not only to improved profitability but also to the ability to manage and scale costs effectively over time.</p>
	Test Case high-level context
Lessons Learned	<p>The DATSs on the field are being used in the best possible way. Irrigation sections and timings have been planned and executed properly, and the people responsible for controlling them have been well trained.</p> <p>The main difference in strawberry production is seen in the seriousness with which the work and obligations are approached. In this sense, production without DATSs is viewed as a hobby at the family level, while in the case of the farmer using DATSs, the production is seen as a business with a clear vision to bring it to a higher level.</p>
	Farmers contribution and motivations

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The results are mostly appreciated and understood, and awareness has been shown by the farmers regarding the potential to improve their production in different areas.

In the case of blueberry production, the interpretation of the results has been explained in the section on contextualisation.

For strawberry production, the results are considered relevant as they clearly present both the advantages and disadvantages of implementing DATSs in the production process.

A good partnership relationship has been successfully established, extending beyond the scope of the project into other areas as well.

Recommendations

Closer cooperation and communication regarding the production aspects - such as problems and challenges - are encouraged, from which valuable conclusions can be drawn and acted upon accordingly.

Information on pesticide and nutrient expenditure can be used by others to gain a clearer understanding of total spending, which may support their future investment planning.

Data on yield and quality improvements resulting from the application of DATSs in strawberry production, as well as environmental indicators such as water use productivity, are being used by policymakers. These aspects are particularly relevant in the context of the EU Commission's water policy.

5.15 TC15

TC15 Evaluation Report for Year 2				
Partner Name and TC number: FILAGRO, TC15				
DATs: GAIASENSE STATIONS				
Agricultural Sector and Crop: Fruit, olives				
Biogeographical Region: Cyprus, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	+1068 €/ha
	Sustainability Impacts	Social	Working time (h/ha)	-54.4%
		Environmental	Nitrogen applied (kg/ha)	-13.9%
			Phosphorus applied (kg/ha)	-22.5%
			Potassium applied (kg/ha)	-9.7%
			Pesticides applied (kg/ha)	-19.5%
			Water use (m ³ /ha)	-48%
			Irrigation water productivity (kg/ m ³)	-7%
			Electricity consumption (kWh/ha)	-29.6%
			Fuel consumption (l/ha)	-61.3%
		GHG emissions (KG CO ₂ eq/ha)	-51.4%	
		Economic	Yield (t/ha)	-41.3%
	Labour productivity (t/h)		+38.1%	
Outcomes	Results from the Assessment Framework			
	Taking into consideration the careful selection of DATs and non-DATs parcels – as well as the fact that three out of the five non-DATs parcels belonged to the same owners as the DATs parcels – no major difficulties were encountered during the data collection process. This year, one of the least-performing DATs parcels was replaced with a new one, now managed by a younger farmer. Challenges in the data collection process were mainly related to the accuracy of fuel and water consumption data, as farmers do not keep exact records.			

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	<p>It should be noted that olive cultivation requires limited agricultural intervention compared to other crops such as vegetables or potatoes. As a result, data collection was a simpler task, and farmer motivation to collect and report data was more easily ensured.</p> <p>According to the current assessment framework, the use of DATSs and the information derived from these technologies have supported a reduction in agricultural inputs, particularly water and fertilisers. This has had a direct impact on environmental aspects, contributing to water scarcity management and reducing fertiliser overuse that could pollute underground aquifers.</p> <p>Additionally, the framework has confirmed the positive social dimension of DATSs, as their use has led to a reduction in the number of farm visits required and has strengthened farmers' confidence in decision-making processes related to cultivation practices, irrigation scheduling, and other agronomic activities.</p> <p>The assessment framework has reflected the expected situation analysis, based on continuous bi-weekly reports prepared by the agronomist leading the test case. In summary, the findings relate to:</p> <ul style="list-style-type: none"> (a) a more consistent reduction in input use across test cases, particularly through decreased irrigation water use in DATSs parcels compared to non-DATSs parcels and to the previous year; (b) a high variability in yields, both among DATSs farmers and between DATSs and non-DATSs farmers, which could not be attributed to DATSs alone but rather to other external and interacting factors; (c) a clear improvement since the first year in farmers' understanding of the value of DATSs and the support they provide in decision-making; (d) a weak correlation between the use of DATSs and the ability to predict disease outbreaks, with no improvement observed compared to the previous year.
	Relationship between advisor (TC Leader) and farmer
	<p>Farmers were carefully selected from the beginning, with an emphasis on including younger and more professionally engaged individuals. Consequently, the assessment framework has been viewed positively, and there is interest in receiving information on the comparative results of their performance. Relevant indicators have been maintained to facilitate benchmarking discussions, and reports have been provided on a fortnightly basis during the cultivation period. This approach has helped ensure that farmers remained actively engaged in both the project and the assessment framework throughout the season.</p> <p>Following extensive discussions, it has also been observed that several external factors are influencing the assessment framework. Despite the use of a control group (non-DATSs parcels), these external variables are perceived as impacting the framework's results.</p>
Common Conclusions	Contextualization of the results
	<ul style="list-style-type: none"> ● Irrigation automation: The DATSs should be linked to an automated irrigation system capable of providing the suggested water quantity as per the instruction of the DATSs. Otherwise, the DATSs automated irrigation suggestions cannot be executed if (a) the labour must open the valves and maintain accurate

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Lessons Learned	<p>pressure timely; (b) the irrigation water is readily available at the desired quantity.</p> <ul style="list-style-type: none"> ● Electronic detection pest traps: the DATSs orders for disease outbreaks need verification through distant means, ie electronic traps. This solution will be included in the third year of the project and its usage importance will be evaluated along with the existing DATSs. ● Water shortage: Water shortages have been a constant problem in the last three years, preventing farmers from implementing the irrigation suggestions of the DATSs. Irregular irrigations are the result of infrequent provisions of water from irrigation networks and from fluctuating pressures from the irrigation systems. ● Heat waves: Heat waves during the flowering period (April–May) have a significant impact on cron production, and this impact is regionally uneven, depending on local micro–climates rendering the control group with possible differentials in the end result of the heat wave impact. ● Farm size does not seem to have an impact on the assessment framework. <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>The farmer sees the DATSs information provided (over time) as a valuable guide to decision making, especially at a distance. Hence, the value for the farmer can be translated to</p> <ul style="list-style-type: none"> ● Time saving ● Risk reduction on the appropriate decision-making process ● A guide towards reduction of inputs <p>Its is important to note that the value of the DATSs information is built over time as the important aspect is time series and learning by studying and interpreting data on a very frequent (almost daily) basis.</p> <p>The results of the assessment framework, especially with regard to the ongoing implementation of the pilot program over a three-year period, allow the farmer to validate crop practises and improve the level of trust to the DATSs support tool. It, therefore, provides a business model that can be replicated and scaled up. In fact, farmers that learn to use and interpret data through the DATSs feel that they cannot go without it after the learning period is over.</p> <p style="text-align: center;">Test Case high–level context</p> <p>Extreme weather events may affect differently the DATSs and no–DATSs parcels depending on the local microclimate. This was highly noticeable this year during the short but destructive heat wave during the flowering period, in which minor differences in air circulation or a slower process in flowering days had different impacts on the trees.</p> <p>Furthermore, variations exist on the soil textures, i.e. its mechanical composition, the soil gradient may not be identical thereby affecting the correlation of data.</p> <p style="text-align: center;">Farmers contribution and motivations</p> <ul style="list-style-type: none"> ● (Also noted above) – As a result of an on going engagement of the farmers with the project and the assessment framework, they have a positive stance

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	<p>on the results. However, they denote, after extensive discussions, that several external factors are affecting the assessment framework and, despite the presence of a control group (non-DATSS parcels), these factors affect the results of the framework.</p> <ul style="list-style-type: none"> ● The assessment results provide a clear insight on the impact of DATSSs on inputs reduction – the direct effect – and the relevant cost components, eg irrigation costs and fertiliser usage. However, production and productivity are dependent on factors beyond the usage of DATSSs, even within the control parcels, hence, the full comparability of results is less feasible. Yet, the reduction of inputs is clear (a consensus of farmers' opinion) that it is not related to the reduced yields but to sensible decision-making based on the additional information provided by the DATSSs. ● As for year 1, farmers have been motivated through (a) a lump sum of 1000€ paid annually to provide data and (b) through the fortnight report (explained above) which kept an ongoing discussion and close relations with the advisor, (c) frequent visits by the advisor onsite to offer free advise with the support of the DATSSs tools..
	Recommendations
	<p>Several measures have already been considered to improve the quality of the results generated by the project in its final year. These measures include:</p> <ul style="list-style-type: none"> ● The purchase and utilisation of electronic traps for monitoring the olive fruit fly, enabling early warnings; ● The evaluation, over the three-year period, of the chemical composition of the soil in both DATSSs and non-DATSSs parcels. <p>Towards the end of the project, a short guideline is planned to be published, outlining the social and economic approach for using DATSSs. This document will highlight common mistakes and provide observations on the behavioural aspects related to the adoption of DATSSs by olive growers.</p> <p>In addition, based on the project's findings, support is planned to be provided to the Cypriot government in shaping its policy for a faster adoption of DATSSs among farmers. This will be carried out through the role of the project team as external advisors to the Department of Agriculture in the context of the CAP Strategic Plan. A policy paper is expected to be published as the final output of the project.</p>

5.16 TC16

TC16 Evaluation Report for Year 2				
<p>Partner Name and TC number: Delphy, 16</p> <p>DATSS: QMS water, soilsensors, datamaps</p> <p>Agricultural Sector and Crop: Fruit, Apple</p> <p>Biogeographical Region: The Netherlands, Continental</p>				
Main Results	Cost and Benefit	CBA	Net Benefit	+209 €/ha
	Sustainability Impacts	Social	Working time (h/ha)	+19.3%
		Environmental	Water consumption (m ³ /ha)	+6%
			Electricity consumption (kg/ha)	+19.8%
			Fuel consumption	+2%
		Economic	Yield	+1.3%
Outcomes	Results from the Assessment Framework			
	<p>Challenges on the data collection process were reported. Due to the weather conditions at the beginning of the season, there was no possibility for new data maps to be created, which are normally used in agricultural decisions. In addition, no log system was available for the watering unit, so all records had to be done manually.</p>			
	<p>Regarding the sustainability results – economic, environmental, and social – a cost–benefit balance was observed. In environmental terms, water consumption was measured at +6% compared to expectations. While this may appear to be a negative result, it is understood to reflect greater efficiency in water use enabled by the technology. Economically, labour costs for irrigation were not aligned with the initially expected levels.</p>			
	<p>When comparing the results to the previous testing period, it was noted that the previous year showed more variation within the block due to natural differences. This year, the use of DATSS was limited by weather conditions, which reduced the observable impact of the technology.</p>			
Relationship between advisor (TC Leader) and farmer				
<p>The farmer expressed particular interest in the total benefit provided by the use of DATSS, as this allows for the identification of where the greatest gains are achieved. However, when multiple DATSS are used simultaneously, it</p>				

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Common Conclusions	<p>becomes more difficult to isolate and assess the benefit of each individual technology.</p> <p>The results were discussed jointly with the TC Leader, and the conversation focused on the perceived value of the DATSs. It was noted that when a DATSs provider promotes their product, they typically present only the most favourable outcomes. However, this year was marked by difficult conditions, which limited the actual use of DATSs. Despite the limited application, the associated costs of DATSs and machinery remained, which is expected to extend the timeframe required to achieve a return on investment. In the case of digital DATSs, the short lifespan caused by rapid technological updates means that each year should ideally yield sufficient revenue to justify the investment.</p> <p>During the discussion, the farmer also raised concerns about whether the costs related to QMS water were properly accounted for, alongside the labour costs for irrigation.</p>
	Contextualization of the results
	<p>When analysing the results provided by the assessment framework, it has been acknowledged that natural differences between the two monitored fields have led to variations in yield, making it more challenging to isolate the true impact of the DATSs. Additionally, the costs associated with the use of DATSs must be taken into account to fully understand their implications, as these can influence the overall benefit perceived by the farmer.</p> <p>In 2024, exceptional weather conditions - specifically a very wet spring - were recorded. These conditions made certain agricultural interventions difficult to perform, which in turn affected the practical implementation and results of the DATSs during that period.</p> <p>It has also been observed that farm size can influence how results are interpreted within the assessment framework. In particular, some costs are borne by the entire operation, even if the implementation of the DATSs is limited to only a small section of the farm. This can distort cost-effectiveness assessments when viewed at parcel level.</p>
	Farming Business Models and DATSs integration
	<p>The value of the DATSs has been defined by the farmer as being primarily linked to support in decision-making and assistance in risk management.</p> <p>The results provided by the assessment framework have contributed to the (in)validation of the business model, both in terms of using and not using the DATSs, by offering data that reflects the economic and operational implications of their application.</p> <p>In terms of scaling up the business model, the role of the DATSs has been identified as significant. If less labour is needed through the use of DATSs, a single person could manage a larger field area, which would support</p>

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	expansion. Additionally, if higher revenues are achieved, this would further contribute to the scalability of the grower's business.
Lessons Learned	Test Case high-level context
	The DATSs currently in use are still considered to be in a pioneering stage. As such, many aspects regarding their optimal application in the field remain to be determined, particularly in relation to context-specific challenges and field conditions.
	Although the QuantiFarm methodology requires the selection of two parcels as similar as possible to form a Test Case, some inevitable differences between DATSs users and non-users continue to exist. In this specific case, only one farmer is involved, and two fields are being compared. Natural variations between the fields have been acknowledged, and these differences are understood to influence the results provided by the assessment framework.
	Farmers contribution and motivations
	The results provided by the assessment framework were aligned with the farmer's expectations. No categories were perceived as missing at this stage.
	The analysis has been considered relevant for farming practices, as it provides insights that support decision-making. While some factors, such as environmental aspects, do not directly generate income, they are still valued by the grower for their long-term impact and contribution to more sustainable practices.
	The farmer has remained motivated to continue participating in QuantiFarm for an additional testing period. A positive attitude has been expressed regarding the potential benefits of DATSs, along with a strong willingness to learn more about them and to explore how new techniques can be fully leveraged.
Recommendations	
To improve the quality of the results generated by the project, it has been noted that, in the case of the fruit Test Case, the DATSs in use provide valuable information that can guide agricultural actions. However, the machines required to carry out these actions are not accounted for in the assessment results. Including such operational elements could enhance the overall analysis.	
The information derived from the results can be used by both farmers and advisors to support decisions regarding the adoption of DATSs. In particular, profit has been identified as a key factor in encouraging growers to adopt new technologies.	
For policymakers, the analysis can help improve the understanding of DATSs adoption and implementation. It has been observed that financial performance is often the main driver of adoption. However, a positive economic result alone may not be sufficient motivation. If potential users do not understand the	

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	technology or are not quick to learn, adoption may be hindered despite the benefits.
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5.17 TC17

TC17 Evaluation Report for Year 2				
Partner Name and TC number: ANAMOB / TC 17				
DATSS: IoT System, Weather Station, Satellite Monitoring via AgriCloud				
Agricultural Sector and Crop: Fruit / Grapes - Vineyard				
Biogeographical Region: Steppic / South-East Romania				
Main Results	Cost and Benefit	CBA	Net Benefit €/ha	+2082
	Sustainability Impacts	Social	Working time (h/ha)	-90.8%
		Environmental	Pesticides use (kg/ha)	+60%
			Fuel consumption (kg/ha)	-94.6%
			GHG emissions (kg CO ₂ eq/ha)	-96.7%
Results from the Assessment Framework				
Outcomes	<p>In 2024, the data collection process for the vineyard test case remained closely aligned with its original setup. The framework continued to provide a reliable and comprehensive view of farm operations for both the DATSS and non-DATSS parcels. The Assessment Framework required only minor alignment adjustments to reflect the specific operational aspects of this test case. We recommended that the farm owner periodically review the framework and use it alongside internal KPIs. Training sessions and benchmark comparisons with sector standards contributed to improving the accuracy of data collection and interpretation.</p> <p>The 2024 cost-benefit analysis highlighted measurable improvements for the DATSS equipped parcel. The net benefit from DATSS adoption was calculated at +2082 €/ha, with major savings on fuel (due to optimized machinery use), labor costs, and administrative work. Notably, fuel costs decreased by 1287 €/ha, and labor cost reductions ranged from 40 to 449 €/ha across activities like fertilization, pesticide application, and field visits.</p> <p>As both parcels belong to the same owner, direct observations on performance and input usage were possible. The non-DATSS parcel presented difficulties in consistent data recording and lacked the traceability and control offered by the digital system. The farmer estimated a 30% higher cost of operations for the non-DATSS parcel due to inefficiencies and the lack of real-time field</p>			

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	<p>visibility. These results reinforce the operational advantages of DATSs integration.</p> <p style="text-align: center;">Relationship between advisor (TC Leader) and farmer</p> <p>The collaboration between the TC Leader and the vineyard owner continued to be effective and constructive. The farmer appreciated the structured approach offered by the Assessment Framework and was actively involved in reviewing results and implementing changes. The shift to a more digital reporting approach was supported through hands-on training and dialogue.</p> <p>The farmer expressed growing confidence in using the system and found the dashboard insights especially useful for monitoring vineyard conditions remotely. Discussions also focused on refining data accuracy and addressing sensor calibration issues.</p>
Common Conclusions	<p style="text-align: center;">Contextualization of the results</p> <p>The outcomes from TC 17 were influenced by seasonal factors such as weather variability, but no exceptional events disrupted data collection or farm operations. Farm size (26 ha) allowed the efficient use of precision technology, and the digital system proved especially beneficial in supporting decision-making for irrigation, pest control, and labor management. The lack of major operational changes in 2024 ensured consistency in evaluating the impact of DATSs compared to the previous year.</p> <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>The farmer sees the main benefits of DATSs integration in terms of fuel savings, labor optimization, and centralized field management. The cost-benefit analysis validated this view, showing that AgriCloud's precision tools enable better workflow planning and reduce waste.</p> <p>These advantages align with the vineyard's business model focused on efficiency and environmental responsibility. Scaling the use of DATSs to other areas of the farm is under consideration.</p>
Lessons Learned	<p style="text-align: center;">Test Case high-level context</p> <p>The coexistence of both DATSs and non-DATSs parcels under the same management provided a unique opportunity for comparative analysis. The main difference remained the visibility and control over operations. The DATSs system allowed automated monitoring, while the non-DATSs parcel required manual oversight, leading to inefficiencies. These insights highlighted the long-term value of precision farming.</p> <p style="text-align: center;">Farmers contribution and motivations</p> <p>The farmer remains motivated by the tangible benefits of using QuantiFarm tools. Key drivers include cost reduction, better field control, and the ability to plan activities based on real-time data. Continued involvement in the project is seen as valuable for accessing innovation and connecting with peers.</p>

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	<p>Invitations to sector-specific events and practical demonstrations would further strengthen motivation and engagement.</p>
	Recommendations
	<p>To further enhance the benefits of digital technologies in vineyard management, we recommend:</p> <ol style="list-style-type: none"> 1. Integration of Real-Time Reporting – This will allow timely field interventions and better alignment of vineyard tasks with environmental conditions. 2. Customization of Indicators – Adapting key performance indicators to include pest pressure levels and microclimate trends can improve precision. 3. Improved Calibration of Sensors – Ensure sensor accuracy through regular maintenance and checks. 4. Training Involvement of Technology Provider – Engaging AgriCloud more actively in farmer training can help maximize system capabilities. 5. Benchmarking with Sector Standards – Comparing performance indicators with other vineyards using DATSs will validate improvements and suggest areas for refinement. <p>These measures will support continuous improvement in data quality, sustainability, and operational performance for TC 17.</p>

5.18 TC18

TC18 Evaluation Report for Year 2				
Partner Name and TC number: Horta – TC18				
DATs: SF DSS				
Agricultural Sector and Crop: Vegetables, Tomato				
Biogeographical Region: Italy, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	+2472 €/ha
	Sustainability Impacts	Social	Working time (h/ha)	+28%
	Sustainability Impacts	Environmental	Nitrogen applied(kg/ha)	+4.5%
			Phosphorus applied (kg/ha)	+0.7%
			Potassium applied (kg/ha)	+31.4%
			Pesticides use (kg/ha)	+4.8%
			Water consumption (kg/ha)	-21%
			Irrigation water productivity (kg/ha)	+29%
			Fuel consumption (kg/ha)	+5.8%
			GHG emissions (kg CO ₂ eq/ha)	+5.2%
	Economic	Yield	+21%	
Labour productivity		+13%		
Outcomes	Results from the Assessment Framework			
	<p>The main challenge has been posed by data collection across different farms and fields, as well as by the need for the farmer to manage two fields using different techniques. In each of the farms involved, both a parcel managed using DATs and a parcel managed without the use of DATs were set up. The 2024 cropping season proved to be particularly difficult for tomato farmers due to adverse weather conditions in Northern Italy, where heavy rainfall created a favorable environment for disease development and prevented machinery from entering the fields because of wet soil. As a result,</p>			

