FERTIMANURE

Deliverable

Project Acronym: FERTIMANURE

Project full name: Innovative nutrient recovery from secondary sources – Production of high-added value FERTIlisers from animal MANURE

Grant Agreement No. 862849

D4.3. 8 Demo-days organized: 4 countries, twice per region

Project start date	January 1st, 2020
Duration in months	48
Deliverable due date	June 30th, 2024
Actual submission date	June 30th, 2024
Work package concerned	4
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Contributor(s)	CDAF (ex APCA), CRAB, CA80, UGent, UVIC-UCC, Fertinagro, WENR

This project has received funding from
the EU Horizon 2020 Research and Innovation Programme
under grant agreement No. 862849

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Preface

This study was carried out and published as a part of the European demonstration project FERTIMANURE funded by the H2020 programme (project number 862849). The FERTIMANURE project focuses on the implementation of nutrient recovery and reuse technologies at 5 pilot installations with aim to produce bio-based fertilisers (BBFs) from animal manure and tailor-made fertilisers (TMFs) as blends of BBFs and (synthetic) mineral fertilisers for crop specific applications.

One of the Work Packages (WP) within the FERTIMANURE project consist of the demonstration of the BBFs and TMFs performance. To assess the ability of these products to substitute current mineral fertilisers, laboratory and field trials were carried out to obtain scientific data on agronomic and environmental performance. The deliverables D4.1, D4.2, D4.5 and D4.6 present the results of these trials. The obtained results and findings were shared and discussed with end-user stakeholders (i.e. farmers, manure processers and field contractors) during field trial visits. This report in the form of D4.3 aims to summarize the results from 8 field trial visits that took place between 2021 and 2023 in four partner countries (Spain, France, Belgium and the Netherlands). The objective of these field trial visits was to promote novel fertilizer usage and discuss about practical issues that may be useful for the recommendations for use of these products.

We would like to acknowledge the researchers and staff of Fertinagro Biotech (Spain), Ghent University (Belgium), BETA – University of Vic (Spain), Departament d'Accio Climatica, Alimentacio i Agenda Rural (Spain), Wageningen Environmental Research (the Netherlands), Chambres d'agriculture France (ex APCA), Chambre d'agriculture de Bretagne and Chambre d'agriculture de la Somme (France), for their work and contribution.

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Document History

Date	Author	Action	Status
February 15th, 2024	Mariana Moreira and Agathe Darret	1st draft	Draft
May 29th, 2024	Nimisha Edayilam, Ivona Sigurnjak	1st draft revision	Draft
June 26th, 2024	Laia Llenas	Approved by UVIC	Approved by the PC

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Summary

Deliverable 4.3 ‘8 Demo-days organized: 4 countries, twice per region’ is a part of FERTIMANURE work package (WP) 4. The WP4 aims to assess bio-based fertilisers (BBFs; produced in WP2) and tailor-made fertilisers (TMFs; produced in WP3) for their ability to substitute conventional synthetic mineral fertilisers whose production is based on finite fossil-based resources and on high energy consumption.

The D4.3 reports on results of the field trial visits that took place under the Task 4.4. Demonstration: Agricultural workshops linked to field demonstration visits.

This deliverable aims to summarise the 8 events organised by different partners during 2021 and 2023. The deliverable is divided into 6 chapters. The introduction is given in Chapter 1. Chapters 2, 3, 4 and 5 report on the description of the 8 events for each of the partner countries. Chapter 6 presents the overall results and main discussions and recommendations on the use of the tested BBFs.

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List of Abbreviations

BBF	Bio-based fertiliser
D	Deliverable
EU	European Union
TMF	Tailor-made fertiliser
WP	Work package

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1. Introduction

Keeping with the idea of a circular economy, nutrient recovery from biomass streams like animal manure has accelerated in recent years, leading to the development of bio-based fertilisers (BBFs). The European Commission has implemented the EU Fertilizing Products Regulation (FPR, 2019/1009), which took effect on July 16, 2022, to ease the transition from conventional fertilisers to BBFs. The regulation's main objective is to promote the manufacture of fertilisers from renewable raw resources that fall under certain categories. The use of organic and organo-mineral fertilisers is receiving much of attention. However, the regulations on the use of animal manure derived BBFs are still not fully clear.

The recent work of European Commission's Joint Research Centre proposes harmonized standards for nitrogen (N) fertilizer obtained from manure that may be applied above the N application standard for manure as a replacement for (synthetically produced) mineral N fertilisers (Huygens et al., 2020). The implementation of these proposed harmonized standards could permit the use of N fertilisers, either partially or entirely derived from processed manure, in areas subject to the 170 kg total N/ha/yr limit set by the Nitrates Directive (91/676/EEC). This implementation, however, is not yet initiated. Therefore, the potential of animal manure derived BBFs is not yet fully explored.

The FERTIMANURE project aims to promote advanced processing of animal manure and evaluate the agronomic and environmental effectiveness of recovered BBFs in comparison to traditional synthetic mineral fertilisers. Specifically, FERTIMANURE will develop, integrate, test, and validate innovative Nutrient Management Strategies to efficiently extract mineral nutrients and other valuable products from manure. The goal is to produce dependable and safe fertilisers that can effectively compete in the European Union (EU) fertilisers market. This objective will be achieved by:

(i) implementing 5 on-farm experimental innovative and integrated nutrient recovery pilots in some of the most relevant European countries in terms of livestock production (Spain, France, Germany, Belgium, the Netherlands);

(ii) addressing the nutrient management through 3 different strategies adapted to mixed and specialized farming systems:

a. (Strategy #1) On-farm production and use of BBF;

b. (Strategy #2) On-farm BBF production and Centralized TMF production;

c. (Strategy #3) On-farm TMF production and use.

WP4 aims to evaluate BBFs and TMFs as potential substitutes for synthetic mineral fertilisers, which rely on finite fossil-based resources. Assessments were conducted at laboratory, pot and field scale. Additionally, field trial visits were organized to showcase and communicate the obtained results to agricultural end-users. The trials from Task 4.2 serve as a mean of disseminating knowledge based on field trial results as well as results from other WPs. The complete report of the 8 visits organized between 2021 and 2023 are included in D4.3.

Partners have established common guidelines outlining the content to be presented, available templates for posters and roll-up displays, required pictures, and indicators for reporting. Each partner has completed a common template for internal reporting after each event, and all these reports are presented in the subsequent sections of the D4.3. An overview of the 8 organized demo-days is provided in Table 1.

Although the field trials started in 2021, for most partners it was not possible to organize visits that year due to the constraints imposed by the pandemic (COVID19) situation. Consequently, only the WENR trial was visited that year. Furthermore, for some locations in 2022 and 2023 the event was limited to an indoor presentation of the project and the results of the field trials, as the crop harvest had already taken place. This was the case for events organized by Fertinagro Biotech in 2022 and UGent in 2023. Finally, in some cases the partners

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have taken advantage of events organized on a larger scale to organize a workshop dedicated to the FERTIMANURE project and BBFs. This was the case for the visits organized by CRAB and CA-80 in France. CRAB organizes every year an open day with different workshops, in 2022 one of these workshops was dedicated to the FERTIMANURE BBFs.

Table 1 Overview of the 8 organized demo-days between 2021 and 2023.

Country	Location	Crop	Products	PP in charge	Date of the event	Number of participants
ES	Vic	Winter wheat	TMF[1]	UVIC- DACC	30/6/2022	16
	Vic	Winter wheat	TMF[1]	UVIC - DACC	18/10/2023	49
	Aragon region	Potatoes	TMF[2]	Fertinagro Biotech	12/12/2022	9
FR	Brittany region	Silage maize	FR-AS	CRAB	9-10/06/2022	504
	Somme department	Potatoes	FR-AS and FR-BC	CA80	24/08/2023	30
BE	West Flanders	Silage maize	BE-AN, BE-AS	UGent	16/06/2022	52
	West Flanders	Silage maize	BE-AN, BE-AS	UGent	20/06/2023	30
NL	Wageningen	Silage maize and grass	NL-AS	WENR	17/06/2021	15

ES: Spain; FR: France, BE: Belgium; NL: the Netherlands; PP: project partner; TMF: tailor-made fertilizer; AS: ammonium sulphate; BC: biochar; AN: ammonium nitrate.