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Common Conclusions	<p>crop yields were reduced, and harvesting was delayed by up to a couple of months beyond the usual schedule.</p> <p>The use of DATSs was associated with a positive economic impact, resulting from increased yields and improved labor productivity, supported by enhanced decision-making processes.</p> <p>Regarding environmental impact, the optimisation of technical inputs led to a slight increase in the amount of nitrogen and phosphorus fertilizers applied. In a season as difficult as 2024, the risk of disease was addressed through the application of plant protection products. The support provided by the DATSs contributed to a shift in management practices, allowing for more accurate timing of applications rather than a reduction in the number of treatments. The effect on water consumption was particularly relevant, resulting in substantial savings. A slight increase in fuel consumption was also highlighted. In summary, greenhouse gas emissions per hectare from parcels using DATSs were found to be slightly higher than those from parcels without DATSs.</p> <p>From a social perspective, an increase in working hours was observed, possibly linked to the limited experience of farmers in using the tools. This is expected to be overcome over time.</p> <p>The cost-benefit analysis highlighted a net benefit, primarily due to an increase in revenues from higher yields in the DATSs-managed parcels, and a reduction in expenses through the optimisation of technical inputs.</p> <p style="text-align: center;">Relationship between advisor (TC Leader) and farmer</p> <p>The assessments highlight in a clear way the positive effects the use of DATSS can lead to the farmer's agricultural activities. The repeated experience of positive effects generated from the use of DATSS can help in building up trust in the tools from the farmers.</p> <p style="text-align: center;">Contextualization of the results</p> <p>The comparison between the use and non-use of DATSs was carried out within the same farm, across two different plots, allowing the data obtained to be considered robust.</p> <p>The 2024 tomato season was particularly challenging in the North of Italy, where the Test Case is located. The season was characterised by cold and humid weather conditions, which were conducive to disease development. These conditions also prevented farmers from accessing the parcels to perform applications of Plant Protection Products and other crop operations, due to excessively wet soil. In some cases, harvesting was delayed by up to two months compared to usual years, resulting in a reduced quantity and quality of the harvested product.</p> <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>The most important aspect for evaluating the utility of the DATSs has been identified as the economic one. The result has been considered satisfactory, as the use of DATSs has allowed for cost reductions through the optimisation of technical inputs, even during a difficult season that generally led to reduced yields compared to normal conditions. Moreover, in the parcels managed with the use of DATSs, yields were found to be higher than in others, even under these challenging circumstances. This suggests that</p>

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	improved agronomic practices, supported by DATSs, can contribute to yield stability over time, even in less favourable years.
Lessons Learned	Test Case high-level context
	The comparison between the use and non-use of DATSs was carried out within the same farm, across different plots, thereby avoiding major biases associated with the analysis of different farms. This approach was more demanding for the farmer, as two distinct management strategies had to be applied. However, it was also considered valuable, as it allowed the farmer to observe how the use of DATSs contributed to improvements in crop management.
	Farmers contribution and motivations
	The assessment framework has provided useful results for the farms, demonstrating the positive impact of using DATSs. Nevertheless, the effort required to implement DATSs has been significant for the farmer, particularly in terms of recording the large amount of data needed for the calculation of impacts. The results of the assessment framework have confirmed the value of applying DATSs, and expectations remain positive for the third testing season.
	Recommendations
	It is considered important that the data requirements are clearly defined at the very beginning of the collaboration, so that all actors involved have a clear understanding of their commitments within the project. The information collected has proven useful in demonstrating the advantages of using DATSs in the monitored parcels, by providing a direct comparison with the standard practices used on the same farm. For the farmer, the economic aspect is often the most relevant in the short term, while environmental benefits may become more significant over the longer term. The environmental aspects are expected to be particularly relevant for policymakers, who can gain a perspective on the potential positive impacts that could result from the upscaled adoption of the tested DATSs at regional or broader geographical levels.

5.19 TC19

TC19 Evaluation Report for Year 2				
<p>Partner Name and TC number: Delphy, TC19</p> <p>DATSS: QMS Tomato</p> <p>Agricultural Sector and Crop: Vegetables, Tomato</p> <p>Biogeographical Region: The Netherlands, Continental</p>				
Main Results	Cost and Benefit	CBA	Net Benefit	+47122 €/ha
	Sustainability Impacts	Environmental	Water consumption (m³/ha)	-27%
			Irrigation water productivity (kg/m³)	+38%
			Electricity consumption (kWh/ha)	-60%
			Fuel consumption (m³/ha)	-15.6%
		Economic	Yield (t/ha)	+1.5%
Outcomes	Results from the Assessment Framework			
	<p>In the context of greenhouse horticulture, it should be specified that fuel consumption refers specifically to natural gas. Petrol, fuel oil, or gasoline are not used in this setting - instead, natural gas is the dominant energy source for heating greenhouses.</p>			
	<p>The overall positive outcome regarding net benefit, observed when comparing the DATSS farm to the non-DATSS farm, requires further clarification. Although efforts were made to select two similar farmers, several factors have contributed to the observed differences. In this case, the variation cannot be attributed solely to the use of DATSSs.</p>			
	<p>One major source of variation has been identified as the cultivar. Differences in cultivar significantly affect how the greenhouse climate must be managed. As a result, the non-DATSS grower was required to use more energy to maintain crop balance, leading to higher gas consumption - an outcome that is independent of DATSSs usage.</p>			
	<p>Additional potential sources of variation include the construction, type, age, and orientation of the greenhouse, as well as the grower's individual management approach or philosophy (often referred to as their "signature").</p>			
Relationship between advisor (TC Leader) and farmer				

TC19 Evaluation Report for Year 2	
Common Conclusions	<p>It remains difficult to determine how farmers perceive the relevance of the evaluation framework. First and foremost, its implementation requires additional effort on their part - which is why compensation for their time and expenses is necessary.</p> <p>Another way to encourage participation could be through a more direct connection between the farmers and the assessment framework, enabling them to see a tangible monetary outcome from their additional efforts. Both farmers were given the opportunity to compare their current data with previous data collections. In some cases, discrepancies were identified, which could be addressed by adjusting the data or by seeking clarification from the evaluator or TC Leader.</p> <p>The results of the previous analysis were shared with the growers and discussed collaboratively. The observations mentioned above were raised by the growers themselves. As a result, they expressed difficulty in leveraging the project to their own benefit. They acknowledged the differences - both in greenhouse and crop management practices, as well as in their individual social and behavioral approaches.</p> <p>Overall, it has remained a challenge to keep growers engaged in the project, as it is not entirely clear what concrete value can be offered to them in return for their efforts in data provision.</p>
	Contextualization of the results
	<p>Based on the results from the evaluation framework, further consideration is needed regarding the DATSs and its implementation on the farm. This is essential to accurately assess the costs and impacts compared to the standard assessment framework.</p> <p>The DSS used in this process also serves as a tool to support decision-making and minimize the risk of mistakes or errors. Sometimes, we compare it to an insurance system, similar to QMS Tomato, as it provides insight into whether the chosen strategy is realistic and feasible.</p> <p>Therefore, it is difficult to directly attribute the outcomes of the assessment framework to the use of DAT. The grower may still make independent decisions, regardless of the guidance provided by the system.</p>
	Farming Business Models and DATSs integration

TC19 Evaluation Report for Year 2	
	<p>The value of the DATSs for the farmer lies in gaining a better understanding of the crops and the effects of certain strategic choices in climate and crop management.</p> <p>The farmer states that the DATSs provides more information about the crop, allowing for earlier detection of potential problems. It also helps analyze the collected data and organize it into a structured overview. Since the platform is cloud-based, the farmer can access it 24/7 from anywhere with an internet connection.</p> <p>DATSs supports the farmer in making informed decisions regarding crop and climate strategies. Additionally, it can simulate different scenarios to help determine the best course of action.</p>
Lessons Learned	Test Case high-level context
	<p>The grower decided to conduct his crop registration using a different DATSs and is using its output as input for our DATSs. We did not expect him to choose another DATSs for data collection. As a result, the analysis of the collected raw crop measurements is beyond our control, which may impact the outcomes of our crop model.</p>
	Farmers contribution and motivations
	<p>The results from last year were discussed with the growers, who were open to sharing their thoughts. However, uncertainty remains as to whether they should be discussed again this year, considering the ongoing differences between the farms, as previously described.</p> <p>The existence of a clear and immediate benefit for the farmer should be considered a key element when aiming to motivate participation. In this case, both farmers were somewhat pressured into joining the project, which may affect their engagement and perception of its value.</p>
	Recommendations
	<p>Maintain the current pace but be mindful of the differences between the DATSs and non-DATSs farms. These differences should be noted as a kind of "disclaimer" when interpreting the results of the analysis.</p>

5.20 TC20

TC20 Evaluation Report for Year 2					
Partner Name and TC number: Anysolution, 20					
DATSS: IoT, Precision Irrigation, Monitoring, Sensors and automatizations					
Agricultural Sector and Crop: Fruit., Bananas					
Biogeographical Region: Spain, Macaronesian					
Main Results	Cost and Benefit	CBA	Net Benefit	To be updated	
	Sustainability Impacts	Economic	Yield	To be updated	
		Environmental	Pesticides applied (kg/ha)	+46.9%	
			Water use (m3/ha)	-2%	
	Results from the Assessment Framework				
	<ul style="list-style-type: none"> • Lack of data organisation. Few sensors and possibilities to automated data ingestion. • The use of data coming from sensors that control irrigation can help to be more sustainable and also reduce the costs in water. • There were no deviations between the expected results and the Assessment Framework. 				
	Relationship between advisor (TC Leader) and farmer				
<ul style="list-style-type: none"> • The farmer was very interested in receiving support and knowledge on the possibilities to take decisions based on data • During the pilot implementation, there were many interactions between the farmer and the Tc leader. One outcome is to take more advantage of the possibilities of digitalisation and to take decisions based on data (mainly from sensors and meteorological stations) and therefore the need to invest in this type of technologies. 					
Common Conclusions	Contextualization of the results				
	<ul style="list-style-type: none"> • The interest of the farmers in having access to more digital solutions to facilitate their day-to-day • The distance between the TC leader and the farmer (islands located very far away). The low digitalisation skills • In some parts of the farm, there are problems with connectivity 				
	Farming Business Models and DATSS integration				

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	<ul style="list-style-type: none"> • The farmer defines the value provided by the DATSs (ex: cost reduction, time saving, knowledge and information, risk reduction, ability to adapt, etc.) as very good. • The farmer is aware of the need to invest in technologies, but it depends on the budgetary availability. • The DATSs increase the knowledge of the impact of digitalisation in the management of the farm (and its costs).
Lessons Learned	Test Case high-level context
	<ul style="list-style-type: none"> • The optimal application of DATSs will be based on the trust generated with the provider, the knowledge about the impact of the technology and the cost of the investment • The user will continue investing in technology, and the non-user will take more time to do the same.
	Farmers contribution and motivations
	<ul style="list-style-type: none"> • The farmers are interested in digitalisation, but they are worried about the investment. • The most important motivation was the possibility to reduce water consumption. • Farmers will benefit from having the investment in technology or testing any sensors.
	Recommendations
	<ul style="list-style-type: none"> • To have some budget for the farmer, offering them the possibility to implement an investment and also to learn from other experiences and funding opportunities to implement DATSs • The efficiencies generated thanks to DATSs should be recommend on policy.

5.21 TC21

TC21 Evaluation Report for Year 2				
Partner Name and TC number: Luke, TC21				
DATSS: <i>Dimmable led lights that are controlled ditigally. Ultrafiltration system Kathari that enables recirculation of drain water.</i>				
Agricultural Sector and Crop: Horticulture. Greenhouse tomato.				
Biogeographical Region: <i>Finland, Boreal</i>				
Main Results	Cost and Benefit	CBA	Net Benefit	+ 513,475 €/ha
	Sustainability Impacts	Social	Working tim	-8.3%
		Environmental	Electricity consumption	-52.2%
			Fuel consumption	874.3%
			Water Consumption	-56.5%
		Economic	Irrigation water productivity	+151.5%
			Yield	+9.5%
	Outcomes	Results from the Assessment Framework		
<p>No particular challenges were encountered in the data collection process, as a system has been established. Although farmers are often very busy, both have eventually found time to collect the data. Depending on the situation, the data are either submitted using an Excel table specifically designed to support this task or collected through personal visits by Esa Palmujoki.</p> <p>Regarding sustainability results – economic, environmental, and social – the analysis for the 2024–25 crop cycle, which covered a full season for both farms, confirmed the initial assumptions. Water use and electricity costs were found to be lower on the DATSS farm. Fertilizer costs were also reduced, as the use of ultrafiltration allowed nutrients in part of the drainage water to be recirculated to the plants. The non-DATSS farm does not implement drainage water recirculation.</p>				
<ol style="list-style-type: none"> 1. January–February 2024 were exceptionally cold. During this period, the capacity of the district heating system on the DATSS farm was insufficient to heat the greenhouse. As a result, the grower had to compensate with significant use of fuel for heating. While the non-DATSS grower also needed more heating energy during the cold spell, the extent was lower due to the use of HPS lamps, which provide considerable radiant heat. Although the district heating system was under repair in 2024, this occurred during the summer and had only a marginal impact on fuel use. It is acknowledged that LED lights increase the need for supplementary heating; however, the peak in 				

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2023–24 was considered exceptional due to the combination of low outdoor temperatures and insufficient heating capacity.

2. The lower pesticide input costs observed on the DATSs farm are not considered to be directly related to DATSs. Most crop protection on both farms is performed biologically, a practice not captured by the assessment framework. In fact, the DATSs farm experiences more pest issues due to its location in a village with many greenhouses, which leads to a higher exchange of insect and mite pests. By contrast, the non-DATSs farm is more isolated and, as a result, faces fewer plant health problems.

A contradiction has been noted in the assessment: it is first claimed that pesticide costs decreased on the DATSs farm due to better crop health linked to improved climatic conditions – which is not accurate – and later it is stated that pesticide use actually increased on the DATSs farm compared to the non-DATSs farm.

3. The reduced cost of labour for pruning on the DATSs farm is not considered a result of better plant health due to DATSs. Rather, the non-DATSs farm prunes more thoroughly to manage Botrytis, while the DATSs farm takes a more lenient approach. This is reflected in the greater prevalence of Botrytis on the DATSs farm, although the grower is more tolerant of the associated losses.
4. As for labour costs related to field visits, although these were higher on the DATSs farm, this is not attributed to the DATSs. The concept of "field visits" appears more suited to arable or outdoor farming. In greenhouses, farmers enter and work in the production space multiple times per day, making it difficult to quantify such visits accurately. It is therefore recommended that this variable not be used in the analysis of greenhouse farms, as it is unreliable and does not reflect the nature of greenhouse operations.
5. Additionally, although HPS lamps increase evapotranspiration compared to LED lights, the lighting system alone does not fully explain the lower water use observed on the DATSs farm in TC21. A more accurate understanding would require data on the amount of light delivered to the plants – measured in micromoles $\text{m}^{-2} \text{s}^{-1}$ and converted to Daily Light Integral (DLI). The higher the DLI, the greater the plant evapotranspiration. However, no DLI data are currently available for the Test Cases.

Regarding deviations between the results from the assessment framework and the initial expectations, the results from the 2023–24 crop cycle largely confirmed the anticipated differences in water, electricity, and fertiliser use between the DATSs and non-DATSs farms. These differences were also regarded as reliable by the growers themselves and were attributed to the use of DATSs. In contrast, they expressed more scepticism about other variables and did not attribute observed differences to DATSs.

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Relationship between advisor (TC Leader) and farmer

The DATSs farmer has expressed that the assessment framework supports, aligns with, and contributes to the development of his practical work. At the time of initial feedback, the non-DATSS farmer remained more hesitant and expressed hope that something useful might emerge once more information was available.

However, following a meeting with the growers held on 24 February 2025 to review the results of the analysis, the non-DATSS grower showed significantly increased interest in the project. This shift in attitude occurred after reviewing the differences observed in water, electricity, and fertiliser use, as well as the net benefit, between his farm and that of the DATSs user. Initially, the non-DATSS grower believed that the DATSs grower had benefited from a longer harvesting period during the 2023–24 cycle. Upon clarification, it was confirmed that, in fact, it was the non-DATSS grower who had a crop cycle longer by approximately 1.5 months. This information further emphasised the differences in net benefit between the two farms.

A key factor in these differences was the impact of the lighting systems and electricity prices during the winter of 2023. The non-DATSS grower was forced to interrupt production due to high electricity prices, resulting in a suboptimal crop cycle. This is critical for year-round tomato growers, who must avoid harvesting during the May–September period when seasonal growers dominate the market. Normally, the non-DATSS grower would plant in August or September, initiating harvest when market prices begin to rise, thus achieving good cost-efficiency for the kilowatts used in winter lighting.

In 2023–24, however, to compensate for the previous winter break, the non-DATSS grower began planting in early May, with harvesting starting in July. As a result, he competed directly with seasonal growers for several months, receiving lower market prices. This decision contributed to a reduced net benefit compared to the DATSs farm.

Moreover, by the time late autumn and winter arrived, the plants on the non-DATSS farm were already relatively old, leading to a lower yield per kilowatt of lighting energy. Although his crop cycle was two months longer than that of the DATSs grower, the total yield was still lower. This highlights the importance of having a lighting system that can be adjusted according to electricity prices, as implemented on the DATSs farm. The DATSs grower was able to continue production throughout the winter of 2023 and initiate the new crop cycle in July 2024 as planned, with harvesting beginning in September, just as market prices began to rise again. The use of dimmable LED lights allowed for strategic market-oriented decision-making, whereas the attempt by the non-DATSS grower to compensate for the previous winter's disruption was less successful and ultimately more costly.

Additionally, a factor contributing to the difference in net benefit is the inclusion of a small volume of plum tomatoes in the DATSs grower's greenhouse, cultivated alongside classic round tomatoes. These plum

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Common Conclusions	<p>tomatoes commanded a significantly higher price, thereby raising the average price received for the total yield. This price difference was appropriately factored into the overall average used for the 2023–24 results.</p> <p>The outcomes of the February 24th meeting with the growers are reflected in the updated observations included throughout this report. Where no new comments have been added, it indicates that the farmers accepted the previous interpretations.</p>
	Contextualization of the results
	<p>To fully understand the true impact of DATSs, it has been considered necessary to include the nutrient content of drainage water in the analysis. This would help assess how ultrafiltration and recirculation influence the amount of nutrients released into the environment and the eutrophication potential of surface waters. For this purpose, monthly water sampling has been carried out on both farms since November 2024.</p> <p>The nutrient content of drainage entering the ultrafiltration system from the greenhouse, as well as that of the water recirculated to the plants after filtration, was previously monitored during the autumn of 2023 and spring of 2024 under the Vattre project. A Memorandum of Understanding had been signed with the Vattre project, and sampling activities were continued even after the project ended in October 2024.</p> <p>Regarding exceptional circumstances that may have influenced the assessment framework results, it has been noted that an unusually cold period in January–February 2024 caused significant strain on the DATSs farm’s district heating system. The heating capacity was insufficient during this time, and the grower had to rely on light fuel oil as a supplementary source of heating energy.</p> <p>With respect to farm size and the number of plants, both farms are broadly comparable. The number of plants is approximately equal, and both focus on the production of round tomatoes as their main crop. However, differences in substrate use have been identified: the non-DATSs farm grows in rockwool, while the DATSs farm uses peat (at least for the time being), which affects water requirements, as rockwool typically demands more irrigation.</p> <p>Update as of 4 March 2025: Additional variation in production has been noted between the farms. While the non-DATSs farm cultivates only classic round tomatoes, the DATSs farm also includes several rows of plum tomatoes within the same greenhouse. This difference has implications for both yield and pricing and should be considered when interpreting the results.</p>
	Farming Business Models and DATSs integration
	<p>The DATSs farmer has stated that he is not entirely sure about the exact value brought by DATSs, although it is acknowledged that his response may vary depending on how the question is posed. Based on several discussions, it has been inferred that cost reduction – particularly regarding electricity – is</p>

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perceived as the main benefit. This aligns with the promise of LED lighting systems, especially those with dimming functionality. Environmental considerations and the associated image of adopting the ultrafiltration system have also been mentioned by the grower, although reductions in water and fertiliser costs appear to be valued less, likely because these savings are not as substantial as those related to electricity. Knowledge and information are also considered important, especially given the farmer's profile as a pioneer grower who enjoys testing innovative approaches.

As previously explained, the dimmable LED lights – one of the implemented DATSs – enabled the grower to maintain his standard cropping schedule throughout 2022–23 and to continue with the same approach in 2023–24. By contrast, the non-DATSs grower attempted to compensate for the winter break in 2023 by modifying and extending his cropping cycle in 2023–24. However, the benefits anticipated from that adjustment were not fully realised. In this way, certain DATSs have supported the optimisation of the business model by enabling growers to strategically time their marketing and benefit from more favourable pricing conditions.