[1] TMF concerns pre-sowing application of the biodried soild fraction (ES-DSC) plus a top-dress application of the ammonium sulphate solution (ES-AS) and the biostimulant (ES-AA) product.

[2] TMF is on-farm combination of pig slurry, synthetic mineral fertilisers, bio-stimulants, humic acids and additives.

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2. Spanish demonstrations events

2.1. UVIC-DAAC event of 2022

Title of event (in local language)	Activitat demostrativa dels assajos agronòmics a camp del projecte FERTIMANURE Coneix els productes biofertilizants del projecte FERTIMANURE i quin rendiment tenen aplicats a camp
Title of event (in English)	Demonstration activity of agronomic trials in the field of the FERTIMANURE project Learn about the biofertilizer products of the FERTIMANURE project and what performance they have when applied in the field
Date	30/06/2022
Location	*Vic, Catalunya, Spain*
Communication (invitation, social networks links, …)	The invitation was sent to numerous stakeholders, including farmers and fertilizer-related companies. The event was also announced on the DACC website. In addition, different news (including a video) were published about the event in the following links: https://el9nou.cat/osona-ripolles/actualitat/el-primer-blat-del-fertimanure/ https://el9nou.cat/video/demostracio-en-un-camp-de-vic-del-rendiment-dels-productes-biofertilitzants-del-projecte-fertimanure/ https://twitter.com/ruralcat/status/1544637345353592832?s=20&t=G-ylJllPP0uI8FxE64IsKQ https://twitter.com/ruralcat/status/1544637345353592832?s=20&t=Mv1pmVzBQ7D66AIA4AfOQw
Participants (total and by stakeholder groups)	Total participants: 16 • SG1 - Agricultural producers: 3 • SG2 - Fertilisers processing industry: 3 • SG3 - Academia and research: 8 (from UVIC) • SG4 - Business and financial advisors: 0 • SG5 - Policy makers & authorities: 1 • SG6 - Public entities & general public: 1
Brief description of the event	The main objective was to present the FERTIMANURE project to different stakeholders (mainly agricultural producers and fertilisers processing industry), focusing on the Spanish pilot and the agronomic trials at the UVIC. Content: • presentation of the FERTIMANURE project; • presentation of the Spanish pilot: technologies and products (with real samples of the BBFs obtained); • the use of biofertilisers in Catalonia (response to the survey to feed WP6); • presentation of the agronomic assays and visit to the experimental field.
Conclusion about the event	The attendees (Figure 1 and 2) were interested in the FERTIMANURE project, as well as in the operation and performance of the pilot plant and the BBFs produced. In addition, the visit to the experimental field was very useful to show how FERTIMANURE products (BBFs and TMFs) are being tested in crops. The opinions of the attendees were also collected through a paper survey.

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Figure 1 Field trial view (UVIC, 2022).

Figure 2 Participants to field trial visit (UVIC, 2022).

2.2. UVIC-DAAC event of 2023

Title of event (in local language)	*Biofertilitzants en base a nutrients recuperats de dejeccions ramaderes - Consideracions tècniques i marc normatiu*
Title of event (in English)	Biofertilisers based on nutrients recovered from livestock manure - Technical considerations and regulatory framework
Date	18/10/2023
Location	*Vic, Catalunya, Spain*
Communication (invitation, social networks links, …)	The event program was published and the event was announced on the DACC, UVIC and BETA websites: https://ruralcat.gencat.cat/c/document_library/get_file?uuid=a31d6f94-48ab-4d27-9468-f807ee07f13b&groupId=20181 https://betatechcenter.com/ca/agenda/biofertilitzants-en-base-a-nutrients-recuperats-de-dejeccions-ramaderes-consideracions-tecniques-i-marc-normatiu/ https://mon.uvic.cat/udivulga/biofertilitzants-en-base-a-nutrients-recuperats-de-dejeccions-ramaderes/ In addition, different news were published about the event: https://betatechcenter.com/el-ct-beta-organitza-una-jornada-patt-a-vic-sobre-biofertilitzants-recuperats-a-partir-de-dejeccions-ramaderes/ https://www.linkedin.com/posts/betatc_patt-biofertilitzants-activity-7117444184390660098-eaT4?utm_source=share&utm_medium=member_desktop
Participants (total and by stakeholder groups)	Total participants: 49. • SG1 - Agricultural producers: 7 • SG2 - Fertilisers processing industry: 14 • SG3 – Academia and research: 13 • SG4 - Business and financial advisors: 0 • SG5 - Policy makers & authorities: 5 • SG6 - Public entities & general public: 10
Brief description of the event	The main objective was to present the FERTIMANURE project and the BBFs obtained to different stakeholders (mainly agricultural producers and fertilisers processing industry), focusing on technical considerations and regulatory framework. Content: • Analysis and trends of the livestock sector and the treatment of livestock manure; • Integrated management of nutrients in agriculture; • Biofertilisers recovered from livestock manure, the FERTIMANURE products;