The non-DATSs grower has shown increasing interest in the results. In recent discussions with a colleague who visited the farm and presented comparative data on nutrient concentrations in drainage water, the grower expressed interest in the possibility of reducing fertiliser costs. He has also shown interest in LED lighting and has already installed inter-row LED lights alongside traditional HPS lights. Nevertheless, he remains somewhat sceptical about transitioning fully to LED lighting due to its limited radiative heat output. This change in greenhouse climate has led to issues on the DATSs farm, such as leaf edge necrosis during the darkest winter months. These symptoms may be attributed to a non-optimal light spectrum during low natural light periods or to other physiological responses triggered by altered environmental conditions.

The results of the assessment framework have provided preliminary evidence supporting the validation of the DATSs-based business model. In particular, reductions in key input costs – including electricity, water, fertilisers, and wastewater treatment fees – as well as gains in ecological sustainability, such as lower nutrient emissions, have been observed. However, further analysis is required to determine the full impact of DATSs on crop yields. Certain DATSs also appear to support business model optimisation by allowing growers to adapt to seasonal price variations and improve market timing.

As for the role of DATSs in scaling up the business model, the effect is considered positive. Nonetheless, one limitation has been identified in relation to dimmable LED lights: unlike HPS lamps, these systems do not enable participation in energy flexibility platforms such as Sympower, which can generate significant revenue for high electricity-consuming farms. To mitigate this, the DATSs farmer has invested in an electric steam and water boiler, which can be connected to such platforms and contribute to overall energy flexibility.

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Lessons Learned	Test Case high-level context
	<p>Despite the requirement to select two parcels as similar as possible to form a QuantiFarm Test Case, certain unavoidable differences have been observed between the DATSs user and non-user farms.</p> <p>In the case of TC21, this question presents particular complexity, as the DATSs are physically integrated into essential production infrastructure - namely, the artificial lighting system and the drainage water treatment system used for recirculation to the plants. As a result, the two systems differ structurally between the farms, rather than being physically identical with the only distinction being the use of digital tools for monitoring and decision-making.</p> <p>The most significant difference lies in the lighting systems: the DATSs farm is equipped with steplessly controllable dimmable LED lights, while the non-DATSs farm operates with a more basic lighting system that can only be switched ON or OFF. These systems are inherently different from the outset, and the added digital control on the DATSs farm enhances operational flexibility.</p> <p>Similarly, the management of drainage water differs: on the DATSs farm, the water is treated and recirculated using a digitally controlled ultrafiltration system, whereas on the non-DATSs farm, drainage water is not treated at all. This introduces a fundamental difference in environmental performance and resource efficiency, directly linked to the infrastructure and not solely to the digital tools.</p> <p>A minor difference also exists in the water sources used by each farm, which can vary over time. The DATSs farm typically uses groundwater from its own well, while the non-DATSs farm has occasionally used surface water from a local river. Both farms also have the option to purchase water from the municipal supply, which has been the primary source during the study years. The origin of the water affects the cost structure.</p> <p>Lastly, the growing substrate differs: the DATSs farm grows tomatoes in peat, while the non-DATSs farm uses rockwool. This influences irrigation needs, as rockwool generally requires more over-irrigation compared to peat.</p>
	Farmers contribution and motivations
	<p>The opinion of the farmers regarding the results of the assessment framework has evolved over time. It was commonly felt – including by the growers – that the results from the first year were difficult to rely upon, as the cropping cycle was affected by exceptional circumstances, notably the sharp increase in electricity prices and the decision by the non-DATSs farmer to interrupt production during the winter.</p> <p>The second year’s results have been considered more reliable, although several factors still require closer consideration when interpreting the findings. Among the various variables assessed, differences in the use of</p>

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	<p>water, electricity, heating energy, and fertilisers were regarded by the growers as the most dependable.</p> <p>The third and current testing year (2024–25) has so far followed a normal cropping cycle without interruptions. Consequently, the perceived reliability of the assessment framework will largely depend on how the third-year data compare with the results from the second year.</p> <p>The assessment analysis has been considered relevant to farming practice, as it examines input factors that directly influence the economic outcomes of the farms, as well as outputs such as yield levels and product pricing. Cost structures and their optimisation remain central concerns for farmer-entrepreneurs.</p> <p>With regard to their motivation to continue participating in QuantiFarm for another testing period, the farmers have gradually come to understand the added value of being able to compare their own business model with another that differs in several key aspects. The selection of a DATSs directly related to electricity consumption is especially meaningful for the DATSs farmer, who is eager to assess the consequences of this investment. He has also expressed particular interest in understanding the cost-saving potential of the ultrafiltration system in terms of water, wastewater, and fertiliser expenses. As a grower with a pioneering mindset, he is naturally motivated to test and adopt new technologies.</p> <p>The motivation of the non-DATSs farmer has, at times, been more difficult to maintain. However, recent discussions between him and a visiting colleague – in which specific results were reviewed – have led to renewed interest. The non-DATSs farmer would likely have remained more engaged had it been possible to discuss results more frequently, though final results are only available once per year. His cautious approach toward adopting new technologies may also explain his more reserved interest in the DATSs.</p> <p>Both farmers participating in TC21 are, to some extent, further motivated by the compensation provided in exchange for sharing their farm data with the project.</p>
	Recommendations
	<p>To improve the quality of the results generated by the project, it has been suggested that an additional discussion be held with the TC Leader and the farmers after the report has been finalised. While it was highly valuable that consultations took place prior to the analysis, new insights often emerge once the results are available. These may highlight elements that were not sufficiently emphasised during the pre-analysis phase and should be taken into account for more accurate interpretation (as illustrated in earlier responses in this survey).</p> <p>With regard to the type of information that can support decision-making by farmers and advisors concerning DATSs adoption, key variables such as electricity and water consumption, as well as nutrient concentrations in</p>

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drainage water, are considered particularly relevant. Any yield increase potentially associated with DATSs should be interpreted with caution. A comparison of yield levels between the two farms prior to and after the implementation of DATSs would be useful in understanding their actual impact. Of special interest is the role that dimmable LED lights may play in enabling growers to optimise their marketing strategy by adjusting cropping schedules in response to electricity price fluctuations.

For policymakers, the analysis provides valuable insights into the differences observed between the DATSs and non-DATSs farms in the use of water, electricity, fertilisers, and heating energy. These differences directly affect the DATSs grower's ability to optimise crop cycle scheduling and to benefit from higher market prices during the autumn and winter months. As a result, the DATSs grower is able to extract greater value from the same inputs compared to the non-DATSs grower, which highlights the potential of such technologies to enhance both efficiency and economic resilience.

5.22 TC22

TC22 Evaluation Report for Year 2				
Partner Name and TC number: FLOX, 22. Farm: Menchine Farms				
DATs: NetFLOX				
Agricultural Sector and Crop: Livestock, Poultry				
Biogeographical Region: UK, Atlantic				
Main Results	Cost and Benefit	CBA	Net Benefit	+0.714 €/ha
	Sustainability Impacts	Environmental	Electricity consumption (KWh/animal)	+43%
			Water consumption (l/animal)	-88%
Outcomes	Results from the Assessment Framework			
	Challenges: Inconsistent data recording, limited digital literacy, and connectivity issues impacted data quality and completeness			
	Sustainability results: Environmentally, resource efficiency improved. Socially, farmer collaboration and knowledge-sharing increased.			
	Deviations: Farmers sometimes worked across DATs and non DATs farms which reduces A/B testing. Some farmers found the guidance too theoretical and not fully aligned with practical needs – so required more custom advice.			
	Relationship between advisor (TC Leader) and farmer			
	Farmer opinion: Farmers saw value but found some metrics too “data-heavy” to use without alerting. More practical indicators and real-time feedback were preferred.			
	Reflection: Some were very engaged, leading to adjustments in DATs use and improved usage. Others lacked time or interest, limiting insights from the framework.			
Contextualization of the results				

TC22 Evaluation Report for Year 2	
Common Conclusions	<p>Considerations: Results alone don't show the full impact; farmer adaptation, external factors, and long-term viability need assessment</p> <p>Exceptional: Challenges around data comparableness, challenges with data availability (issues with breaking hardware/training related).</p> <p>Farm size: no issues.</p> <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>Defined value: Key benefits were time-saving, potential for cost reduction, and improved decision-making. However, data complexity was a challenge.</p> <p>(In)validation: n/a</p> <p>Role in scale: Enabled data-driven expansion without increasing labour, but needs more testing/proof.</p>
Lessons Learned	<p style="text-align: center;">Test Case high-level context</p> <p>Conditions: Variability in field conditions, farmer expertise, and technology access influenced outcomes.</p> <p>DATs vs non-DATs: mainly to do with farm location, breed types (changing) management expertise, etc.</p> <p style="text-align: center;">Farmers contribution and motivations</p> <p>Farmer opinion: Mixed; some saw improvements, others felt results lacked direct application to their specific conditions but critically had huge potential.</p> <p>Relevance of assessment analysis: Useful for benchmarking but needed to be more practical and actionable for daily farming decisions.</p> <p>Motivation: Potential is great, and therefore there is buy-in.</p> <p style="text-align: center;">Recommendations</p> <p>Results improvement: Better data standardisation, farmer training (buy in), and significantly increasing product management skills within FLOX will help.</p> <p>Results usage by policymakers: Potential analysis to identify government funding support (with clear ROI on farmers/environment/social) and direct contact with farmers.</p>

5.23 TC23

TC23 Evaluation Report for Year 2				
Partner Name and TC number: Idele – TC23				
DATSs: Feeding robot, heat detectors, calving detectors				
Agricultural Sector and Crop: Beef cattle				
Biogeographical Region: France, Continental				
Main Results	Cost and Benefit	CBA	Net Benefit	+25.3 €/100 kg meat
	Sustainability Impacts	Social	Working time (h/100 kg meat)	-39%
		Environmental	Electricity consumption (KWh/100 kg meat)	+19.5%
Outcomes	Results from the Assessment Framework			
	<p>Data collection did not pose major challenges, as both the DATSs user and non-user farms are part of the Inosys network – a French farmers’ network that gathers extensive farm-level data to serve as an observatory of various livestock sectors and to generate reference material and case studies. Most of the data used for QuantiFarm were obtained from the existing Inosys dataset. The main difficulty encountered related to obtaining data disaggregated by activity for resource use, as most data were only available at the whole-farm level.</p>			
	<p>Regarding the sustainability results – economic, environmental, and social – a response cannot yet be provided, as the complete analysis is still pending.</p>			
	<p>As for deviations between the assessment framework results and the expected outcomes, the results have generally aligned with initial expectations about the benefits of DATSs. These include a reduction in working time and associated labour costs, without other major benefits being observed, except for a reduction in fuel consumption. This decrease, however, has been accompanied by an increase in electricity use, and no impact on production performance (meat) has been detected. It remains unclear whether the higher electricity consumption can be fully attributed to DATSs, as the DATSs user also operates poultry houses – unlike the non-DATSs user – and these are known to consume significant amounts of electricity. This factor may lead to a slightly over-optimistic cost–benefit analysis.</p>			
Relationship between advisor (TC Leader) and farmer				
<p>In this Test Case, a three-party organisational structure has been implemented, in which the TC Leaders are in contact with the farm advisor, who is</p>				

TC23 Evaluation Report for Year 2	
Common Conclusions	<p>responsible for engaging with the farmers, collecting data, and reporting it back to the TC Leaders.</p> <p>Regarding the farmer’s opinion on the relevance of the assessment framework to agricultural activity, the farmer is generally not highly involved in the project. He has agreed to participate and to allow data collection, provided it does not take up too much of his time – which is the case, since the project relies on data already being collected through Inosys. The farmer is aware that, given the scale of the project, which involves multiple agricultural sectors and a wide range of technologies, the framework is broad and may not yield results that are specifically tailored to his situation.</p> <p>Following the 2023 results, the decision was made – in agreement with the farm advisor – not to share the results with the farmers. This was primarily due to concerns that the economic analysis appeared to be biased, if not inaccurate, and therefore unsuitable for sharing in its original form. With the 2024 results and the upcoming Demo Events, discussions are underway to determine the best approach for reflecting on the assessment framework and its findings with the farmers. However, expectations remain limited on the farmers’ side, as their main motivation is to contribute to research by providing data, rather than to receive detailed feedback.</p>
	Contextualization of the results
	<p>To fully understand the true impact of DATSs, the use of an additional, complementary approach may be necessary. For example, comparing two hypothetical investment scenarios on the DATSs farm could offer further insights. A relevant methodology for this type of comparison can be found in <i>Cniel Infos – Dossier Investissements en élevage laitier</i>.</p> <p>No exceptional circumstances have been identified that could have influenced the 2024 data collection or the corresponding results.</p> <p>Farm size may indeed have had an influence on the results, as the DATSs user farm operates with a larger herd than the non-DATSs user, which likely allows for economies of scale. However, a potentially greater influence may come from the additional agricultural activities that differ between the two farms. These differences could either be a consequence of the presence of DATSs or factors that influenced the initial decision to adopt them.</p>
	Farming Business Models and DATSs integration
	<p>The primary motivation for the farmer to equip his farm with DATSs was time saving in beef cattle operations. According to his advisor, the DATSs user is described as a "very technical farmer, keen on using technologies to optimise his time." This optimisation of time, enabled through the use of various DATSs, has allowed him to develop and maintain several agricultural activities on the farm, including beef cattle breeding (from farrow to finish),</p>

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	<p>apple growing (for cider, although not produced on-site), and poultry breeding (three houses for meat production).</p> <p>The results provided by the assessment framework have supported the validation of the business model in this case, as the DATSs appear to fulfil their intended purpose and have demonstrably contributed to a reduction in workload.</p> <p>As for the role of DATSs in scaling up the business model, it is difficult to draw definitive conclusions based solely on the assessment framework results, given that the two farms – DATSs user and non-user – follow very different business models.</p>
Lessons Learned	Test Case high-level context
	<p>In this TC, since the DATSs are applied at the farm level (or at least herd level) we could not get 2 separate herds on the same farm, so we had to make the comparison between 2 different farms. It was tried to hire farms that were as similar as possible, starting with farms in the same region (so same environmental and economic local context) that both have a farrow to finish beef cattle activity and that both sell their meat with a Quality Label. There are still some remaining differences, first the herd size with our DATSs-user having a herd almost twice as big as our non-DATSs-user and second, as mentioned before, our DATSs-user have multiple agricultural activities where as our non-DATSs user only has a poultry house, for young hens.</p>
	Farmers contribution and motivations
	<p>The opinion of the farmer regarding the results of the assessment framework was not expressed, as the results had not yet been presented to the farmers. The relevance of the assessment analysis for the farming practice was regarded as potentially useful in reinforcing the choice made by the DATSs-user to equip himself; however, since the comparison was carried out between only two farms, it was doubted that conclusions drawn from the analysis could be generalized to other contexts. The motivation for continued participation in the QuantiFarm project for another testing period was attributed to the absence of specific expectations regarding the project's results, provided that the data collection does not become more complex or time consuming. The hosting of the Demo event was agreed upon by the DATS-user, while the ongoing transfer of the farm to his daughter was observed with some concern due to its less than smooth progress; nonetheless, his participation in the last testing period of the project was not expected to be jeopardized because of his commitment to the Inosys network, although a limitation in his participation might be imposed if the situation on the farm were to deteriorate.</p>
	Recommendations
	<p>To improve the quality of the results generated through the project, it has been suggested that a broader analysis could be conducted – either at a general level</p>

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or by agricultural sector – to identify potential trends in the types of impacts that DATSs may have across different contexts.

Regarding the type of information that can support farmers and advisors in making decisions about DATSs adoption, the cattle breeding sector has shown that the main motivations are time saving and improved ease or comfort of work. Therefore, the results related to labour quality, quantity, and cost are considered the most relevant and useful to share within this context.

To support policymaker understanding of DATSs adoption and operation, the key messages and outputs should be highlighted – including time saving, fuel saving, and feed saving. These outcomes reflect important social and environmental benefits. However, it should also be noted that the return on investment (ROI) may be extended if technical performance is not improved or if the time saved is not reinvested into other economically productive activities.

5.24 TC24

TC24 Evaluation Report for Year 2				
Partner Name and TC number: KU Leuven TC24				
DATs: smart counting camera (TC24), smaxtec ruminal bolus (TC27)				
Agricultural Sector and Crop: Meat (TC24), Dairy (TC27)				
Biogeographical Region: Belgium, Continental				
Main Results	Cost and Benefit	CBA	Net Benefit	+13 €/animal
	Sustainability Impacts	Social	Working time (h/animal)	-49%
		Environmental	Water consumption (m ³ /animal)	-29%
			Fuel consumption (m ³ /animal)	+129%
Outcomes	Results from the Assessment Framework			
	Communication with the farmers is not always easy, as it often takes some time for farmers to respond on questions and often need additional information and reminders in order to fully comply with the requests.			
	The highlights in the TC24 short report is referring to PigUp software which was used on Farm 1, but that farm left the project even before the first data collection. Instead the DATs of Farm 3 should be mentioned (CloudFarms sow management software, 3 smart counting cameras, Fancom system for feed, water and climate monitoring), see also the initial Test case questionnaire of farm 3.			
	The costs and benefits found by comparing the two farms need to be further investigated in order to understand whether the differences can be attributed to the use of the DATs or to other aspects of the farm management. The estimated costs and benefits are quite large and it seems doubtful that the found results are only due to the use of the DATs.			
Outcomes	Relationship between advisor (TC Leader) and farmer			
	With the update of the assessment framework in year 2, the farmers are happy to see more parameters that have specific relevance in the pig farming sector. As some of those parameters were proposed by the farmers themselves, they are glad to see that their suggestions are processed and used to updated the assessment framework. However, the proposed parameters are not reflected in the short report. Hopefully they can be included in later reporting.			
Contextualization of the results				

TC24 Evaluation Report for Year 2	
Common Conclusions	<p>There is a significant size difference between the farm with and the farm without DATSs (616 vs 340 sows in 2023). This size difference result in a different magnitude of meat production and therefore revenue.</p> <p>By taking into account some more used indicators of pig performance with the updated version of the assessment framework, it is easier to get insight in the differences (e.g. efficiency level and pig survival rates) between the farms regardless of their size.</p>
	Farming Business Models and DATSs integration
	<p>The farmers indicate that the use of technology mainly makes the daily work easier and more precise without a direct impact on running costs or revenue of the farm. [e.g. smart counting camera makes counting the pigs easier and more precise during movement of the pigs, however, this does not have a direct impact on performance indicators, costs, or revenue]</p> <p>By analysing the data from the DATSs (e.g. climate control system) the farmer increases the insight of what is happening in the farm and indicates this leads to a better understanding of irregularities on the farm.</p>
Lessons Learned	Test Case high-level context
	<p>The size of the two pig farms is clearly different which has a big influence on the costs and revenues. The larger farm (more sows) does not raise all the piglets themselves; therefore they produce less meat but have an additional source of income by the sales of the piglets.</p>
	Farmers contribution and motivations
	<p>When requesting the farmer to fill out the complete assessment framework, we experienced some troubles in the communication with the farmers. Sometimes it is difficult or impossible for the farmer to collect all requested information, but farmers tend do just stop responding instead of indicating the faced issues.</p> <p>Farmers do not see the immediate benefit of spending time filling out the questionnaires and assessment framework. They are not very interested in the discussing the short report. However, they are interested in the use of new technologies.</p>
	Recommendations
	<p>By taking into account the sector-specific parameters, as included in this year's assessment framework, there could be a better understanding of which aspects of pig farming are influenced by the DATSs. Next to the quantitative analysis, a qualitative understanding of how the farmer makes use of the DATSs on their farm could increase our understanding of benefits which might not be reflected in the current cost-benefit analysis.</p>

5.25 TC25

TC25 Evaluation Report for Year 2				
Partner Name and TC number: Idele – TC25				
DATs: Feeding robot				
Agricultural Sector and Crop: Dairy cattle				
Biogeographical Region: France, Continental				
Main Results	Cost and Benefit	CBA	Net Benefit	+26.5 €/1000 l milk
	Sustainability Impacts	Environmental	Electricity consumption (KWh/1000 l milk)	+60.7%
			Fuel GHG emissions	–22.8%
		Social	Working time (h/1000 l milk)	+21.6%
Outcomes	Results from the Assessment Framework			
	<p>Both farms, DATs users and non-DATs users are part of the Inosys network, a French farmers network that gathers lots of data on the farms to be an observatory of the different breeding sectors and produce references and case study. Most of the data for Quantifarm were obtained through the data collected for Inosys. The main issue was to get data per activity for use of resources because, for most of them, IDELE could only get accurate data at the farm level.</p> <p>In general, the results of the analysis are consistent with the expected benefits of the DATs: reduction in working time (and labour costs) and a reduction in fuel consumption, replaced by a higher consumption in electricity. However, we are not sure the higher consumption of electricity can be entirely linked to the use of DATs since our DATs-user also has a pig production activity (that the non-DATs-user doesn't have) and that are known for consuming a lot of electricity. Regarding the decreased cost of feed, part of it can be linked to the use of the DATs but as the farm advisor express, the DATs-user farmer did not change his feed when he equipped himself with the robot so the impact of the DATs might not be so direct on this point and maybe the way he feeds his cows is just more economic. The lower milk productivity on the DATs-user farm also raises some questions on whether or not it can be considering he has a "better feed management". However, the CBA remains positive due to the higher selling price of milk.</p>			
	Relationship between advisor (TC Leader) and farmer			

TC25 Evaluation Report for Year 2	
Common Conclusions	<p>The TC has a three-part relationship since TCLs talk with the farm advisors who oversee discussing the project with the farmers, including data collection.</p> <p>Globally, the farmers are not very involved in the project. They are ok with participating and with data collection if it doesn't take them too much time. They are aware that, as a big project with multiple agricultural sectors involved and multiple technologies being evaluated, they might not get specific results as the framework is quite general and must fit a wide range of situations and technologies.</p> <p>Together with the farm advisor, TCL chose not to share the results with the farmers, mainly because the economic analysis appeared to be biased, and TCL were not comfortable sharing it with the farmers.</p> <p>With 2024 results and the upcoming Demo Events, we are currently thinking about how to best reflect on the Assessment Framework's results with the farmers. But again, farmers are not expecting much of this project and they are just ok to help research by delivering data to this project.</p>
	Contextualization of the results
	<p>Another complementary approach is probably necessary to better assess the impacts. For instance, comparing two hypothetical investments on the DAT farm could give additional insights (methodology Cniel Infos : – Dossier Investissements en élevage laitier)</p> <p>Any exceptional circumstances could have influenced 2024 data collection and thus results.</p> <p>The farm size might influence the results as the DATSs–user farm has a bigger herd than the non–DATSs–user, allowing probably for economies of scale but what might be of bigger influence is the additional agricultural activities that are different on both farms. However, those differences might also be possible due to the presence of the DATSs, or they had an influence on the choice to equip the farm with DATSs.</p>
	Farming Business Models and DATSs integration
	<p>The main reason for the use of DATSs by the farmer was to save time on a tedious task. However, after the DATSs implementation, the farmer didn't change the feed of the cows. The only thing that changed was the way it was distributed to the cows.</p> <p>We could say that the DATSs in the TC serve its purpose and is proven to help reduce workload, although the lower milk productivity highlights the fact that the business model and positive CBA partly rely on a higher selling price of milk.</p> <p>It is hard to say based only on the Assessment Framework results since the two farms, DATSs and non–DATSs users have two very different business models.</p>

TC25 Evaluation Report for Year 2	
Lessons Learned	Test Case high-level context
	<p>In this TC, since the DATSs are applied at the farm level (or at least herd level), it is not possible to separate herds on the same farm, so a comparison between two different farms was done. The farmers recruited were as similar as possible, starting with farms in the same region (same environmental and economic local context). There are still some remaining differences. First, the herd size with our DATSs-user having a herd almost three times as big as our non-DATSs-user, and second, the DATSs-user has another agricultural activity: pig production that our non-DATSs-user doesn't have.</p>
	Farmers contribution and motivations
	<p>TCLs preferred not to present the results to farmers.</p> <p>The analysis might be interesting to comfort the DATSs-user in the farmer's choice. However, the comparison being made is only between two farms; TCL is not sure any conclusions might be drawn from it and extended to another context.</p> <p>The farmers are not waiting for anything regarding the results of the project so as long as the data collection doesn't get more complex or time-consuming, there should be no issue with having them participate in the project. Also, there should be no issue in hosting the Demo Event planned for 2025 at our DAT-user farm since the farmer is used to this kind of activity.</p>
	Recommendations
<p>Maybe it could be interesting to look at a general level or maybe at agricultural sector level if there are some trends on the type of impacts the DATSs can have.</p> <p>In the cattle breeding sectors, the main motivations for DATSs adoption are time saving and easiness/comfort of work so the results on the impact in quality/quantity and cost of labour seems to be the most interesting and useful to share.</p> <p>Time saving, fuel saving, feed saving. From a social and environmental aspect, it is interesting, but the ROI could be quite long if technical performances are not improved and if the saved time is not reused for another economic activity.</p>	

5.26 TC26

TC26 Evaluation Report for Year 2				
Partner Name and TC number: TEAGASC, TC26				
DATs: Milking robots				
Agricultural Sector and Crop: Dairy, cows				
Biogeographical Region: Ireland, Atlantic				
Main Results	Cost and Benefit	CBA	Net Benefit	+300 €/animal
	Sustainability Impacts	Environmental	Electricity consumption (kWh/animal)	+31.8%
			Social	Cows with high SCC
		Working time (h/animal)		-76.6%
Outcomes	Results from the Assessment Framework			
	<p>There were fewer data collection challenges for the 2024 testing period, this was due to stronger relationships with the farmers built over time, greater familiarity with the data collection process, and improvements made to the data collection template. A few challenges did arise around the 'market data' tables. It remains uncertain whether this information was to be collected based on national figures (e.g., per unit costs for electricity, agri-diesel, average income, etc.), an average of the two farmers' figures (due to only being able to enter one set of 'market data' in the online form), or solely the figures provided by the farmer using a DATs. These questions were asked to WP2, and it was indicated that TCLs could decide how to report these figures. The flexibility was appreciated but led to uncertainty when filling out the information and could lead to differences in reporting among TCLs.</p>			
	<p>There were no major deviations between the Assessment Framework analysis and expected outcomes. It is challenging to compare the two testing period reports for a few reasons. Reports from the two testing periods were presented in different formats, and the 2023 report for TC26 doesn't reflect full calendar year data for Farm 2. Additionally, the two farms in our TC are very different and thus, the exercise of comparison and its outcomes may not be particularly relevant (as indicated in text provided in other parts of this report).</p>			
	<p>The new format for 2024 TC reports is welcomed, as it contains details about the sustainability results. However, as an example of an area for improvement in the cost-benefit analysis, it is unclear if Farm1's electricity output from his solar panels is reported (related to the 'electricity consumption reported as +31.8% higher). Within the sustainability impact section—environmental dimension-electricity consumption, 'electricity'.</p>			
Relationship between advisor (TC Leader) and farmer				

TC26 Evaluation Report for Year 2	
Common Conclusions	<p>The farmers haven't expressed strong opinions about the relevance of the data collection process and outcomes of the Assessment Framework for their day-to-day agricultural activities. Over the past year, both farmers expressed that the process of organising economic, social, and environmental KPIs in preparation to submit the assessment framework was a useful exercise, allowing them to reflect on their farm's performance. The farmer with the DATSs stated he wants to investigate his real water costs in more detail in 2025 because of the data collection process. Note: in Ireland, water use and costs can be challenging to measure given the high use of wells in rural areas. There are limited to no costs incurred by landowners to access the water; associated electricity costs are difficult to isolate.</p> <p>The farmer has not provided his input/reflection on the results of this recent cost-benefit analysis. The report was shared with the farmer shortly after we received it on 25/02/25, less than one week before this report was due. It was not appropriate to pressure the farmer for his input, especially as it was the middle of the intensive spring calving season.</p>
	Contextualization of the results
	<p>To understand the true impact of TC26's DATSs, many more farms in Ireland with and without milking robots would need to be surveyed. In addition to collecting economic, social, and environmental KPIs in the assessment framework and social indicators via the social questionnaires, it may be beneficial to gather real-time data produced by milking robots about cow health (SCC), number of milkings/day/cow, milk quality, milk production volume and content analysis (fats, protein which determine price/unit paid to the farmer), etc. This data can deepen understanding about how this DATSS performs in real conditions, what kind and how much data is provided, how much of the data is accessed by the farmer, and what kinds and how much of the data is useful to farmers.</p> <p>Due to the selection of farms in the test case (outside of current TCLs control), the results provided by the Assessment Framework will never give a very accurate picture of the impact of milking robots on dairy farms in Ireland. To make the most of the data generated with the constraints of the two farms in the TC, it will be important to the project to re-analyse the 2023 data. As mentioned, there were important updates provided to WP2 in early 2024 for Farm 2 so TC26 figures could be re-analysed. To date, the cost-benefit analysis has yet to be re-run for TC26. We understand that D2.2 had to be submitted by a certain date and that there wasn't sufficient time to revise the TC26 data with the additional data provided and that a revision of 2023 data should appear in the next WP2 deliverable.</p> <p>The two farms could not be more different. Farm 1 is a conventional, pasture-based dairy farm, with 180 milking cows and over 400 animals on site (calves, replacement heifers) with good grazing land, large acreage due to the ability to buy/rent more local land, giving the farmer the ability to increase their herd size. The farm was developed alongside the installation of the milking robots.</p>

TC26 Evaluation Report for Year 2	
	<p>In contrast, Farm 2 is a very small, in terms of acreage and herd numbers, organic farm operating on poor land with vastly different production goals.</p> <p style="text-align: center;">Farming Business Models and DATSs integration</p> <p>Farm 1 with the DATSs values many aspects of the technology, including labour savings, increased flexibility for how and when farm tasks are performed, and improvements in animal health and welfare (e.g., early disease detection, reduction in vet bills, and improved hoof health from cow choice for milking frequency and thus freedom of movement from grazing paddock to the shed for milking and back), and the feeling of increased control of herd management through individualised cow performance data supplied by the robot.</p> <p>The collection of data through the QuantiFarm assessment framework came at the end of an initial business planning period for the DATSs farmer and thus didn't directly validate/invalidate his plan. This farmer had developed his green field site since 2017, installing successive milking robots over five years as he grew his herd. He was a new entrant into dairy on this farm. Maybe in next year's report, the TCL could report more about how the farmer feels the Assessment Framework analysis validates or invalidates his future business plans.</p> <p>The Farm1 farmer planned and has purchased a total of 3 robots since starting to milk on the site in 2018. His careful planning, farm management practices (like installing solar panels with battery storage), along with his technical knowledge and confidence about the performance of the DATSs have enabled him to carry out the expansion. Additionally, he has been fortunate enough to rent and buy land connected to or close to his home farm, critical in a rotational pasture-based grazing system when using milking robots. The labour savings and labour flexibility afforded by the installation of all three milking robots has now enabled him to farm differently. For example, he grows and harvests his own silage and grass cuttings. Feeding cut, fresh grass to housed cows is done to supplement silage and for pasture management. In the first few years on the farm, when there was one milking robot, the farmer had to pay a contractor for silage harvesting/baling. Now, he can use his own equipment and staff members for these jobs, creating time savings and labour costs and giving him more control of farm management.</p>
Lessons Learned	<p style="text-align: center;">Test Case high-level context</p> <p>Optimally, in an Irish pasture-based dairy system, a farmer must have the necessary infrastructure (internal roadways, ideally at least three grazing pastures within walking distance of the shed, ample shed size and suitable farmyard design), sufficient technical affinity, technical knowledge and/or technical advice and support (from peers, farm advisor, technology provider) and requisite financing in place before investment in and use of milking robots. Much planning is involved, given the high cost of milking robots and the longer time necessary for ROI. Additionally, each milking robot can optimally service 50–60 cows over 24 hours. Thus, a farm should have a corresponding</p>

TC26 Evaluation Report for Year 2	
	<p>herd size suitable to the number of robots it can afford. The average dairy herd size in Ireland is ~100 cows.</p> <p>Unfortunately, this number doesn't correspond with one milking robot's capacity and wouldn't justify the expenditure for two robots. There are cultural factors and decision-influencing factors which also influence farmers' decisions to adopt milking robots. In Ireland, less than 5% of farmers have adopted this DATSs, so there are fewer opportunities to encounter milking robots, see them being demonstrated, and learn from their peers about this technology's pros and cons. Some stakeholders in the Irish dairy sector would be against milking robots and feel money is better spent on herringbone or rotary parlour technologies and other complementary technologies like automatic cluster removers, automatic calf feeders, drafting facilities, and automatic heat detection.</p>
	Farmers contribution and motivations
	<p>The DATSs farmer was provided with the reports, but there wasn't enough time to gather his feedback without exerting too much pressure on his time, especially during the intense spring calving period.</p> <p>From TLC's perspective, both farmers have committed to participation for three years and will follow through on their generous willingness to volunteer.</p>
	Recommendations
	<p>Clarify what is to be collected in the 'market data' section of the new online system. Provide brief descriptions within the TC 'short reports' about how data was generated (i.e., direct comparison of Farm1 and Farm2? Over one year? Two years? If two years, was an average used to calculate the direct/indirect effect between the two testing periods?). There is a missed opportunity to gather additional data in TC26 directly from milking robot data and complementary technologies used by the farmer. The milking robot generates information about feed management, SCC, milk fats %s, milk proteins %s, no. Milkings/day/cow.</p> <p>Complementary technologies used on the farm include cow collars for heat detection and animal tracking. Some of these KPIs are being gathered for other 'livestock and dairy' test cases (D2.2, Table 16, p.187) – feed management, heat detection, animal tracking – but not for TC26.</p> <p>As mentioned, cost-benefit results from this TC may not be sufficient to provide evidence-based information for use by farmers and advisors when considering the adoption of milking robots in Ireland. However, other project information about the DATSs adoption process could be useful to farmers and advisors, like learnings from the Integrated DATSs Adoption Framework, Recommendation option within Toolkit and DIA. The cost-benefit analysis from this TC may not give stakeholders, including policymakers, an accurate picture of the impact of milking robots on a typical Irish dairy farm. However, the analysis provides policymakers with a snapshot of one particular use of DATSs on an individual farm, adding to the value of milking robots for this farmer. This TC may act like one of the WP1 storyboards, providing a glimpse</p>

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into the experiences of one Irish dairy farmer, which can be used to widen policymakers' understanding of the process of DATSs adoption.

When making policies, like providing funding mechanisms in the form of grants for modernisation through investments in technologies (TAMS III in Ireland), benchmarking tools are important for Irish stakeholders.

5.27 TC27

TC27 Evaluation Report for Year 2				
Partner Name and TC number: KUL TC27				
DATs: Ingestible bolus sensor				
Agricultural Sector and Crop: Dairy, Cows				
Biogeographical Region: Germany, Continental				
Main Results	Cost and Benefit	CBA	Net Benefit	+923 €/animal
	Sustainability Impacts	Economic	Milk productivity (l milk/animal/day)	+11.6%
		Environmental	Water use (m ³ /animal)	+15%
			Electricity consumption (kWh/animal)	+48.9%
			Fuel consumption (l/animal)	+12%
			Drugs use (g/animal)	24.2%
Outcomes	Results from the Assessment Framework			
	<p>The data required for the Assessment Framework does not always match the data available on the farm. It's necessary to transform the data to fit into specific units needed for the framework assessment. Data required for the framework assessment, for example, water consumption or other data like electricity or fuel, are in most cases available for the whole farm. If you include all the water used for cleaning in the water consumption of a dairy barn, it's difficult to relate these values to the DATs directly.</p>			
	<p>The input category cost of feed, which indicates that there is a difference of 918 € per animal between the farm with animal between the farm with DATs and the farm without DATs, will have to be clarified more deeply because it's not clear whether it's the exclusive impact of the DATs or not. If we look at the result of the cost–benefit analysis to see any effect of the DATs, it looks like the cost of feed is strongly (99%) dependent on the DATs. This deserves further analysis or evaluation.</p>			
Relationship between advisor (TC Leader) and farmer				

TC27 Evaluation Report for Year 2	
	<p>It's hard to say what the farmers think about the relevance of the evaluation framework. First, it is extra work for them. That is why we support them economically.</p> <p>Another way of motivation could be a more direct connection of the farmer in the Assessment Framework to see a monetary outcome for extra work. Both farmers had the opportunity to see their data in relation to the previous data collection. This meant that in some cases, there was a difference that could be resolved by changing the data or getting feedback from the evaluator or TC Leader.</p>
Common Conclusions	Contextualization of the results
	<p>Looking at the results according to the Assessment Framework, there should be further considerations of the DATSs and its implementation on the farm in order to assess the costs or impacts compared to the standard assessment framework.</p> <p>To date, there have been no exceptional circumstances that have influenced the results of the framework. The farm size for both farms is the same in terms of the number of animals injured, the number of dairy of animals and the type of farm, as well as the biogeographical region</p>
	Farming Business Models and DATSS integration
	<p>The value provided by the DATSs for the farmer is to achieve some time savings and a better understanding of the cows, their physiological and perhaps behavioural needs, if we consider heat detection.</p> <p>The farmer states that having more information about the cows allows the detection of earlier problems, identifying the risk of an acute illness or disease. If he looks at the water consumption and other results from the DATS, the farmer can predict more accurately what is happening with the cow and the data being analysed. The data is stored in the cloud system and is always available via mobile phone. DATSs also helps the farmer directly in heat detection.</p>
Lessons Learned	Test Case high-level context
	<p>The DATS used for test case 27 was surprisingly having a problem with the materials. This is not in the responsibility of the farmer, but of the manufacturer of the DATSs. The material is eroding and we never expected that this would happen because it is connected to food safety and maybe a problem of carry-over of unwanted substances in milk.</p>
	Farmers contribution and motivations
	<p>Both farmers are not very interested in discussing the results of the Assessment Framework. This may be a motivation and understanding of what the framework can do for the farm.</p>

TC27 Evaluation Report for Year 2	
	<p>Is there a clear benefit for the farmer at the beginning? This should be one of the questions if we want to motivate farmers to participate. Both farmers were pushed a little bit to participate in the project. This might be more understandable in the context of the increasing paperwork of a farmer in Germany.</p>
	<p style="text-align: center;">Recommendations</p>
	<p>If we want to improve the role of the DATSs and the understanding of DATSs a bit better, it might be necessary to cover the whole process of the DATSs application until its end. That means there should be a kind of life cycle analysis just for the DATSs, evaluating if it is possible to experience a recycling process or a recovery process. This is not the responsibility of the farmer or the slaughterhouse, but it might be helpful to improve the acceptance of the DATSs.</p>

5.28 TC28

TC28 Evaluation Report for Year 2				
Partner Name and TC number: ANAMOB, TC 28				
DATs: Animal tracking systems, Automatic feeding systems, Automatic milking systems				
Agricultural Sector and Crop: Livestock, Dairy				
Biogeographical Region: Romania, Steppe				
Main Results	Cost and Benefit	CBA	Net Benefit	+410 €/animal
	Sustainability Impacts	Environmental	Water use (m ³ /animal)	-64%
			Electricity consumption (kWh/animal)	+376%
			Fuel consumption (l/animal)	+479%
			Drugs use (g/animal)	+86.5%
		Social	Working time (h/animal)	-23,9%
Results from the Assessment Framework				

TC28 Evaluation Report for Year 2	
Outcomes	<p>In 2024, the implementation of Digital Agricultural Technologies (DATSs) in the dairy Test Case continued to improve farm efficiency. The cost–benefit analysis demonstrated that farms using DATSs experienced more efficient feeding management, improved animal health tracking, and increased milk production consistency. The net economic benefit per cow was €295.40, reflecting reduced waste in feed allocation and optimized milking schedules.</p> <p>The payback period for the initial investment in DATSs technology (€102,860) was estimated at approximately six months due to operational savings and better herd productivity. Automated feeding systems led to a 6% reduction in feed waste, while animal tracking systems improved heat detection accuracy, reducing calving intervals by 14 days on average.</p> <p>From a sustainability perspective, DATS farms showed a slight decrease in water usage per litter of milk produced, but energy consumption increased due to the operation of automated systems. This trade–off should be monitored in future assessments.</p> <p>Data collection was generally efficient, with farmers adapting well to the new digital reporting system. However, technical malfunctions in automatic sensors occasionally led to gaps in data accuracy. The need for real–time data validation was highlighted as an area for improvement to prevent reporting inconsistencies.</p>
	Relationship between advisor (TC Leader) and farmer
	<p>Regular interactions between the TC Leader and the farmer played a key role in ensuring that DATSs systems were fully utilized.</p> <p>The farmer recognized the value of the Assessment Framework in tracking herd productivity and optimizing resource allocation. The transition to a digital reporting system initially posed challenges, but with continued training, the farmer became increasingly confident in using the system. Discussions emphasized the importance of real–time data access for better decision–making</p>
Common Conclusions	Contextualization of the results
	<p>The results show that the adoption of DATSs in dairy farming leads to more precise animal management and higher operational efficiency. However, external factors such as fluctuations in feed prices and milk market dynamics affected overall financial performance.</p> <p>Farm size also influenced results, with larger dairy operations benefiting more significantly from DATSs integration due to economies of scale.</p>
	Farming Business Models and DATSs integration