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	• Regulatory framework for biofertilizer products. Opportunities and threats; • Use of biofertilisers in organic agriculture; • Participatory activity. Perception and acceptance of biofertilizer products; • Visit to the Spanish pilot plant for the transformation of livestock manure into fertilisers (Cal Ros Farm, Muntanyola), including a presentation of technologies and products (with real samples of the BBFs obtained).
Conclusion about the event	The attendees (Figure 3 and 4) showed keen interest in the FERTIMANURE project, as well as in the operation and performance of the pilot plant and the BBFs produced. Their opinions were collected through participatory activities, revealing several key insights. Attendees highlighted the need to enhance the competitiveness of biofertilizer prices and establish farmer-friendly application systems. They also expressed concerns about the complexity and duration of fertilizer registration processes, which can discourage many producers. Attendees emphasized the potential for self-management to improve economic viability if the process proves profitable. Additionally, they suggested forming alliances between livestock producers and biofertilizer or marketing companies to facilitate market entry. Regarding agricultural performance, biofertilisers were perceived as products with high nutrient and organic matter content, enhancing soil structure and providing better performance compared to inorganic fertilisers.


Figure 3 Presenting the project (UVIC, 2023).


Figure 4 Presenting the Spanish pilot (UVIC, 2023).

2.3. Fertinagro Biotech event of 2022

Title of event (in local language)	Presentación de los resultados del proyecto FERTIMANURE
Title of event (in English)	Presentation of the results of the FERTIMANURE project
Date	12/12/2022
Location	*Terruel, Spain*
Communication (invitation, social	The invitation was sent to numerous stakeholders, including livestock farmers and arable farmers. In addition, different news was published about the event: • https://www.linkedin.com/feed/update/urn:li:activity:7008018193495519232

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networks links, …)	• https://twitter.com/fertinagro/status/1602255886717796353?s=20&t=LeGWvEF78pT_byYpBaQi1g • https://m.facebook.com/story.php?story_fbid=pfbid021Fb7GCShz4fmpzQ54CziGKn77PgcJCtRR8Ex9yLbZSiQxVMEZmxRgTKvUF6fCCQAl&id=100063772890898
Participants (total and by stakeholder groups)	Total participants: 9 • SG1 - Agricultural producers: 6 • SG2 - Fertilisers processing industry: 0 • SG3 – Academia and research: 3 (from Fertinagro BioTech) • SG4 - Business and financial advisors: 0 • SG5 - Policy makers & authorities: 0 • SG6 - Public entities & general public: 0
Brief description of the event	The main objective was to present the FERTIMANURE project to different stakeholders (mainly livestock farmers, arable farmers), focusing on the on farm TMF development and the subsequent agronomic trials carried out on potatoes. Content: • Presentation of the FERTIMANURE project; • Overview of trial location; • Development of the on-farm TMF; • Summary of treatments (traditional and TMF) on potato; • Economic benefit of the TMF approach compared to the traditional one and conclusions.
Conclusion about the event	The attendees (Figures 5 and 6) were interested in the FERTIMANURE project and the production and application of the on-farm TMF. They found attractive the harvest results in potatoes as well. Traditionally, they do not apply slurry to irrigated crops, but depending on the economic benefit, they could find viable to use the improved TMF for potato crops in the area. They are interested in the results obtained in the potato trial to be carried out in 2023.

Figure 5 Participants to FERTIMANURE event (Fertinagro BioTech, 2022).