TC28 Evaluation Report for Year 2	
	<p>For the farmer, the main value of DATSs lies in cost reduction, labour efficiency, and improved herd management. The results validate the business model, demonstrating that DATSs lead to consistent improvements in productivity.</p> <p>The ability to scale DATSs effectively suggests a high potential for future business expansion, provided the costs of energy consumption can be optimized.</p>
Lessons Learned	Test Case high-level context
	<p>The comparison between DATSs and non-DATSs dairy operations showed that while non-DATSs farms maintain basic efficiency, DATS farms achieve more stable performance and higher profitability.</p> <p>Key differences include better data-driven decision-making, more precise feeding, and reduced calving intervals, which lead to higher milk yields.</p>
	Farmers contribution and motivations
	<p>The farmer remains highly engaged in the QuantiFarm project due to clear financial benefits and improved farm operations.</p> <p>The results reinforce the value of continuing with DATSs adoption, and the farmer is motivated to further integrate new digital tools to improve productivity and sustainability.</p>
	Recommendations
	<p>To enhance the effectiveness of DATSs in dairy farming, the following improvements are recommended:</p> <ol style="list-style-type: none"> 1. Increase Data Collection Frequency: implementing real-time monitoring tools will improve decision-making and allow for faster adjustments in feeding and health management. 2. Optimize Energy Efficiency: since energy use increased with automation, exploring renewable energy sources or more efficient equipment could help reduce costs. 3. Improve Data Validation and Accuracy: developing an automated alert system for sensor malfunctions will enhance data reliability. 4. Further Customization of the Assessment Framework: focusing on milk quality metrics, energy consumption, and animal welfare indicators will ensure a more comprehensive evaluation. <p>These recommendations will ensure that DATSs integration continues to drive efficiency, sustainability, and profitability in dairy operations.</p>

5.29 TC29

TC29 Evaluation Report for Year 2				
Partner Name and TC number: ART21, TC29				
DATs: Beehive monitoring and protection				
Agricultural Sector and Crop: Apiculture, Bee husbandry				
Biogeographical Region: Lithuania, Boreal				
Main Results	Cost and Benefit	CBA	Net Benefit	-2.3 €/beehive
	Sustainability Impact	Economic	Bees productivity	+2.7%
Outcomes	Results from the Assessment Framework			
	Data collection is straightforward and has not posed major challenges so far. Communication with the farmer, who supplies essential data on the farm's economic and social aspects, is also efficient and productive. This is largely due to the farmer's openness to innovation and willingness to adopt new technologies.			
	DATs provided economic benefits that are clear and easily identifiable. It increases farm productivity and reduces bee colony losses. Also, it saves money that beekeepers might need to spend on additional workers that would be monitoring the beehives, as well as supplements for bees that might not be needed when TC is implemented. As far as environmental benefits, as it was foreseen, the system helps to reduce bee colony losses, which in turn minimize the negative impact on the environment and improving the quality of production.			
	Relationship between advisor (TC Leader) and farmer			
The farmer was informed about the Assessment Framework results and responded positively to the DATs evaluation. He values such activities, recognizing their importance in adding credibility to new solutions. While he acknowledges the benefits of the DATs, he thinks that the reduction of bee colony losses is not necessarily a benefit of the DATs, but other variables as well.				
Common Conclusions	Contextualization of the results			
	Natural variability influences the results of hive assessments. Factors such as temperature, humidity, forage availability, hive population dynamics, and pest activity fluctuate constantly, affecting the monitored parameters. Even when comparing apiaries with and without the monitoring system in proximity, environmental conditions cannot be assumed to be identical.			
	Farming Business Models and DATs integration			
The beekeeper utilizes the beehive monitoring system to gather real-time data on hive conditions directly at the apiary without the need of manual				

TC29 Evaluation Report for Year 2	
	<p>monitoring. This enhances hive management practices and supports more informed decision-making. From the beekeeper’s perspective, the system does save time</p> <p>Additionally, the system facilitates changes in business operations, particularly in communication with customers and stakeholders. Sharing the collected data fosters transparency and offers verifiable insights into hive health and honey quality.</p>
Lessons Learned	Test Case high-level context
	<p>The Beehive Monitoring System is designed to accommodate future upgrades, allowing for the integration of additional parameters related to hive health and honey quality. Such enhancements could further improve apiary management and operational efficiency.</p>
	Farmers contribution and motivations
	<p>The beekeeper views the monitoring system’s assessment framework with optimism but remains cautious about fully relying on the results due to natural variations in hive conditions.</p> <p>The beekeeper is willing to participate in the QuantiFarm project, as it requires only minimal data input, information that is already gathered during routine hive inspections or field observations.</p>
	Recommendations
	<p>The findings demonstrate clear benefits of the Beehive Monitoring System, serving as a strong example of how such technology can support beekeepers in their work.</p> <p>These insights could also be shared with policymakers to advocate for improved legislation, subsidies, grants, or other incentives that encourage beekeepers to adopt advanced monitoring technologies.</p>

5.30 TC30

TC30 Evaluation Report for Year 2				
Partner Name and TC number: Benco Baltic d.o.o., TCenco Baltic d.o.o., TC30				
DATs: Spectroscopic oyster analysis tool				
Agricultural Sector and Crop: Aquaculture, Oysters				
Biogeographical Region: Croatia, Mediterranean				
Main Results	Cost and Benefit	CBA	Net Benefit	49244 € at the company level
	Sustainability Impact	Economic	Mortality rate (%)	-79,5%
		Environmental	Oysters' productivity (number/ha)	+62,5%
			Fuel GHG emission	-8,3%
Outcomes	Results from the Assessment Framework			
	<p>Data collection does not present significant challenges. Communication with the farmer, who provides the necessary data on the farm's economic and social aspects, is also smooth and productive. This is due to the farmer's willingness to try new solutions and adapt the technologies.</p> <p>DATs provides clear economic benefits. It increases farm productivity and reduces oyster mortality. This leads to the cost-benefit analysis being positive even if the investments that would generally be required for system implementation (not the case for TC30) are considered. However, the exact numerical estimation of the impact is difficult to calculate because it requires precisely isolating other variables. The DATs does not contribute to environmental improvements because, in essence, oyster farming does not create specific ecological impacts. Reducing the CO₂ resulting from reduced travel to the chemical laboratories for oyster analysis could be counted as an environmental impact. However, the effect is negligible due to the limited number of such visits.</p> <p>No deviations between the results from the assessment framework and the expected outcome were noticed. Similar results were expected and are observed in this evaluation round.</p>			
	Relationship between advisor (TC Leader) and farmer			
	<p>The farmer was briefed about the assessment framework results. The farmer is positive about the DATs evaluation and believes such activities are important and bring credibility to the new solutions. He is aware that the DATs brings benefits but is not convinced that the benefits are directly related to the DATs. In the farmer's opinion, the variation of the oysters and the variation in the environmental conditions (water temperature, amount of nutrients, salinity) is also significantly related to the observed changes.</p>			
Contextualization of the results				

TC30 Evaluation Report for Year 2	
Common Conclusions	<p>The analysis should consider isolating multiple variables to understand the true impact of the DATSs. However, this would require the DATSs to be implemented in a laboratory environment instead of a real one.</p> <p>Natural variability impacts the results of the TC assessment. Variability in salinity, temperature, nutrient levels, dissolved oxygen, predator fish population, and behaviour is always present and impacts the parameters evaluated in the assessment framework. Even though the farms with DATSs and the farms without DATSs are located close by, the environmental parameters cannot be considered totally equal.</p> <p>The potential of the farmed oysters is also a factor, which can include some errors when comparing the two farms.</p>
	Farming Business Models and DATSs integration
	<p>The farmer first uses the DATSs as a tool to provide information on oyster quality on-site. This improves the farm's activities and allows more calculated decisions to be made. From the farmer's point of view, the DAT does not save time specifically; it just diverts time from one activity to the other (from laboratory analysis to the on-site tests).</p> <p>The DATSs enables business model modification in terms of communication with clients or other stakeholders. Information provided by the DATSs, if shared, brings transparency and provides concrete evidence of the quality of the produce.</p>
Lessons Learned	Test Case high-level context
	<p>The DATSs is open to upgrades. Therefore, the evaluation of additional quality and safety parameters can be incorporated into the functionality of the DATSs. This could bring more benefits to the farm and its operational aspects. However, this is out of the project's scope since such upgrades require efforts in data collection, analysis, and model development and could be regarded as a developmental project by itself.</p> <p>As mentioned earlier, the two farms can be regarded as similar in all aspects. However, the natural variation of multiple parameters exists and induces some errors in the data and results of the assessment framework.</p>
	Farmers contribution and motivations
	<p>The farmer is optimistic about the assessment framework's activities but takes the results provided with a grain of salt. The variability in natural parameters mentioned earlier is the reason for this.</p> <p>The assessment analysis provides only limited benefits to the farming practice by ensuring the farmer knows the DATSs's benefits. It also allows farmers to gather insights faster and more frequently, resulting in improved decision-making.</p> <p>The farmer is willing to participate in the QuantiFarm project because he is asked to provide limited data inputs, which are either collected on the farm or in the field.</p>
	Recommendations
	<p>Taking into account additional environmental variables can improve the analysis's results. However, this requires more infrastructure, sensors, and</p>

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human work. Therefore, the results could be improved by considering and including a margin of error.

The results show a clear benefit of the DATSs. This can be used as a good practice example of DATSs improving the farmers in their occupation.

Policymakers could be provided with the results and reasoned to improve legislation on the subsidies and grants or other incentives for farmers to implement new DATSs in their farms.

5 Discussion of the second annual cycle of testing

As explained in Chapter 5, the refinement in the Test Case Evaluation Report means that a direct comparison of results between the 2023 and 2024 test cycles is not feasible due to significant differences in the structure and focus of the evaluation reports.

Given the variability in DATSs, farm management, and sector conditions, the subchapters analysis is structured by sector to normalize findings and highlight sector-specific trends, challenges, and benefits. This approach ensures that feedback is contextualized within relevant production systems. While this method facilitates structured comparisons, it also presents limitations. However, differences in farm size, management practices, and DATSs types within the same sector make direct comparisons challenging.

The insights presented here are derived from the feedback collected in the Test Case Evaluation Reports, which document real-world applications of DATSs in various farming systems. The findings reflect the experiences and perceptions of farmers and TCLs involved, rather than a fully standardized, quantitative assessment. This sector-based analysis should therefore be interpreted as a qualitative synthesis of key learnings, rather than a direct comparison of DATSs effectiveness across different contexts.

6.1 High-level results for TCs

In this subchapter it is proposed to do a high-level study by comparing the cost-benefit analysis between 2023 and 2024 results. Table 6 outlines the 30 TCs with the respective net benefit results analysed by WP2's Assessment Framework from DATSs using under real conditions. In both test cycles the majority of the TCs present a positive net benefit with a wide dispersion of the net benefit value.

Although the detailed discussion of these results is made individually in Deliverable D2.3 from POLIMI, along with the economic, environmental, and social indicators, the contextualization done in this subchapter will allow us to extract key economic trends and understand how different agricultural sectors and crops have responded to the implementation of digital agriculture technologies across both test cycles.

In particular, Table 6 offers a high-level view of the CBA comparison between 2023 and 2024 for various TCs across different sectors. Briefly, while differences in measurement units and crop composition—such as TC6's shift from wheat to a mix of onions and potatoes—make direct comparisons challenging, the overall picture remains encouraging.

Many TCs demonstrate positive performance, underscoring the potential for growth and improvement across sectors. For instance, in the arable sector, TC1 (gaiasense on potatoes) and TC2 (irristrat on corn) show positive figures, and TC10 (fms.agricould.ro on wheat) continues to deliver favourable outcomes. In the fruit category, TC11 (gaiasense on olives) and TC16 (QMS water software from Delphy on apples) exhibit strong positive results, while TC13 (vite.net® on grapes) and TC17 (fms.agricould.ro on grapes) also contribute to the positive trend. Similarly, sectors such as vegetables, meat, dairy, and aquaculture record several TCs with impressive gains; for example, TC30 (BENCO on oyster) in aquaculture stands out with a robust performance.

Some TCs have recorded negative values. In 2024, negatives are noted for TC3 (SATIVUM on wheat), TC4 (Augmenta HA VRA on cotton), TC6 (QMS water software from Delphy when considering the onions and potatoes mix), TC14 (NETAJET on blueberry/strawberry), and TC29 (ART21 on bees). Meanwhile, in 2023, TC8 (Agrosmart for silos on wheat), TC9 (KGZS on barley, corn, wheat), TC15 (gaiasense on olives), and TC21 (automated greenhouse by Signum on tomatoes) recorded negative outcomes - along with TC6 (QMS water software from Delphy on wheat) and TC29 (ART21 on Bees). A particularly inspiring turnaround is seen with TC21 (automated greenhouse by Signum on tomatoes),

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which shifts from an extremely negative figure in 2023 to a positive outcome in 2024, hinting at effective operational adjustments or changing market conditions.

Overall, the high-level analysis not only highlights areas for targeted improvement but also reflects a strong foundation of positive results across many TCs. This balanced view encourages a context-specific approach to evaluating performance, ensuring that strategic decisions are informed by both successes and opportunities for further growth.

Table 6 – Comparison between CBA from 2023 and 2024 from each TC.

Sector	TC	Crop / Animal	2023	2024	Metrics
Arable	1 Neuropublic	Potatoes	+ 3 816	+148	€/ha
	2 Agromais	Corn	+ 917	+264	
	3 ITACyl	Wheat	+ 151	-47	
	4 Augmenta	Cotton	+ 148	-106	
	5 Horta	Wheat	+ 306	+195	
	6 Delphy ¹	Wheat, onion, potato	- 37 (wheat)	-1247 (potato), +12 (onion)	
	7 FFP2	Potatoes	+ 140	+3	€/t
	8 AgroSmart	Wheat	- 1	+3,1	
	9 KGZS	Barley, Corn, Wheat	- 23	+63	€/ha
	10 ANAMOB	Wheat	+ 427	+182	
11 Neuropublic	Olives	+ 3 467	+243		
12 Delphy	Apples	?	+138		
13 Horta	Grapes	+	+361		
14 Terra	Blueberry, Strawberry	- 53 285, + 59 047	-2 205, +52 407		
15 Filagro	Olives	- 1 062	+1068		
16 Delphy	Apples	+ 5 934	+209		
17 ANAMOB	Grapes	+ 4 402	+2082		
20 Anysol	Bananas	+ 2 0570	To be updated		
Vegetables	18 Horta	Tomatoes	+ 3 172	+2 472	€/ha
	19 Delphy	Tomatoes	+ 623 087	+471 22	
	21 LUKE	Tomatoes	+1 362 556	+701 820	
Meat	22 FLOX	Poultry	+ 0,5	+0.714	€/animal
	23 IDELE	Cows	+ 602	+25,3	€/100 kg per meat
	24 KU Leuven	Pigs	+ 34.18	+13	€/animal
Dairy	25 IDELE	Cows	+ 306	+26.5	€/1000 l of milk
	26 Teagasc	Cows	+ 1 866	+300	€/animal
	27 KU Leuven	Cows	-	+923	
	28 ANAMOB	Cows	+ 209	+410	
Apiculture	29 ART21	Bees	-	-2.3	€/beehive
Aquaculture	30 Benco	Oyster	+ 12 500	+49 244	€ at the company level

6.2 Outcomes

The Outcomes section presents the economic, environmental, and social effects observed in each sector, based on DATSs assessment results as well as the feedback collected from test case evaluations. It

¹ Due to crop changes from 2023 to 2024 the CBA is not comparable.

highlights how DATSs have influenced productivity, cost–efficiency, resource use, and farmer engagement. This analysis is qualitative in nature and should be interpreted as a synthesis of stakeholder experiences rather than a standardized, quantitative comparison.

6.2.1 Arable

In the arable sector, the adoption of DATSs yielded economic, environmental, and social benefits, though outcomes varied. Economically, many farms reported a reduction in irrigation costs, improved water–use efficiency, and lower fertilizer expenses, though incomplete or missing data sometimes made it difficult to gauge the full financial impact. From an environmental standpoint, optimized nutrient management and reduced emissions contributed to more sustainable practices, yet factors such as drought and soil variability could limit effectiveness. Socially, farmer resistance, insufficient training, and labour shortages slowed adoption rates, even though demonstrated results and advisory support gradually improved acceptance. Overall, strong guidance, long–term monitoring, and targeted policy incentives are essential to fully realize the potential of DATSs in the arable sector.

6.2.2 Fruit

Overall, the use of DATs in the fruit sector has led to notable gains in resource efficiency and productivity. Several farmers have reported lower costs for inputs like water, fertilizers, and labour, although some faced unexpected expenses tied to increased electricity usage and irrigation requirements. While certain producers saw clear economic returns, others remained unsure about the long–term financial benefits. On the environmental side, digital tools helped optimize water use, reduce chemical inputs, and lower greenhouse gas emissions. However, extreme weather events, such as droughts, heavy rains in spring, and heat waves, significantly affected both outcomes and the perceived effectiveness of these technologies. Socially, initial hesitation toward digital solutions shifted to greater trust as their practical advantages became evident, though limited connectivity in remote regions and constrained budgets still present key obstacles to wider adoption.

6.2.3 Vegetables

In the vegetables sector, DATSs led to higher yields despite challenging conditions by optimizing input use. However, economic and environmental impacts varied. Some farms benefited from reduced electricity and fertilizer costs, while others saw increased fuel and fertilizer consumption due to system adjustments. Environmentally, DATSs improved nutrient recirculation and lowered emissions, though these benefits were not universal. Socially, farmers had mixed reactions, some struggled with higher workloads due to the learning curve, while others embraced digital adoption with enthusiasm, expecting long–term benefits.

6.2.4 Meat

In the meat sector, DATSs demonstrated time–saving potential, but data complexity posed challenges. While they improved resource efficiency, their economic impact varied, with significant cost and benefit differences between farms using DATSS and those without. It remains unclear whether these differences stem from DATSs alone or other management factors. Environmentally, intelligent counting and climate control systems allowed for more precise water and energy adjustments, though no immediate short–term environmental benefits were observed. Socially, DATSs improved farmer collaboration, but some struggled with digital literacy. Additionally, communication challenges, such as delays in filling out questionnaires, were noted, despite a general agreement that technology simplifies daily work, particularly in animal counting.

6.2.5 Dairy

Across dairy, there were some shared outcomes. Economically, farms experienced benefits through increased milk prices, labour savings, and operational efficiencies. TCs presented net benefit; some experienced positive impacts on labour savings and herd management, while others noted significant feed cost differences, despite being unclear if the DATSs was the cause. All farms faced challenges in isolating the specific impact of the DAT due to overlapping activities and data that covered the entire farm. Increased energy consumption was noted, due to infrastructure changes and to the continuous operation of digital systems, but at the same time, water efficiency was. The reduction in workload and improvements in herd management were appreciated by all farmers, although their hard engagement with the data collection and Assessment Framework.

6.2.6 Apiculture

The apiculture sector had an economic impact by reducing costs and increasing productivity with the beehive monitoring. By decreasing colony losses, improved ecological sustainability had a positive environmental impact. In terms of social outcomes, farmers demonstrated being open to innovation but cautious about full reliance on data.

6.2.7 Aquaculture

In aquaculture, DATSs led to increased farm productivity and reduced oyster mortality. While the environmental impact was minimal, there was a reduction in CO₂ emissions from lab visits. Socially, farmers valued the transparency in product quality enabled by DATSs but questioned whether all improvements could be directly attributed to the technology.

6.3 Common conclusions

The Common Conclusions section identifies cross-cutting trends and key insights that emerged within each sector, based on the feedback collected from test case evaluations. It examines factors such as farm size, infrastructure, and digital readiness, which influenced the effectiveness and scalability of DATSs. Additionally, it highlights key barriers to adoption, including training needs, data management complexities, and sector-specific challenges that impacted decision-making and long-term viability. This analysis is qualitative and should be viewed as a reflection of stakeholder experiences.

6.3.1 Arable

The evaluation of DATSs in arable farming highlighted key sector-wide conclusions. Climatic conditions significantly influenced their effectiveness, emphasizing the need for adaptability to droughts and irregular weather. Farm size impacted economic viability, with larger farms benefiting more due to economies of scale, while smaller farms faced higher adoption barriers. DATSs affected entire farming operations, not just test fields, influencing broader decision-making and input management. However, challenges in data collection and quality, including inconsistent recording and technical difficulties, hindered comprehensive analysis. Addressing these issues through adaptable technologies, targeted support for smaller farms, and improved data standardization is essential for maximizing the benefits of DATSs.

6.3.2 Fruit

The evaluation of DATSs in the fruit sector highlighted key sector-wide conclusions, particularly regarding the influence of extreme climatic conditions, such as prolonged droughts, overly wet springs, and high disease pressure, on both outcomes and perceived value. Water shortages and heatwaves often undermined their potential benefits, emphasizing the need for robust adaptation strategies. Larger farms tended to incur higher upfront costs in equipment and training but generally experienced more pronounced productivity gains over time. However, these initial investments could discourage early adoption, reinforcing the importance of monitoring results over multiple seasons. Clear decision support, particularly in areas like pest control and irrigation scheduling, motivated producers to maintain and expand the use of DATSs, though tangible economic advantages typically depended on sustained adoption beyond a single harvest cycle.

6.3.3 Vegetables

The evaluation of DATSs in vegetables highlighted key sector-wide conclusions. Comparing farms using DATSs with those without provided robust data, demonstrating the value of digital tools. However, successful adoption depended on farm infrastructure and readiness for digital transition, with lighting and irrigation system differences complicating direct comparisons. Farmers recognized the potential of DATSs but highlighted the need for additional training and advisory support to maximize benefits.

6.3.4 Meat

The evaluation of DATSs in the meat sector highlighted key sector-wide conclusions. The long-term viability and adaptation of farmers to DATSs requires further evaluation, with data consistency challenges arising from hardware and training limitations. Differences in farm size (e.g., 616 vs. 340 sows) affected revenues, costs, and data analysis, making direct comparisons difficult. A more specific Assessment Framework focusing on key parameters such as survival rate and efficiency would improve farm comparisons. The main perceived benefit of DATSs was daily practicality, particularly in animal counting and environmental monitoring, though these improvements did not immediately translate into higher revenue or cost reductions.

6.3.5 Dairy

The dairy sector reveals several important insights into the use of feeding robots and DATSs on farms. The economic viability of feeding robots is heavily influenced by external factors like milk prices, with larger farms potentially seeing greater benefits from automation. TCLs emphasized the need for more data from a diverse range of farms to accurately assess the impact of these technologies, noting that variability in farm size and management practices can significantly affect results. Material erosion was fixed as a DATSs problem which impacts safety and device lifecycle, suggesting that cost–benefit analyses should focus on data directly related to bolus use. Larger farms benefit more from automation due to economies of scale, while smaller farms struggle to justify the initial investment, with financial returns also being influenced by factors like feed price fluctuations and milk market conditions.

6.3.6 Apiculture

Natural variables, such as temperature, humidity, forage availability, hive population dynamics, and pest activity, significantly influence hive assessment results in the apiculture sector. The beehive monitoring system enhances hive management by providing real–time data, reducing the need for manual monitoring and saving time for beekeepers. Despite the proximity of apiaries, environmental conditions cannot be assumed to be identical, complicating direct comparisons. The system also improves business operations by facilitating transparent communication with customers and stakeholders, offering verifiable insights into hive health and honey quality. Overall, the integration of this technology supports more informed decision–making and better hive management practices.

6.3.7 Aquaculture

The feedback from TC in aquaculture highlights key conclusions. Assessing oyster quality is complex due to multiple environmental factors, making it difficult to fully isolate the benefits of DATSs. This variability presents challenges in determining the direct impact of digital tools on production outcomes.

6.4 Lessons learned

This section identifies key cross-cutting lessons emerging from the TCs, with a focus on areas for improvement that can enhance the effective adoption and long-term use of DATSs. Rather than reflecting on specific crop types, it highlights systemic needs and challenges common across different agricultural sectors.

6.4.1 Data reliability and collection

Reliable and accessible data is essential for evaluating the impact of DATSs. Several TCs reported challenges with data accuracy, consistency, and manual data entry burdens – particularly for small farms. Standardizing data collection protocols and ensuring better interoperability between systems would enhance the usability of data and trust in outcomes. Isolating variables in experimental settings, as noted in aquaculture, can also improve the robustness of impact assessments.

6.4.2 Training and capacity building

Effective and targeted training emerged as a critical success factor across all sectors. Farmers often require hands-on, practical guidance to understand the use and benefits of DATSs. Long-term adoption depends on training that not only explains the tools but also connects them to economic outcomes and farm-specific needs. Support for smaller farms and those with lower digital literacy levels is needed to ensure inclusivity.

6.4.3 Support mechanisms and advisory services

Ongoing support from advisors, extension services, and DATSs providers helps maintain farmer engagement and ensures that tools are used effectively. Customised advisory support, tailored to the farm's size, production type, and regional context, was highlighted as a major facilitator of adoption. Farmers responded positively to demonstrations and guidance that connected technology to day-to-day challenges.

6.4.4 Economic considerations and incentives

Many farmers are more motivated by time savings and simplification of tasks than by financial returns alone. Still, clear economic benefits, such as improved margins, reduced inputs, or higher-quality products, must be communicated. Incentives like subsidies for infrastructure (e.g., connectivity, sensors) and financial planning support were considered key, especially in areas with lower adoption readiness.

6.4.5 Usability and practical integration

DATSs that integrate easily into daily routines are more likely to be adopted. Technologies requiring extensive manual input, complex reporting, or frequent troubleshooting were seen as barriers. The simplicity of use and perceived value in reducing workload were often more important than advanced features. In sectors like meat and dairy, this point was repeatedly emphasized.

6.4.6 Tailored assessment and metrics

Assessment frameworks should include practical and sector-specific metrics that resonate with farmers. For example, dairy producers suggested indicators like milk quality, energy efficiency, and animal welfare. In pig farming, lengthy and generic questionnaires discouraged participation, pointing to the need for simplified and relevant evaluation tools.

6.4.7 Infrastructure and connectivity

The success of DATSs is often limited by the lack of infrastructure, especially in rural and remote areas. Investment in connectivity, electricity, and basic digital tools is a prerequisite for

digital transition. This challenge was particularly evident in fruit production and apiculture, where sensor use and real-time monitoring require stable infrastructure.

6.4.8 Policy and regulatory drivers

In some TCs, adoption was driven more by regulatory requirements than by farmer interest. While this can trigger initial engagement, sustained adoption relies on demonstrating added value beyond compliance. Policymakers should consider integrating DATSs into broader sustainability and productivity agendas, supported by legislation and financial frameworks that reflect on-the-ground realities.

7 Planning of Demo Events in QuantiFarm TCs (T4.3)

This chapter aims to introduce the structure, purpose, and planning process of Task T4.3 Demonstration Events Implementation and Evaluation, highlighting its role in demonstrating DATSs in real-world conditions. It explains how the Demo Event Evaluation Report will support the overall impact assessment in Deliverable D4.4 and how the Q&A session, designed based on feedback from the Plenary Meeting, addressed key challenges raised by TCLs.

By outlining these elements, the chapter establishes a clear framework for execution and evaluation, ensuring that Demo Events contribute to the broader QuantiFarm objectives of fostering DAT adoption and knowledge-sharing across European agriculture.

7.1 Overview of T4.3 and the Role of Demo Events

Task T4.3 Demonstration Events Implementation and Evaluation focuses on the organization of Demo Events to showcase the implementation of DATSs in real-world conditions. The goal is to provide farmers, advisors, and stakeholders with first-hand experience of DATSs' benefits, costs, and sustainability impacts. These events will take place across 30 TCs in different European regions between January 2025 and January 2026, allowing for broad knowledge exchange and adoption stimulation.

During the Demo Events, the QuantiFarm Toolkit will be presented, offering training sessions for participating farmers. Additionally, at least one farmer or advisor from each TC will attend a Demo Event in another country to observe different DATSs applications and farming practices, enhancing cross-border knowledge transfer.

To ensure efficient and well-organized Demo Events, the materials below were developed in collaboration with Confagricoltura, CONSULAI, Neupublic and GAIA.

- Demo Events Guidelines (created by Confagricoltura) – A structured framework providing instructions, best practices, and mandatory resources for event planning (Annex VI).

Timeline and Use of Materials

- **Before the Demo Event**
 - Pre-registration of participants via the available tools/platforms.
 - Information sheet to be shared in advance or printed for on-site distribution.
 - Demo Events Planning Tool (developed by Neupublic with support from CONSULAI) – A centralized database where TC Leaders indicate their preferred event dates, locations, and cross-farm visits
- **During the Demo Event**
 - Information sheet (if not distributed earlier).
 - Participant list to be completed on-site to record attendance.
 - Feedback questionnaire to be distributed to participants for input on their experience.
- **After the Demo Event**
 - Demo Events Evaluation Report (developed by CONSULAI) – A standardized reporting template to capture key event details, including organizational aspects, participant information, and main takeaways. This report must be completed and submitted after the event.

Some of the materials mentioned above are included in Annex VII. These resources will be further detailed and analysed in Deliverable D4.4 Test Case evaluation report for reporting period 3, which will provide an in-depth overview of their application, usability, and feedback collected from the Demo Events.

7.2 How the Demo Event Evaluation Report Feeds the Deliverable D4.4

The Demo Event Evaluation Report is a fundamental component of Task T4.3 Demonstration Events Implementation and Evaluation, ensuring a structured approach to monitoring, impact assessment, and feedback collection from all Demo Events. Each TCL is responsible for submitting a detailed Demo Evaluation Report after their event. These reports ensure that key insights are consistently documented and synthesized. As shown in Figure 8, the reports serve as the input, providing structured data on participation, DAT impact, participant feedback, key lessons, and recommendations.

This information flows into D4.4 Test Case evaluation report for period 3, consolidating and analysing the findings, producing a high-level output.

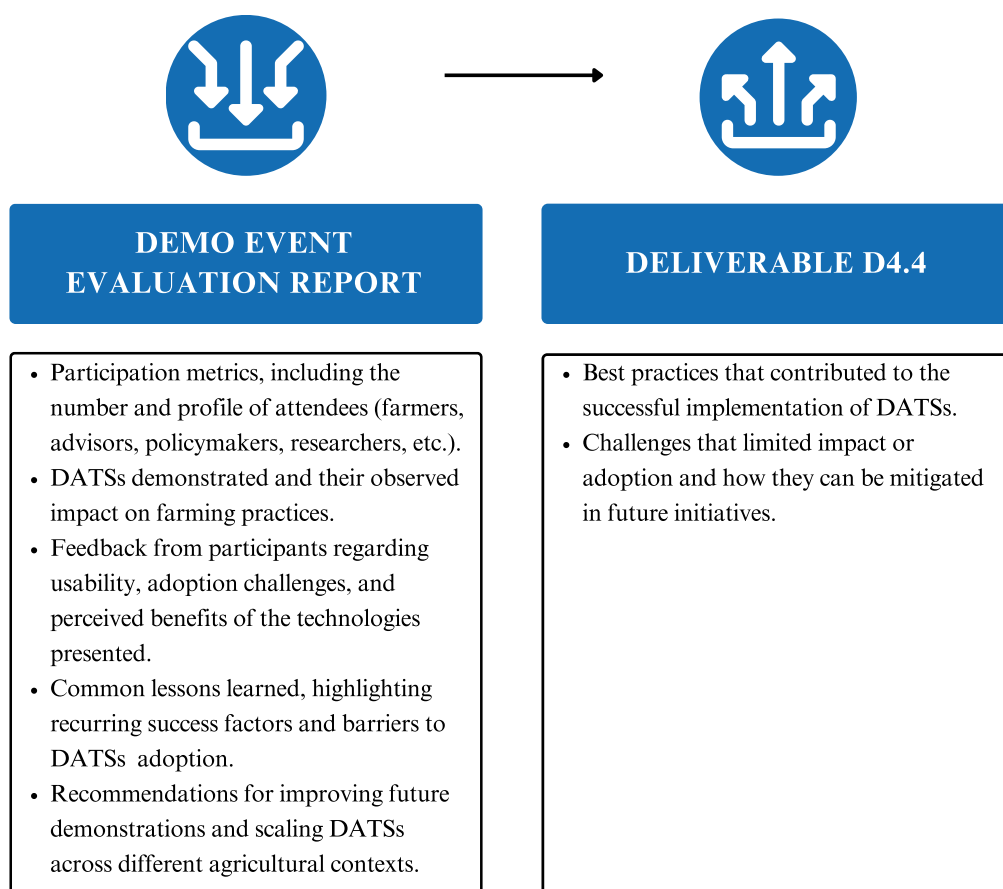


Figure 9 – The Evaluation Reports of each demo event are going to feed D4.4.

7.3 Addressing Open Questions: The Q&A Session Approach

During the 6th plenary meeting, on 4th December 2024, CONSULAI conducted an Interactive Workshop on Demo Events, featuring John Greaney from Teagasc as a guest speaker. The workshop provided a comprehensive overview of best practices for organizing Demo Events, ensuring that TCLs had a clear framework for structuring their events effectively. The session covered the topics mentioned below. Further details regarding the agenda can be found in Annex VIII.

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- Defining clear objectives for Demo Events, ensuring they effectively showcase the benefits and applications of DATSs.
- Planning and structuring on-farm demonstrations, including locations, engaging host farmers, and setting up interactive field activities.
- Facilitating knowledge exchange, using group discussions and peer-to-peer learning methods.
- Using effective learning and engagement strategies, such as visual tools, interactive props, and structured reflection techniques.
- Monitoring and evaluating Demo Events, through structured feedback collection and post-event assessment.

Following this workshop, it became evident that TCLs still required further clarification on key aspects of Demo Event execution. The insights through a Mentimeter dynamic (Annex IX) helped identify the most pressing concerns and, in response, CONSULAI, in collaboration with other WP leaders, organized a dedicated Q&A session to address these challenges.

The selection of topics for the Q&A session was based on recurring issues raised by TCLs, focusing on the most critical operational aspects, as illustrated in Figure 9. Further details regarding the agenda can be found in the Annex X.

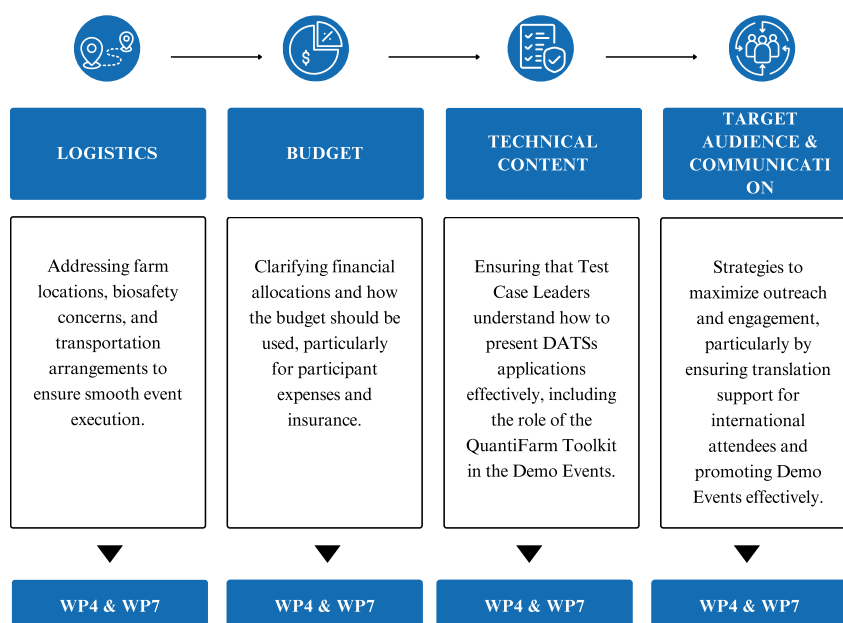


Figure 10 – Demo event organizational operational topics from each WP.

Despite addressing the key concerns raised, it became evident that continuous monitoring and follow-up will be necessary to ensure that all Demo Events are being executed according to plan. To facilitate this, we implemented monthly meetings with TCLs to:

- Track the progress of Demo Events and ensure they are happening as scheduled.
- Identify what still needs to be done and address any outstanding challenges.
- Share updates on upcoming events and coordinate which TCLs will participate in each event.
- Ensure that each TCL fulfils their obligation to visit a Demo Event in another country, fostering cross-border knowledge exchange.

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These monthly meetings will allow for real-time problem-solving, better coordination, and increased engagement among TCLs, ensuring that Task T4.3 remains on track and that the insights from the Demo Events can be maximized across the QuantiFarm network.

8. Conclusions and next steps

A SWOT analysis was performed, taking into account the real impact of DATSs, whether positive or negative. In conclusion, the overall assessment shows that in some cases, DATSs could offer considerable potential to improve efficiency, reduce costs, and support data-driven decision-making, as summarized in Figure 10 (strengths and opportunities). At the same time, there are clear opportunities to expand the use of DATSs across a broader range of agricultural sectors, particularly through enhanced data availability and more robust decision-making tools.

However, weaknesses were identified, such as data collection quality, infrastructure requirements, and social or cultural resistance. By proactively managing threats like extreme weather events and high operational costs while capitalizing on the identified strengths, DATSs can become an integral part of sustainable and efficient agricultural practices.

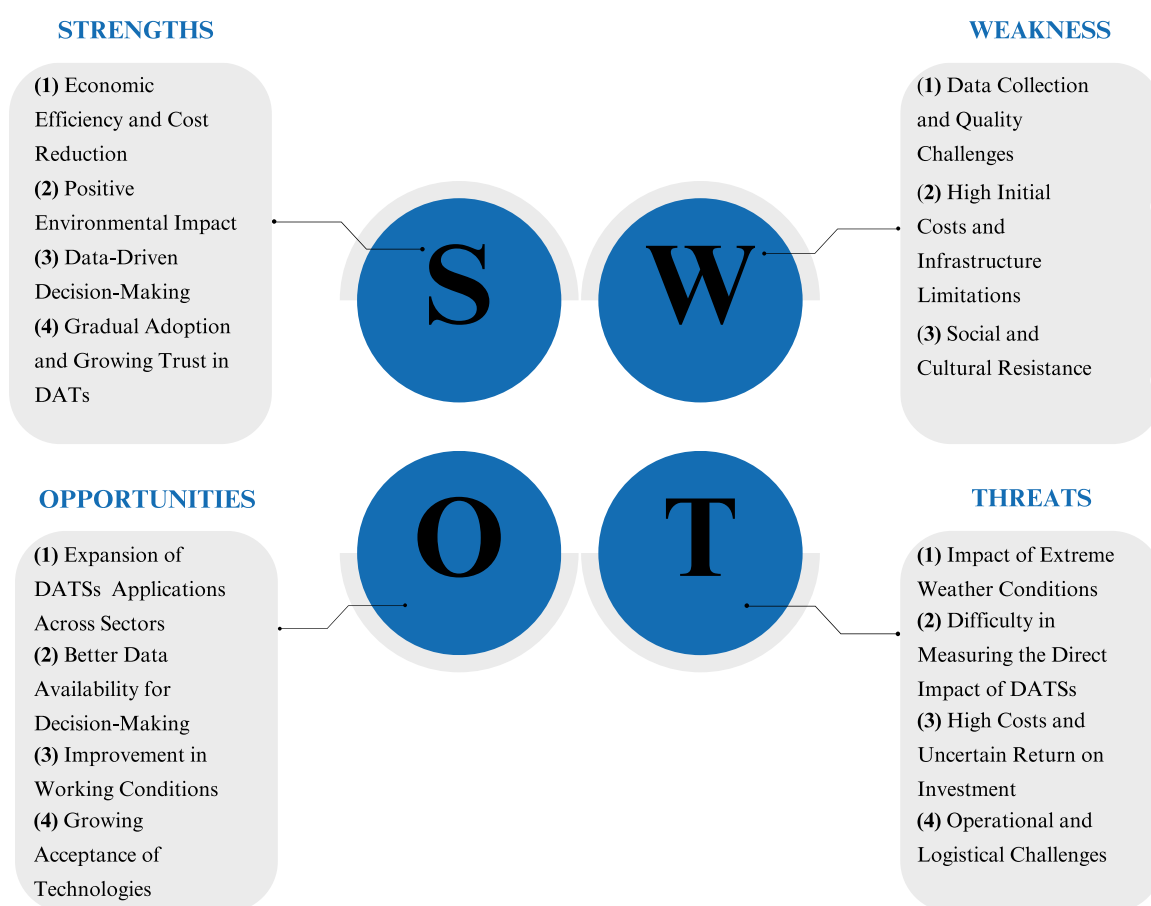


Figure 11 – SWOT analysis on DATSs impact.

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As the project progresses, it is vital to plan and coordinate our next steps effectively to maintain momentum and ensure alignment with our overall objectives. The following actions have been identified as priorities that will guide our efforts.

- 1. Guarantee that Assessment Framework results are shared with farmers by TCLs**
Ensure that all Assessment Framework results are shared with farmers, identifying gaps where communication may not yet have occurred. Link this action to insights from the Test Case Evaluation Reports, which emphasize the importance of addressing farmers' motivations and expectations. Strengthen dissemination practices where necessary to increase engagement, transparency, and relevance at the farm level.
- 2. Ensure Evaluation Reports completion**
Evaluate the possibility of incorporating the 2023 TC 27 missing Evaluation Report on the Deliverable D4.4. Data from the 1st year of TC 27 is still missing, and it is necessary to ask this data from TCL again to allow WP2 to perform the Assessment Framework analysis.
- 3. Review Group Organization**
Assess the current structure of each group, identifying instances where the same TCL may be assigned to different crops in separate groups. Reorganize where necessary to enhance efficiency and improve communication.
- 4. Enhance Data Collection Automation**
Collaborate with the management team, WP2, and WP3 to streamline and automate further aspects of the data collection process. This is one of the main strengths of the project, and the opportunities it brings are many related to time saving, data centralization and workflow optimization.
- 5. Plan a Training Session**
Schedule a training session before the summer holiday to reinforce best practices, introduce new tools, and update procedures. Provide agendas and materials in advance for maximum benefit.
- 6. Map and Define the Structure for Deliverable D4.4**
Outline the primary objectives, methodologies, and expected outcomes for Deliverable D4.4. Allocate responsibilities and set clear timelines to ensure timely and accurate completion.