Figure 6 Presenting the location of the field trials (Fertinagro BioTech, 2022).

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3. French demonstration events

3.1. CRAB event of 2022

Title of event (in local language)	Portes ouvertes 2022 : L'agriculture de 2040 se prépare à Kerguéhennec Atelier 5 – Les fertilisants organiques et bio-sourcés, nouvelle génération
Title of event (in English)	Open days 2022 : the 2040's agriculture is under preparation at the Experimental Station of Kerguehénnec Workshop 5 – The organic and bio-based fertilisers, a new generation
Date	9/6/2022 and 10/6/2022
Location	*Kerguéhennec Experimental Station, Bignan, 56500, Brittany, France*
Communication (invitation, social networks links, …)	Link to the registration site : https://my.weezevent.com/50-ans-de-kerguehennec
Participants (total and by stakeholder groups)	Total participants: 504 • SG1 - Agricultural producers: 102 • SG2 - Fertilisers processing industry: 127 • SG3 – Academia and research: 38 • SG4 - Business and financial advisors: 138 • SG5 - Policy makers & authorities: 4 • SG6 - Public entities & general public: 95
Brief description of the event	The aim of the event was to present the FERTIMANURE project and to visit the maize field trial where nitrogen recovery efficiency of BBF ammonium sulphate was tested. The targeted stakeholders were farmers and agricultural/farm advisors from Brittany region. Content: - Brief presentation of the context and regulation on fertilisers; - Definition of BBF and types of BBF; - General presentation of the FERTIMANURE project; - Focus on 2 technologies to nutrient recovery from animal manure (pyrolysis and N stripping) and on 2 BBF (biochar and ammonium sulphate) produced and tested in France; - Presentation of the research protocol to assess nitrogen recovery efficiency of BBF and results obtained in 2021. - Visit of the field trial. Key messages: In Brittany, the production of BBF can be an opportunity for farmers. The results obtained in 2021 shows that the BBF ammonium sulphate as the same N recovery efficiency as ammonium nitrate (mineral synthetic fertilizer used as reference).
Conclusion about the event	The workshop witnessed strong participation from farmers, advisors, policy makers, and students (Figures 7, 8 and 9). For some attendees, it was their first introduction to BBFs. They found the event highly relevant, particularly in light of the current fertilizer market context. Many expressed interest in staying informed about the results obtained in 2022 and overall progress of the FERTIMANURE project. Some questions were raised regarding the storage and application of BBF ammonium sulphate.

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Figure 7 Field trial view (CRAB, 2022).

Figure 8 Presenting N stripping pilot and results for FR-AS in 2021 (CRAB, 2022).

Figure 9 Participants (CRAB, 2022).

3.2. CA-80 event of 2023

Title of event (in local language)	Alimentation en eau de nos légumes d'industrie : optimiser aujourd'hui et prévoir demain
Title of event (in English)	Water supply for our industrial vegetables : optimise today and plan for tomorrow
Date	24/08/2023
Location	*Berny en Santerre (80200), Somme department, France*
Communication (invitation, social networks links, …)	Invitation (Figure 10) shared on the social networks.
Participants (total and by stakeholder groups)	Total participants: 30 • SG1 - Agricultural producers: 23 • SG2 - Fertilisers processing industry: 7 • SG3 – Academia and research: 0

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	• SG4 - Business and financial advisors: 0 • SG5 - Policy makers & authorities: 0 • SG6 - Public entities & general public: 0
Brief description of the event	The main objective was to share the results of our trials conducted over two years (2021 & 2022) and to showcase the different trials conducted in 2022. These trials aim to demonstrate the feasibility of alternative production methods for vegetables, such as using less water and organic nutrients. The target audience includes producers, agricultural small and medium-sized enterprises (SMEs), and research institutions. The event was divided into two parts: an indoor session showcasing posters presenting the results of various trials, followed by a second part consisting of visits to the field trial plots. In France, we tested Ammonium Sulphate (FR-AS) and Biochar (FR-BC).
Conclusion about the event	We received positive feedback from participants (Figures 11 and 12), who were eager to learn about the final results of the experiments and to gain insight into the timeline required to develop tools for creating bio-fertilisers on a large scale.

Figure 10 Invitation to the event (CA-80, 2023).