9. Annexes

Annex I – Test Case 6 Description Form Update

Test Case (TC) Description Form		
<p>This form will serve to better understand the Test Case (TC) details with special focus on the DAT (Digital Technologies in Agriculture) description, the cost benefit relation, and sustainability impact. With this information we will be able to develop the most suitable analysing methods for your Test Case. The objective is to coordinate efforts among all of us and plan the methodologies that will be used to process and analyse the data provided by you. Given the multilateral aspects of this project, we will be testing and analysing data from different technologies, sectors, crop/ animal, and biogeographical regions. Also, given the importance of cycles on the farm, parts of this survey, along with new questions, will be asked again during the project.</p> <p>In order to facilitate this task, the analysing parameters should be set accordingly to the TC needs so we may do as little changes as possible along the project, avoiding major methodological changes and complications in the data collection process along the projects' duration. For this reason, it is important to gather as much information as possible about the technology, the parameters it provides, how it assists in the decision-making process, and the conditions in which it is operating.</p> <p>During the application stage you have provided some information about the TC. To normalise the information gathered from all TCs, we are now asking for more details about the DAT and the impact on agriculture activity. Please feel free to use the information provided at the application stage to give background on specific details asked in this document. We count on your expertise on the field and technology to provide a Test Case description as detailed as possible.</p> <p>Note - Throughout the questionnaire the word "DAT" is mentioned repeatedly. In the context of Qu antifarm and this questionnaire, a DAT is defined as a particular Digital Agriculture solution that consists of hardware (e.g.: tractor, drone, computer, robot, weather station, etc.) and/or software, and that helps the farmer in performing an individual production step (e.g.: fertilisation, weeding, irrigation, harvesting etc) or in managing the farm.</p>		
Partners involved		
Partner name	Role / Value Chain Actor Type (e.g.: <i>Farmer, Cooperative, Agri-food company, Technology Provider, Contractor etc.</i>)	Involvement (Full partner / Third party)
Delphy	Project partner	Full partner
Country and Biogeographical Region		
The Netherlands, Continental		
Agricultural Sector		
<ul style="list-style-type: none"> ● <i>Please select from the following list which agricultural objects are the focus of your Test Case</i> <ul style="list-style-type: none"> ○ <i>Horticulture -Vegetables</i> 		
Please provide the following information about the farm and the farmers involved		

D4.3 Test Case evaluation report for reporting period 2

- *Please fill-out the following tables (according to necessity) for each of the farms. Copy the table as many times as necessary.*
- *Please copy paste as many tables as necessary to organise the information*

Exact location of the farm where the DAT is used	Schoondijke, The Netherlands
Number of parcels on the farm where the DAT is applied	2
Size of these parcels (ha or number of animals)	Differs per season, but a DAT and non-DAT part on the same parcel
Crop cultivated on these parcels (there might be more than one)	2023: #NA 2024: Onions + Potatoes 2025: Onions + Potatoes
Total approximate revenue of the farm (please indicate an interval of values)	Average Yield Onions: 70 tonnes / hectare Potatoe: 55 tonnes / hectare
Farmers Name	Hans Moggré
Farmers contact (email)	(via Delphy)

Description of the end user of the DAT

- Please provide some information on who will be mostly using the DAT in daily practice and in what role (e.g.: farmer, advisor, agricultural cooperative, etc)

In daily practice, the DAT is mainly used by the farmer himself. He carries out the work in the field. Some work will be performed by a contractor, at the time when the farmer himself does not have the appropriate mechanization. Furthermore, an advisor (Delphy) will support the farmer in using the DAT.

Technology Description

To contextualise the Test Case, please provide a general description on the DAT (250 words max)

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- What are the main goals in using the technology (e.g.: input/cost reduction, yield increase, risk reduction, environmental sustainability, animal welfare, etc.)
- Part of the farm operations where the technology is applied (e.g.: individual production steps or “whole-farm approach”).
- In which process phases are the DAT applied and how does it help (e.g.: cultivation, irrigation, sowing, harvesting, farm management, traceability)?

For season 2024 and 2025 several DAT's are planned to be used in onions and potatoes. Both onions and potatoes will be drip irrigated based on the use of sensors en optimization software.

The main goals: Smart Irrigation: input optimization, yield increase, environmental sustainability

Application of technology: Irrigation: not on whole farm, as not everywhere is water available and DAT-based

Process Phase: DAT's are used for cultivation and irrigation

1- Referring to the technology provider:

- a. Who is/are the technology developer(s)? Please describe the organisations that have been involved in the development of the DAT and their specific roles.

Please indicate the name of the organisations involved, and what roles they had (e.g.: researcher, prototype development, manufacturer, etc.)

Several DAT's are used

- Irrigation
 - Soil moisture sensors = Estede (2024) en for 2025 GeoBas miniMetos Soil + GeoBas LoRain Soil+
 - Yield measurements: manual trial harvesting
 - QMS Water = Delphy Digital development

- b. Who is responsible for the DATSs' commercialization and what is the commercialization model?

- *Please let us know who the owner of the DAT is*
In all cases the farmer
- *Did the farmer buy the solution or is it just paying for services? Did a contractor buy the solution and is using it to offer services to farmers?*
 - Soil moisture sensors = buy + licence costs
 - Yield measurements: none (only labour)
 - QMS Water = licence costs
- *Who made the decision to adopt the DAT?*
In all cases the farmer
- *Was there an investment needed to adopt the DAT? If yes, how much was the total investment?*
 - Soil moisture sensors = € 800/each

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<ul style="list-style-type: none">○ QMS-hardware box = +/- € 3.000 <ul style="list-style-type: none">● <i>Who were the sponsors / public incentives / investors (if there were any)?</i> Partly financed by QuantiFarm project ● <i>If a different funding model was used, please describe it as detailed as possible (e.g.: annual subscription with no additional investment).</i> N.A.
2- Referring to farmers: What type of benefits have you obtained thanks to the use of the DAT? Was the investment “worth it”?
<ul style="list-style-type: none">● <i>On what specific tasks is the DAT helpful? How is it helpful? (e.g.: time saving, money saving, worker comfort, friendlier impact on the environment, information management, etc.)</i> Automated irrigation is no matter of supplying more or less water, it’s a matter of doing the right amount on the best moment in time. Due to some unreliable sensors it was not possible to fully trust the automated process, therefore the saving on labour was limited. Main goal is optimization of yield.
3- Referring to the DAT’s software, please indicate and/ or describe: a. The parameters or indicators that can be extracted from the software providing important information to the farmer.
<ul style="list-style-type: none">● <i>Some of the information provided by the software comes in the form of parameters and indicators like - (for precision irrigation) the water evapotranspiration (for animal welfare) body temperature, (arable) growth rate, (milking) amount of milk. Please let us know what is provided by your DAT.</i> <p>GeoBas miniMetos Soil: suction tension + soil moisture</p> <p>GeoBas LoRain Soil+ : suction tension + soil moisture + soil temperature + relative humidity, precipitation</p> <p>QMS-water: irrigation advice + applied amount of water</p>
b. The output delivered by software analysis and how it influences the farmers decision making process.
<ul style="list-style-type: none">● <i>Apart from single parameters and indicators, some software compiles that information providing direct suggestions and lines of action (e.g.: when to harvest, what section needs water, what animal has a health problem etc.). Please elaborate for your DAT.</i> <p>The combination of soil moisture sensors and weather poles indicates when to irrigate, which is incorporated into the QMS Water model.</p>

D4.3 Test Case evaluation report for reporting period 2

<p>c. The platform and display mode used to consult the data provided by the DAT.</p>
<ul style="list-style-type: none"> ● <i>Please let us know where you check the information provided by the DAT (e.g.: phone, laptop, if there is remote access, if you must be close to the DAT)</i> ● <i>Please indicate how the data is made available (e.g.: via an application programming interface, email, cloud repository, paper)</i> <p>The data from the soil moisture sensors and weather poles is included in QMS Water, the results are visible on an app on the phone.</p>
<p>4- Referring to the DAT's hardware, please indicate, and describe: The sensors and technologies used for the collection of data on the parameters referred in the answers above.</p>
<p>5- Regarding DAT installation, please describe the process</p>
<ul style="list-style-type: none"> ● <i>Please describe, to the best of your knowledge, the installation steps.</i> ● <i>Who was responsible for installing the DAT on the farm? (e.g.: DAT provider's technical team, farmer, advisor, a combination of stakeholders, etc.)</i> ● <i>The installation process went according to plan, or were there adjustments needed to accommodate specific needs?</i> ● <i>The DAT installation finished on time? If not, was it longer or shorter than expected?</i> <p>Soil sensors and software are installed according supplier's manual. Initial setup of QMS-Water by Delphy consultant. All went well.</p>
<p>6- Usually, the DATSs are implemented to address a certain need on the farm and to assist in performing the tasks that are directly related with that need. But there might be cases when the DAT use enables farmers to accomplish additional tasks beyond the focus of the DAT (e.g.: use a particular system of the DAT, like a tractor, a drone, weather tower, or a specific sensor). If that is the case, please indicate and describe:</p>
<p>a. What other tasks benefit from the use of the DAT?</p>
<p>Sensors are parcel-based. QMS-water can be used broader on the farm (on other parcels)</p>
<p>b. What DATSs are involved in those other tasks.</p>
<p>QMS-Water</p>
<p>c. How do these systems contribute to the accomplishment of additional tasks?</p>
<ul style="list-style-type: none"> ● <i>e.g.: a weather station may be there to support a DSS on pest management but could also support the farmer in getting an early warning about frost, even if this was not foreseen originally by the DAT provider.</i> <p>Not relevant</p>

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7- For how long this DAT has been used on the farms integrated in the TC (consider the first farms to systematically use the DAT)?
This started with this TC
8- Regarding data collection, please indicate:
a. How often do you collect data?
<ul style="list-style-type: none">● <i>Hourly, daily, weekly, monthly, annually, etc.?</i> <p>How often we collect data depends on the DAT being used. Below is a list of indications:</p> <ul style="list-style-type: none">- Sensor: multiple measurements/dat- QMS water > daily advice
b. How does the data collection process work?
<ul style="list-style-type: none">● <i>Some DATSs have this process automated via IoT, but there might be the case where you must dislocate to the DAT to extract the data directly from there. Please describe your situation.</i>● <i>List of data types that the Test Case is expected to generate (e.g.: weather parameters recordings, fuel consumption, scouting outcomes about pest infestation)</i>● <i>Please indicate the unit for measuring each data type (e.g.: Celsius, Litres)</i>● <i>What data model is available that describes the data that is being measured about these agricultural objects?</i> <p>Sensor information is transferred into QMS water by API.</p>
c. Is the data collected through the DAT enough for decision making purposes, or some other tool is used (even manually)?
<ul style="list-style-type: none">● <i>Do you use excel or any other tool/app to treat the data somehow? If you do, please let us know the tools and the methods used to analyse the data.</i>● <i>Please tell us about the format that the Dataset is expressed (e.g.: JSON, XLS, CSV).</i>● <i>Is it necessary to extract data using a hard drive?</i> <p>The data from the weather post, soil moisture sensors and are used to model in QMS water to determine the amount of moisture application.</p>

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It is necessary to extract the data of the yield measurement to translate to the application otherwise the data are useless.

d. Is there any data that you collect periodically and have to communicate/ report to any external organisation? Please detail.

- *What data is shared, and to what purpose?*
- *Which data types are open and available to be reused in the context of QuantiFarm?*
- *To which organisation do you communicate/ report it to?*
- *Is this communication/reporting mandatory?*

The data from the weather post, soil moisture sensors and BOS system are shared with Delphy to use in the QMS to determine how much water to give at what time.

Cultivation records are shared with some buyers for the purpose of certification, like UniTip and to licensees for e.g. Global Gap or Planet Proof, this is mandatory. It is not necessary to reuse it in the context of Quantifarm.

9- The TC will consist of comparing data from a parcel using the DAT to another parcel that is not using the DAT. Referring to the parcel that will not be using the DAT, please indicate if the same tasks/ processes are done. If so, please describe how the same tasks/ processes are performed.

- *We would like to know how the tasks were made before DAT implementation (or without DAT) and compare a “before and after” scenario.*
- *If some of the tasks were not done before DAT implementation, please state it and explain why.*

The tasks before the implementation of the DAT were made on the feel and sight of the farmer.

10- Still referring to the parcel not using the DAT, please indicate in more detail:

a. If and how the parameters/ indicators monitored by the DAT (when the DAT is available) are controlled when the DAT is not available.

- *Please try to be as specific as possible on how the parameters analysis was done without the DAT. If the analysis was not possible because there was no data available, please let us know the method that was used on the farm to understand how the decisions were taken (e.g.: how did you know when to water the crop, when to harvest, when to call the vet?).*

(Remark: question unclear!) In addition, based on rainfall and the vitality of the crop on sight, it was determined how much and when to irrigate.

D4.3 Test Case evaluation report for reporting period 2

<p>b. How many more (or less) farm workers are involved in performing the tasks without the DAT when compared to the same tasks using the DAT?</p>
<ul style="list-style-type: none">● <i>It is natural that DAT implementation allows for the reduction of the working force on performing certain tasks, but in some cases that might not happen. Please let us know if there was a reduction in the workload and to what point.</i> <p>There is no reduction in work for the number of people. Besides, this is a single person operated farm.</p>
<p>c. How many additional hours do the farm workers spend performing the tasks without the DAT?</p>
<ul style="list-style-type: none">● <i>If there is no direct reduction on the number of workers with DAT implementation, perhaps there was a reduction in the amount of time they spent performing the tasks. Please let us know an approximation of the time saved in person-hours.</i> <p>With this tool there is no reduction of labour. Goals is yield and input optimization.</p>
<p>d. Are there any tools or practices that became obsolete with DAT implementation? Does this obsolescence have any consequences to other tasks in the farm? Please describe it.</p>
<ul style="list-style-type: none">● <i>With DAT implementation, some previously used tools and common practices for the same purpose may have lost their practicality / usefulness (or part of it). Please let us know, in that case, if there are additional methods that have “suffered” or tasks that became harder to accomplish.</i> <p>No.</p>

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Annex II – Emails sent by WP4 to TCLs

Dear Test Case Leaders from September group,

As discussed on last week meeting, the **1st data submission deadline** is on **Monday 30th of September**. You can find the presentation and meeting recording on [Google Drive](#).

This year the data submission is also made on NextCloud. The main difference from last year is the **new web-based tool** which replaces the previous Excel template completion.

Please find the link to the web-based data collection tool [here](#).

Please note that the tool does not automatically save your input data and data are not stored inside the platform. Thus, to save your work, click the 'Save to File' button to generate a local JSON file. This file can be used to resume your session later by clicking the 'Load from File' button.

[Here](#) you can find a **video tutorial** from POLIMI team that explains **step by step how to use the web-based tool for data collection**.

Once you have completed your data entry, please upload the generated JSON file to your designated folder **2024** in [NextCloud](#) (if you do not have access to the platform, please let us know so that we can activate your account as soon as possible).

If you have any questions, please do not hesitate to contact us,

Best regards,

Dear all,

Please find in October group's folder on [Google Drive](#) the meeting's presentation (includes different links) and recording.

As agreed, Polimi team is going to resend to all an individual email with the new data template **but on Excel file format**.

This file is going to help and facilitate the collection of data between farmers, producers, and TCLs.

Please note that officially procedure is to submit the JSON file (result of the [new online base tool](#)) on NextCloud -> TC's folder -> 2024 folder.

Please consult the video: [Step by step: How to use the web based tool for data collection \(youtube.com\)](#)

Any doubts please feel free to reach CONSULAI or Polimi teams by email.

Deadline for JSON files submission on NextCloud – **31st October 2024**.

Thank you,

Dear Test Case Leaders from **November group**,

As discussed on today's meeting, the **1st data submission deadline** is on **Thursday 30th of November**. You can find the presentation and meeting recording on [Google Drive](#).

This year the data submission is also made on NextCloud. The main difference from last year is the **new web-based tool** which replaces the previous Excel template completion.

Please find the link to the web-based data collection tool [here](#).

Please note that the tool does not automatically save your input data and data are not stored inside the platform. Thus, to save your work, click the 'Save to File' button to generate a local JSON file. This file can be used to resume your session later by clicking the 'Load from File' button.

[Here](#) you can find a **video tutorial** from POLIMI team that explains **step by step how to use the web-based tool for data collection**.

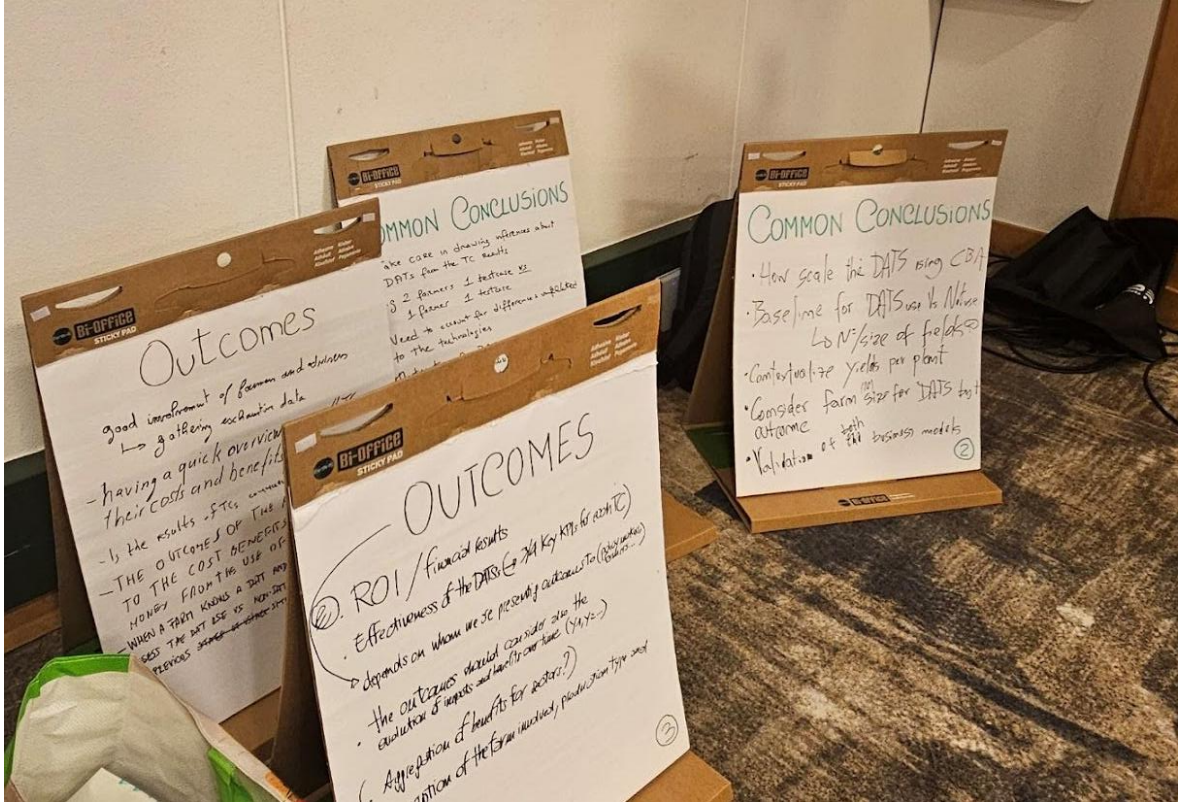
Once you have completed your data entry, please upload the generated JSON file to your designated folder **2024** in [NextCloud](#) (if you do not have access to the platform, please let us know so that we can activate your account as soon as possible).

If you have any questions, please do not hesitate to contact us,

Best regards,

Annex III – Lisbon Plenary Meeting Evidence

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Annex IV – Attendance List from the 5th Plenary Meeting



No	Name and surname	Organization name
1	Dionysios Solomos	GAIA
2	Jack Verhoosel	TNO
3	Caroline van der Weerd	TNO
4	Andrea Binchi	POLIMI
5	Sandra Cesari De Maria	POLIMI
6	Francesco Parigi	POLIMI
7	Chiara Corbo	POLIMI
8	Nikos Kalatzis	NP
9	Diogo Moniz	Consulai
10	Carolina Ramos	Consulai
11	Beatriz Almeida	Consulai
12	Mariana Pedro	Consulai
13	Daniele Rossi	Confagricoltura
14	Alessandro Iachetti	Confagricoltura
15	Elisabetta Pierantoni	Confagricoltura
16	Dimitris Fotakidis	FSH
17	Nefeli Raftopoulou	FSH
18	Alkis Kyriakou	FSH
19	Panagiotis Petrou	FSH
20	Dusan Pevac	FSH Serbia
21	Tamara Glišić-Krivošija	FSH Serbia
22	Tatjana Knežević	FSH Serbia
23	George Papadopoulos	AUA
24	Ivaylo Dobrev	OKYS
25	Petya Nikolova	OKYS

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26	Vanja Biševac	CEMA
27	Chiara Innocenti	CEMA
28	Lisa Parce	TEAGASC
29	Trevor Donnellan	TEAGASC
30	Vanessa Paredes-Gomez	ITACyL
31	Giuseppe Amato	HORTA
32	Jens Słootmans	KUL
33	Jan Kiers	Delphy
34	Christian van Os	Delphy
35	Zoe Guy	IDELE
36	Clement Allain	IDELE
37	Evaggelia Giatsiou	Augmenta
38	Viorel D. Marin	ANAMOB
39	Adina E. Cristea	ANAMOB
40	Linas Didžiulevičius	AgroSmart
41	Martynas Velička	BENCO
42	Adam Wróblewski	FFP2
43	André Rodrigues	Agromais
44	Jorge Durão Neves	Agromais
45	Mario Antunes	Agromais
46	Boštjan Ferenčak	KGZS
47	Filip Vakaž	KGZS
48	Radivoj Nićin	Terra
49	Savvas Malliotis	Filagro
50	Markus Rombach	AGRIDEA
51	Kęstutis Skridalla	ART21

Annex V – September, October and November Meeting Agenda

WP4 organized meetings with all groups (September, October, and November) to ensure consistent communication and alignment across TCLs.