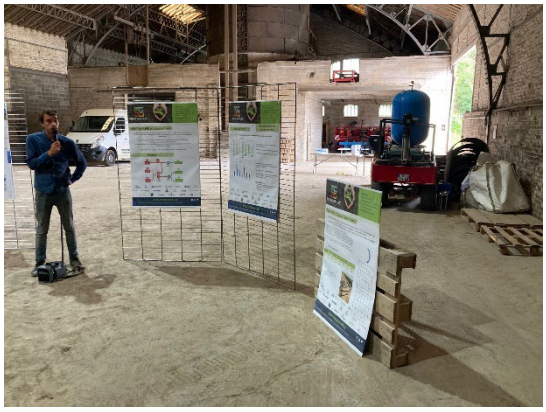

Figure 11 Presenting the FERTIMANURE project (CA-80, 2023).

Figure 12 Participants (CA-80, 2023).

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4. Dutch demonstration events (WENR)

Title of event (in local language)	Bezoek aan de veldproeven van FERTIMANURE
Title of event (in English)	Visit to the field trials of FERTIMANURE
Date	17/06/2021
Location	*Wageningen, 6708 PB the Netherlands*
Communication (invitation, social networks links, …)	Visit of the greenhouse and the field experiment of Fertimanure in Wageningen by the project team of the project Biobased Fertilisers Achterhoek and other members.
Participants (total and by stakeholder groups)	Total participants: 15 • SG1 - Agricultural producers: 1 • SG2 - Fertilisers processing industry: 2 • SG3 – Academia and research: 3 • SG4 - Business and financial advisors: 2 • SG5 - Policy makers & authorities: 3 • SG6 - Public entities & general public: 4
Brief description of the event	Objectives: - To conduct a field trial visit focusing on silage maize within the framework of the FERTIMANURE project. - Introducing the H2020 Project FERTIMANURE to participants.
Conclusion about the event	Introduction of the H2020 Project FERTIMANURE was well received (Figures 13 and 14). Crop silage maize showed an equal or slightly better response on the BBF in comparison with the Calcium Ammonium Nitrate (CAN) the most common fertiliser in the Netherlands and used here as a reference mineral nitrogen fertilizer. The application of the BBF was performed successfully, injected using new machinery, showing technological readiness for field application.

Figure 13 Participants and field trial view (WENR, 2021).

Figure 14 Participants and field trial view (WENR, 2021).

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5. Flemish demonstration events (UGent)

5.1. Event of 2022

Title of event (in local language)	Proefveldbezoek herwonnen meststoffen
Title of event (in English)	Experimental field visit on recovered fertilisers
Date	16/06/2022
Location	*Wingene, 8750, West Flanders, Belgium*
Communication (invitation, social networks links, …)	Proefveldbezoek herwonnen meststoffen | Inagro
Participants (total and by stakeholder groups)	Total participants: 52 • SG1 - Agricultural producers: 14 • SG2 - Fertilisers processing industry: 17 • SG3 – Academia and research: 8 • SG4 - Business and financial advisors: 5 • SG5 - Policy makers & authorities: 4 • SG6 - Public entities & general public: 4
Brief description of the event	The aim of the event was to inform farmers about: i) agricultural performance of ammonium salts (I.e. ammonium nitrate, ammonium sulphate) by presenting results from the FERTIMANURE field trial; ii) application of ammonium salts by providing a demonstration on machinery; iii) carbon footprint and GHG emissions of ammonium salts; iv) costs related to these biobased fertilisers; v) legal update on their RENURE status and finally vi) observations and results from other projects that examine the use of ammonium salts. The event had a good participation of 52 stakeholders out of which most belong to industry and farmers community.
Conclusion about the event	The stakeholders (Figures 15-18) showed interest in the results and the presented program. They will be invited again to the next event when we plan to present the final results of FERTIMANURE.

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Figure 15 Visiting the maize field trial (UGent, 2022).

Figure 16 Presenting equipment (UGent, 2022).

Figure 17 Presenting FERTIMANURE project (UGent, 2022).

Figure 18 Presenting results from 2021 (UGent, 2022).

5.2. Event of 2023

Title of event (in local language)	De toekomst van duurzame landbouw in Vlaanderen
Title of event (in English)	The future of sustainable agriculture in Flanders
Date	20/06/2023
Location	*Caritasstraat 39, 9090 Melle, Belgium*
Communication (invitation, social networks links, …)	https://nutricycle.vlaanderen/evenementens/de-toekomst-van-duurzame-landbouw-in-vlaanderen/
Participants (total and by stakeholder groups)	Total participants: 85 • SG1 - Agricultural producers: 30 • SG2 - Fertilisers processing industry: 11 • SG3 - Academia and research: 14 • SG4 - Business and financial advisors: 8

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	• SG5 - Policy makers & authorities: 12 • SG6 - Public entities & general public: 10
Brief description of the event	The aim of the event was to inform farmers about: i) agricultural performance of ammonium sulphate by presenting results from the FERTIMANURE field trials 2021-2022; ii) carbon footprint and GHG emissions of ammonium sulphate; iii) legal update on their RENURE status iv) observations and results from other projects that contribute to sustainable agriculture.
Conclusion about the event	The event had a good participation of 85 stakeholders (Figures 19 and 20) out of which most belong to industry and farmers community. The stakeholders showed an interest in the results and presented programme.

Figure 19 Participants (UGent, 2023).

Figure 20 Presenting BBF tested in the field trials (UGent, 2023).

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6. Conclusions

Eight events were organised between 2021 and 2023, with a total attendance of 760 participants. Agricultural producers (SG1) and Fertilisers processing industry (SG2) stakeholders were the groups that were most represented at the organised events.

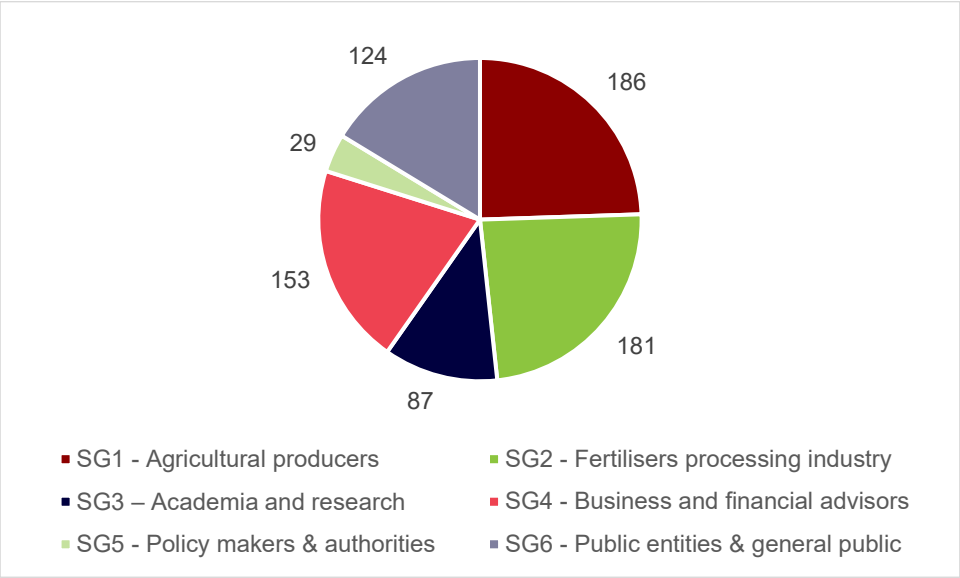

Figure 21 The total number of 760 participants at 8 events categorized in 6 stakeholder groups.

Overall, the FERTIMANURE project was positively received, with participants expressing interest in learning more about the ongoing trials. For some attendees, this was their first exposure to BBF or TMF. The field trial visits and presentation of FERTIMANURE results provided clarity regarding the performance of these products in terms of nutrient content and their potential to replace chemical synthetic fertilisers. Some inquiries were raised regarding BBF, particularly regarding storage and application issues for ammonium sulphate (FR-AS).

Depending on the economic benefits, farmers may find it viable to use these types of fertilisers, especially in the current context of high costs associated with chemical synthetic fertilisers. If BBF prices remain competitive and logistical challenges are addressed through the development of practical tools and the possibility of self-management, it is more likely that we will see an increase in the utilization of these fertilisers.