The main agenda is the following:

- 1. Group classification**
 - End of growing season
 - Entities
- 2. Timeline**
 - Overview in WPs integration
 - Important deadlines
- 3. New Data Submission Process**
 - New data-based platform presentation by WP2
 - Nextcloud
- 4. Important Information**
- 5. Q&A**

Annex VI – Demo Events Guidelines

[Link](#)



T4.3: Demo Events Guidelines

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Annex VII – Mandatory Materials

The purpose of this annex is to present some of the materials developed under T4.3. However, they are not shown in detail, as they will be covered more extensively in D4.4.

1. Planning Tool of Demo Events- [link](#)

Test Case Number	Test Case Leader	Country	Agricultural Sector	Crop(s) addressed	End of Season	Test Case Digital Solution (type)	Scheduling of the Demo Event (MMS/2025)	Date Status (confirmed/ TBC)	Event Location	Target Audience (indicative organizations to be invited such as local cooperatives, DNs, etc.)	Additional Notes
1	NEUROPUBLIC	Greece	Arable	Potatoes	October	SF DSS/APP	September 2025		Lesithi, Crete, Greece	Farmers, advisors, agronomists, cooperatives, and agricultural organizations	
2	Agromas	Portugal	Arable	Corn	October	Precision Irrigation	29/April/2025		Jódi Coimbra, Quinta da Chorda	Farmers, advisors, cooperatives, and agricultural organizations	Wheat, Corn
3	ITACyL	Spain	Arable	Barley, Sunflower, Chick peas, Wheat	July	SF DSS/Agri-Environmental Monitoring	2 June 2025		Valdehiedra, Castilla y León region, Spain	Farmers, advisors, cooperatives, and agricultural organizations	
4	Augmenta	Greece	Arable	Cotton	October	VRA add-on for old tractors	July 2025	TBC	Magnesia or Patla, Greece	Cotton Farmers, Agronomists	Exact location and dates will be finalized after the start of cotton cultivation period. It is not yet clear if it would be possible to have this in Turkey, if not, we will organize it in Italy
5	HORTA	Turkey	Arable	Wheat	June	SF DSS/ App	May 2025				
6	Delphy	The Netherlands	Arable	Potatoes, Onion	October	Machinery with VRA, data analytics	21 August 2025	Confirmed	Colijnsplaat, The Netherlands	'Onion Day' (big event for arable farming with trade fair and guided tours)	
7	FFP2	Poland	Arable	Potatoes	October	SF DSS/ App	June to July 2025		Schleswisch Poland	Farmers, advisors	
8	Agrosmart	Italy	Arable	Wheat	July	Silica management	October or November 2025		Lazio	cooperatives, grain purchasing companies, advisors	
9	KGZS	Slovenia	Arable	Barley, corn, wheat	October	FMS/ Financial Modelling	11/04/2025	confirmed	farm in NE Slovenia, region Pomurje	farmers, advisors, technology providers, other specialists for agriculture, academia, CIVI-qualified members	The event will take place on a farm (that) in our region as part of the larger event "Farm of the Future Day", where various digital and advanced solutions in agriculture will be showcased. A dedicated area (tent stand) will be set up for the QF Open Day, presentation of QF tools, project and TCF FMS.
10	Anamob	Romania	Arable	Wheat	July	FMS/ app	May 2025		farm in SE Romania	Farmers, DAT providers, authorities	
11	NEUROPUBLIC	Greece	Fruit	Olives	December	SF DSS/APP	September 2025		Kalamata, Greece	Farmers, advisors, agronomists, cooperatives, and agricultural organizations	
12	Delphy	Poland	Fruit	Apples	September	Drones and soil sensors	summer 2025		small scale event, for cross visits see TC16		
13	HORTA	Italy	Fruit	Grapes	October	SF DSS/ App	May 2025		Emilia Romagna, Italy		
14	Terra	Serbia	Fruit	Strawberry, Blueberry	June	Precision irrigation/Variable nozzling	september - october 2025		Strawberry greenhouse Bašča Palatica	Farmers, advisors, agronomists, cooperatives, and agricultural organizations	
15	Flage	Cyprus	Fruit	Olives	November	SF DSS/APP	May 2025		Altea Olive Groves	Farmers, advisors, local public agronomists	
16	Delphy	The Netherlands	Fruit	Apples	October	Drones and soil sensors	3 July 2025	Confirmed	Wageningen, the Netherlands	'The Apple Day' (big event for fruit with trade fair and guided tours)	
17	Anamob	Romania	Fruit	Grapes	October	Harvesting robots and SF DSS					
18	HORTA	Italy	Vegetables	Tomatoes	September	SF DSS/ App	June 2025		Emilia Romagna, Italy		
19	Delphy	The Netherlands	Vegetables	Tomatoes	November	SF DSS/ App	Fall 2025				
20	Anysolution	Spain	Vegetables	Peppers, Lettuce	NA	Precision Irrigation, Monitoring	October 2025		Las Palmas de Gran Canaria, Spain	Greenhouse entrepreneurs in the whole country, Greenhouse advisors (ProAgri), packing houses, agricultural cooperatives, The Spanish Greenhouse Growers Association, educational institutions (HAKI, NOVA) University of Huelva, Ministry of Agriculture and Forestry in Finland, Researchers Luleå, Tampere University.	
21	Luke	Finland	Vegetables	Tomatoes	NA	Automated Greenhouses	19 January 2025	Confirmed	Näppi, Finland		
22	Flox	UK	Meat	Poultry	NA	Cleaning Robot, AI					The Demo event will have multiple locations including EARL, Bernard Brevinck, our DAT user, equipped with a feeding robot, heat and cooling detection and one or two experimental farms in the area. One will be Leif Thomsen's dairy experimental farm that is hosting at the same time a Demo event on precision feeding with sensors, DATs and strategies and a second one could be Thourghé d'Anglo, a beef experimental farm that could be interesting to gain more insights on the beef sector in France and diverse DATs that are used in this sector. The demo event will be hosted at LUYO, Belgium. We are currently still trying to find a good moment to organize the event.
23	IDELE	France	Meat	Cows	NA	Feeding robot/ Heat detector/ Calving detectors	31/03/2025 - 1/04/25	Confirmed	Pays de la Loire region, France	Farmers, advisors, agronomists, cooperatives, and agricultural organizations	
24	KU Leuven	Belgium	Meat	Pigs	NA	Automated monitoring, AI	09/2025		LUYO, Belgium	pig farmers, advisors	
25	IDELE	France	Dairy	Cows	NA	Feeding robot and Activity Robot	To be validated but could be around the 18/19/20 of June 2025		Brittany region, France	Farmers, advisors, agronomists, cooperatives, and agricultural organizations	The Demo event will be hosted on multiple locations in the Brittany region. One will be the GASC 2 (Egges), our DAT user and on the 19th of June we will offer to take part in the Open House of the GRESSEB, a beef experimental farm, located DIGIFEREB.
26	Teagasc	Ireland	Dairy	Cows	October	Milking Robot	September 2025, to be confirmed		Dairy farm in SE or midlands, Ireland, to be confirmed	Dairy farmers, dairy advisors, technology providers, agricultural college staff and students with dairy options (Sligo, Cork, Galway, Clare, Roscommon, Wick, Leitrim, Donegal, Mayo, Kerry, Limerick, Tipperary), local and national policymakers	The demo event may be hosted on a different dairy farm than the TC but where milking robots are also in use, event timing and details remain under consideration. event location is the farm for practical presentation complemented by a tour of the experimental facility of

2. Planning Tool Preferred TC to visit - [link](#)

As part of the knowledge sharing process, at least one farmer or farm advisor from each TC is required to attend a Demo Event hosted by a different TC in another country.

Note: Each TC Leader has been allocated a budget of 800 euros (per person per TC) to cover travel and subsistence costs.

Please indicate your preferred TC that you would like to visit (only one option applies). While the selection is open, it is recommended to consider factors such as the relevance of crop types and DATs being applied.

Test Case Number	Test Case Leader	Preferred TC to visit
27	KU Leuven	Dairy test case TC26 or TC25 (depending on dates)
2	Agromais	TC 3
13	HORTA	TC11
16	Delphy	TC12
12	Delphy	TC16
15	Flagro	TC16
7	FFP2	TC17
21	Luke	TC19
18	HORTA	TC21
19	Delphy	TC21
24	KU Leuven	TC27
8	Agrosmart	TC29
30	Benco Baltic	TC29
9	KGZS	TC8
29	ART21	TC8
1	NEUROPUBLIC	
3	ITACyL	
4	Augmenta	
5	HORTA	
6	Delphy	
10	Anamob	
11	Neuropublic	
14	Terra	
17	Anamob	
20	Anysolution	
22	Flox	
23	IDELE	
25	IDELE	TC 26 or 27
26	Teagasc	TC27 or TC25 depending on event dates
28	Anamob	

3. Information Sheet – [link](#)

D4.3 Test Case evaluation report for reporting period 2



Annex I - Information sheet

Event Purpose

This event showcases DATSs in action. Participants will see practical applications, learn about costs, benefits, and sustainability impacts, and explore the QuantiFarm Toolkit to support their farming decisions.

Objectives

- Demonstrate DATSs and highlight their local benefits.
- Share Experiences and success stories to encourage DATSs adoption.
- Present the QuantiFarm Toolkit to support digital farming decisions.
- Facilitate Networking among farmers, advisors, and stakeholders.

Event Details

- Location: Each Target Country (TC) will host a local, in-person event.
- Audience: Farmers and agricultural stakeholders from the wider region.
- Cross-country Exchange: One participant from each TC will attend a Demo Event in another country.
- Date Range: January 2025 – January 2026.
- Expenses: Local transportation, meals, and field visits are covered by TC organisers.
- Language Support: Translation services are available for international attendees if needed.

What to Expect

- Hands-on DATSs Demonstrations
- Networking Opportunities
- Access to the QuantiFarm Toolkit
- Knowledge Sharing on digital farming practices

This project has received funding from the European Union's Horizon Europe research and innovation program under grant agreement No 101059700

4. Feedback Questionnaire – [link](#)



Annex IV – Feedback questionnaire

INTRODUCTION TO THE FEEDBACK QUESTIONNAIRE

Thank you for participating in the Demo Event organized by "partner organisation" in the context of the Horizon Europe project "QuantiFarm". This feedback form aims to gather your insights to help us understand the impact and effectiveness of the Demo Event. As a participant, you had the opportunity to explore the application of Digital Agricultural Technology Solutions (DATS) and learn about its associated costs, benefits, and sustainability impacts. Additionally, you were introduced to the QuantiFarm Toolkit and trained on various tools designed to support agricultural activities. Your feedback is essential to refining our approach. Please take a few moments to share your thoughts and suggestions.

A. DEMOGRAPHICS

1. Which of the following describes you the best?

- Farmer
- Agronomist – Consultant
- Agritech professional
- Producer Organization
- Researcher
- Policy Maker
- Other (please specify)

2. What is your gender?

- Female
- Male
- Other

3. Please state your sector(s) of operation/expertise, (e.g. Livestock, Crop farming, Horticulture etc.):

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B. THE FUTURE OF FARMING AND DIGITALISATION

4. What do you see as the biggest threats to the future of farming?

	Not a threat at all (1)	Slight threat (2)	Moderate threat (3)	Significant threat (4)	Very significant threat (5)
Climate change	o	o	o	o	o
Increased production costs	o	o	o	o	o
Low market prices for crops/livestock	o	o	o	o	o
Low demand for crops/livestock	o	o	o	o	o
Compliance with environmental standards	o	o	o	o	o
Lack of funding	o	o	o	o	o
Change in consumer preferences	o	o	o	o	o
Limited access to markets	o	o	o	o	o
Strict regulatory framework	o	o	o	o	o
High competition	o	o	o	o	o

5. Which types of services or information would be most valuable to you in a digital farming solution?

	Not important at all (1)	Slightly important (2)	Moderately important (3)	Very Important (4)	Highly important (5)
Weather forecast	o	o	o	o	o
Information on pest and disease presence	o	o	o	o	o
Marketplace for selling products or buying farm inputs	o	o	o	o	o

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5. Demo Event Evaluation Report – [link](#)



Annex V – Evaluation report

The scope of the Evaluation Report is to provide a brief overview of the organisational and attendance details and include key insights from discussions with participants, along with an analysis of the feedback gathered by local participants in relation to the project's main focus areas and outcomes, through the feedback form.



GENERAL INFO		
1.	Date of event	Select date from calendar
2.	Name of demo event	Enter name of event
3.	Country of demo event	Enter country name
4.	Crops/Animals	Enter type of crop/animal
5.	DATs	Category Name /
6.	Total number of participants (from all target groups)	Enter number
7.	Total number of participants per each target group	TC Leaders
		TC's Farmers
		Technology companies
		Advisory services
		Education (Academic and university)
		Research Institute
		Consumers and citizens
		Policymakers
CAP networks		
Media		
Other (please state)		
8.	Which technologies solutions practices were demonstrated?	Open field (please state)

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8.	Will the proposed solutions be utilized on the participants farms? What comments did participants shared during the demo event? (Based on interaction with attendees)	Open field (please state)
9.	What didn't work well at the event - observation (Based on interaction with attendees)	Open field (please state)
10.	Participants' suggestions- how to improve the demo event (Based on interaction with attendees)	Open field (please state)
11.	Event implementation (how, what was presented, structure of demonstration)	Open field (please state)
Post demo event survey (Please provide a ORCODE to all participants to submit satisfaction feedback)		
13.	Please indicate the Overall Experience from participant's feedback questionnaire	
14.	What would you do differently if organising a similar event in the future?	
Visual output materials		
15.	Documents related to event	File 1
		File 2
		File 3
		File 4
16.	Social Media Publications	Include posts or videos

Annex VIII - Demo Events Workshop Agenda

During the 6th plenary meeting, the WP4 session considered a dynamic session and the agenda is the following:

1. Mentimeter Moment

- Interactive survey to assess TCLs' experiences, confidence levels, and anticipated challenges in organizing demo events

2. Guest Speaker: John Greaney (Teagasc)

- Presentation and insights from the Climate Farm Demo project
- Sharing experiences on climate-smart farming and knowledge exchange

3. Interactive Workshop on Demo Events

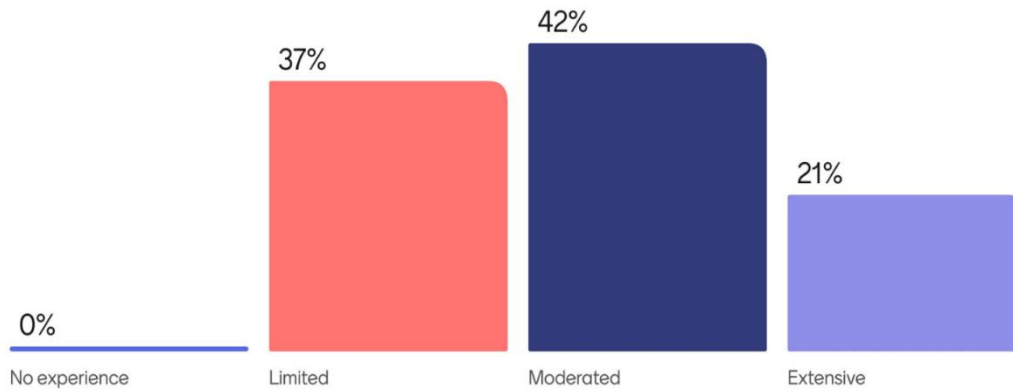
- **What is a Demonstration Event?**
 - Definitions and objectives
 - Importance of practical, hands-on showcases
- **Planning a Demo Event**
 - Setting clear objectives, identifying target audiences, and defining key messages
 - Demonstrating DATSs' practical use, showcasing QuantiFarm tools, and building trust
- **Making the Best Use of the Host Farmer**
 - Central role of the host farmer in explaining and contextualizing on-field practices
 - Facilitated Q&A and feedback opportunities
- **Farm Demo Set-Up**
 - Creating effective visuals, hands-on activities, and concise take-home messages
 - Use of boards, props, and interactive methods
- **Learning and Facilitation Methods**
 - Role of facilitators in guiding discussions and encouraging peer-to-peer exchange
 - Group size considerations, different learning activities, and reflection techniques (ORID)
- **Evaluation and Follow-Up**
 - Monitoring and gathering feedback
 - Analyzing data to refine future demo events
 - Team reflection and continuous improvement

4. Q&A

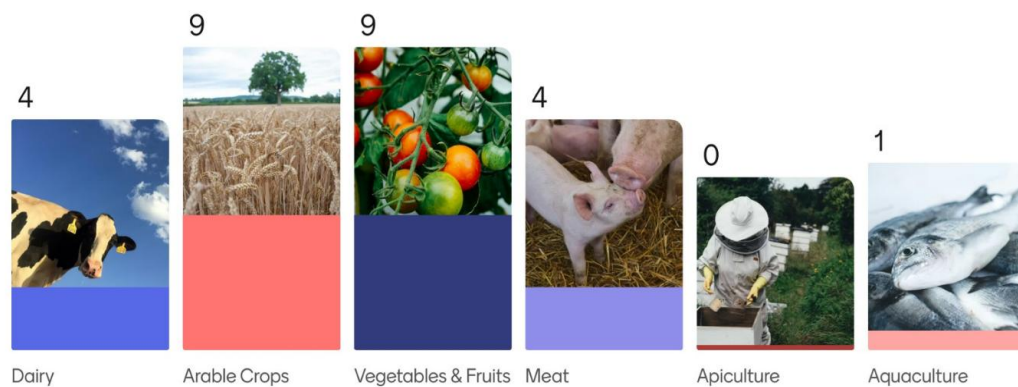
- Open floor for questions regarding demo event organization, facilitation methods, and follow-up processes

Annex IX- Mentimeter Results

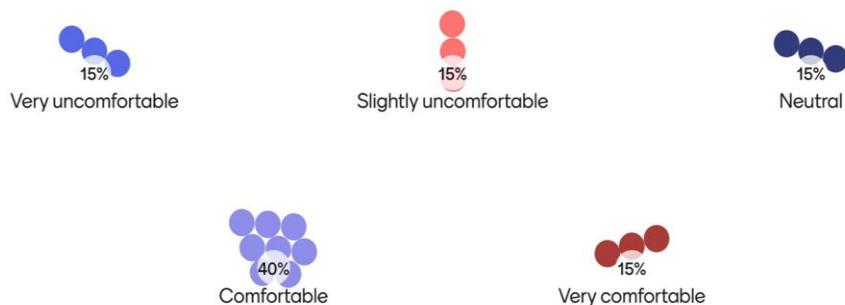
1. What is your **level of experience** in organising **demo events**?



2. In which **sector/s** will you organise a **demonstration event/s**?



3. How **confident** are you engaging **different stakeholders** at **demo event** ?



4. What **challenges** do you anticipate organising **demo events**?

Because of hygienic issues we cannot visit the test farm	Reaching broad audience, including different stakeholders	To attract audiences	Logistic and farmer availability
Getting TC farmer on board due to busy schedule.	Total number of people that will be on site.	Logistics	Presenting technical details of the project

4. What **challenges** do you anticipate organising **demo events**?

Target public, dimension	Farmer and location availability	Farmers availability	The suggested structure is quite long in terms of hours should be shorter
Quite limited (insufficient) budget for all required provisions.	Stakeholders' fatigue. Lack of interest in events.	Farm location not in our region, logistics, biosafety on farm due to diary production	Visibility resources

4. What **challenges** do you anticipate organising **demo events**?

translation and engagement of foreign farmers/technicians	Have a good reception by farmers and transmit them valuable info for them	Time commitment	1. Budget 2. Attendance.
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Annex X- Demo Events Q&A Agenda

1. Purpose and Objectives

- Clarify demo event organization requirements and expectations for Test Case Leaders (TCLs)
- Review guidelines and mandatory materials for successful demo events

2. Logistics (Confagricoltura)

- Overview of demo events' key information (location, scheduling, on-site structure)
- Mandatory materials, organization responsibilities, and timelines

3. Budget Provisions (GAIA)

- Funding guidelines and budget allocation for organizing demo events
- Coverage for travel costs (cross-visits, farmer participation, etc.)

4. Technical Content (Neuropublic)

- Presentation of the QuantiFarm Toolkit and resources
- Use of DATSs assessment results and decision-support tools

5. Target Audience and Communication (ReFrameFood)

- Strategies for promoting demo events (press releases, social media, registration forms)
- Available communication materials (brochures, presentations, banners)

6. Q&A

- Open discussion to address remaining questions or clarifications regarding the organization and execution of demo events