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FERTIMANURE

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INNOVATIVE NUTRIENT RECOVERY FROM SECONDARY SOURCES-PRODUCTION OF HIGH-ADDED VALUE FERTILISERS FROM ANIMAL MANURE

PROJECT COORDINATOR

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University of Milan (Italy)
Leitat (Spain)
GreenWin (Belgium)
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PROJECT WEBSITE:

https://www.fertimanure.eu

This project has received funding from
the EU Horizon 2020 Research and Innovation Programme
under grant agreement No. 862849

Brief project summary

The mission of the FERTIMANURE project is to provide innovative solutions (technology, end-products, and business models) that solve real issues, ie the manure challenge, and help farmers with the challenges that they are currently facing. FERTIMANURE will develop, integrate, test and validate innovative nutrient management strategies so as to efficiently recover and reuse nutrients and other products with agronomic value from manure, to ultimately obtain reliable and safe fertilisers that can compete in the EU fertiliser market.

The FERTIMANURE project will cover both technological and nutrient management approaches. The technological side will be addressed with the implementation of 5 innovative & integrated on-farm experimental pilots for nutrient recovery in the most relevant European countries in terms of livestock production (Spain, France, Germany, Belgium, The Netherlands), whereas nutrient management will be addressed through 3 different strategies adapted to mixed and specialised farming systems:

Strategy #1 with on-farm production and use of bio-based fertilisers (BBF)(1) , **Strategy #2** with on-farm BBF production and centralised tailor-made fertilisers (TMF)(2) production, and **Strategy #3** with on-farm TMF production and use.

Definition of Bio-based fertilisers (BBFs): *Bio-based fertilisers (BBFs) are fertilising products or a component to be used in the production of (Tailor-Made) Fertilisers that are derived* ***from biomass-related resources.***

The BBFs of FERTIMANURE are "obtained through a ***physical, thermal/thermo-chemical, chemical, and/or biological processes for the treatment*** *of manure or digestate that result into a change in composition due to a change in concentration of nutrients and their ratios compared to the input material(s) in order to get better marketable products providing farmers with nutrients of sufficient quality".*

However, just separation of manure in a solid and liquid fraction (as first processing step) is excluded. These products are not conceived as a BBF, although they are valuable sources to supply nutrients on agricultural land.

LIST OF BBFs Produced in FERTIMANURE

Number	BBF-code	BBF product description
1	NL-AS	Ammonium sulphate solution
2	NL-LK	Liquid K-fertiliser
3	NL-SC	Soil conditioner
4	NL-WP	Wet organic P-rich fertiliser
5	NL-DP	*90% dried organic P rich fertiliser (calc)*
6	ES-NC	Nutrient-rich concentrate
7	ES-DSC	Bio-dried solid fraction
8	ES-PA	Phosphorous (ashes)
9	ES-AM	Ammonium salts
10	ES-AA	AA-based biostimulants
11	DE-AS	Ammonium sulphate solution (liquid)
12	DE-BC	Biochar (solid)
13	DE-AP	Ammonium phosphate on perlite (solid)
14	BE-AN	Ammonium nitrate

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15	BE-AS	Ammonium sulphate
16	BE-AW	Ammonium water
17	FR-BC	Biochar
18	FR-AS	Ammonium sulphate
19	FR-LK	Liquid K-fertiliser

Definition of Tailor-Made Fertilisers (TMFs): *A tailor-made fertiliser (TMF) is a customized fertiliser that meets with the nutrient requirements of a specific crop by taking into account the soil type, soil fertility status, and growing conditions and fertilisation practises.*

The TMFs obtained in FERTIMANURE are produced from BBFs (produced from manure or digestate and/or other recovered fertilising products that are available) and/or mineral fertilisers (MF) (and/or biostimulants).

Fully crop specific TMFs can be defined and centrally produced assuming e.g. a sufficient nutrient status of a soil type and no additional fertilisation practice.

However, on farm level the soil-crop requirements will be different due to another nutrient status of the soil and the fact that often manure/digestate will be applied on the fields which has to be taken into account as nutrient supplier. Consequently, the composition of the TMF (combination of BBF and MF) that will be used by the farmer can differ from the one produced in a centralised way.

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